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A TREATISE

ON

RELAPSING OR FAMINE FEVER.

BY

R. T. LYONS,

Assistant-Surgeon, Bengal Army.

LONDON:

HENRY S. KING & Co., 65, CORNHILL.

1872.

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TO

JOHN CAMPBELL BROWN, ESQ., C.B.,

HONORARY SURGEON TO HER MAJESTY,

AND INSPECTOR-GENERAL OF THE BENGAL

MEDICAL DEPARTMENT,

AND

JAMES PETER BROUGHAM, ESQ., M.D.,

LATELY SURGEON OF THE PRESIDENCY GENERAL HOSPITAL

AT CALCUTTA,

THIS LITTLE WORK IS RESPECTFULLY DEDICATED.

PREFACE.

This work is an adaptation of the chapter on relapsing fever in Murchison's Treatise on the Continued Fevers of Great Britain, to the disease as it has been observed in India. The divisions of the subject, the descriptions, the views, and mode of reasoning of this author have been followed, and many passages have been extracted verbatim or abridged from the original. The facts, however, have been derived entirely from Indian observation.

I have adopted the doctrine of the identity of intermittent, remittent, and continued fevers, because I believe it to be sound and true. These fevers do not appear to be distinct diseases, differing from each other in essential nature, but forms or varieties of the same disease. In the following pages, it will be seen that relapsing fever has as often, if not more frequently, assumed the intermittent as the remittent form, while the continued form of the disease has been comparatively rare. The intermittent and remittent relapsing fever of India is the same disease as the continued relapsing fever of Great Britain. The cause, the general symptoms, the complications and the sequelæ are identical; the entire natural history of the disease is the same in all.

Intermittent, remittent and continued varieties of the other forms of fever are likewise observed in this country. I met with the intermittent variety of typhus during the epidemic of that disease which

occurred in the Rawul Pindee jail in 1869. The intermittent simple fever is a disease seen every day throughout India. The intermittent typhoid fever is common in Calcutta, and I have been particularly struck with it, as intermittent fever of so protracted a duration, extending in some cases over a month and even two months, I had not seen in the Punjab, where I had resided for nearly ten years. As typhoid fever has a special anatomical lesion, the doctrine of the identity of intermittent, remittent, and continued fevers is placed beyond a doubt by the fact that these three varieties of typhoid fever possess in common the characteristic intestinal lesion of that classical disease.

It was my original intention to have delayed the publication of this work until I had completed similar treatises on typhus, typhoid, and simple fevers. Circumstances, however, have compelled me to postpone the preparation of these treatises. The subject of the identity of the thermometric varieties of relapsing fever is thus deprived of the collateral support which it would derive from the fact that corresponding thermometric varieties of the other forms of fever are to be met with in this country. The facts that are available regarding the other forms of fever, added to those presented in the present work, form together a body of evidence which, in my opinion, will be convincing to most minds.

I absolutely reject the malaria theory of the origin of fevers. It is unworthy of permanence. It calls upon us to believe that the fevers are due to something unknown. European pathologists have, however, traced the origin of these diseases to definite and tangible causes. But a little unbiassed observation is needed to perceive the identity of the fevers of Europe and those of India: why there should be any essential difference is incomprehensible, and has never been

explained. A cause known to produce a disease in Europe will as surely produce the same disease in India. The human race is essentially the same in this country as in Europe, and is influenced by physical circumstances in the same manner.

Whatever differences there may be between the fevers in Europe and in India, they are unimportant, and do not involve a dissimilarity in their nature or cause. Equivalent differences exist in the human race in this country and in Europe. The people are olive, black, or dark complexioned in this country, and the women attain maturity early in life, and some other differences might be mentioned; but these peculiarities have never been regarded by naturalists as constituting an essential difference between the people of India and of Europe.

Relapsing fever has long been recognised in this country as a distinct disease, and various designations have been applied to it, such as jungle fever, bilious remittent fever, congestive fever and other names. The chief error regarding it was the ascription of its origin to malaria, or some subtle but unknown deleterious aërial agent. In this work it is shown that the want of food is the origin of the disease, and that it is propagated by contagion. In recent years, in the Bengal Presidency, famine and scarcity from drought, and wide-spread distress from inundations of the rivers, have been common. The fever which followed these calamities has been ascribed to malaria: the tangible cause, which was present, we are told was inoperative; whereas in Europe its effect would have manifested itself in a form of fever which in this country has been and is still by many regarded as malarious.

This serious error will, I trust, be ultimately corrected by the exposition of the disease in its various forms which is presented in the following pages.

As in the case of other false doctrines in medicine, the faith in malaria has not directly achieved any benevolent result, nor indirectly secured to mankind much appreciable good. The malaria theory of the origin of fever has not in India, so far as I am aware, contributed to the diminution of this disease, in its various forms. The theory is, in the present day, very influential in Lower Bengal; and in connection with this fact stands forth the fearful and perilous prevalence of fever in that province of India. It appears to me that in no part of the British dominions is fever so prevalent. In the Punjab, the malaria theory has in general received but a formal or wavering support; and in connection with the epidemics, at one time very common, that occurred in the prisons, it was absolutely rejected. To the abandonment of the malarious etiology of the epidemics of fever in the jails of the Punjab is to be attributed the practical extermination of relapsing fever in those jails. The diminution of disease and mortality in the jails of Lower Bengal was not due to elaborate measures designed to disperse or prevent the generation of malaria, but to the adoption of the homely plans, originally sketched by Hutchinson, for the better provision of the necessaries of life to the prisoners.

Since the manuscript of this work was transmitted to England in October, 1871, I have personally observed two epidemics of relapsing fever in Lower Bengal, and have ascertained with certainty the nature of the awful epidemic which broke out last year in the Burdwan and adjoining districts, and which is still not extinct. I have been enabled to insert in Section XIV. a few cases of relapsing fever observed in the epidemic which occurred in the Right or Chittagong Column, commanded by Brigadier-General Brownlow, C.B., of the Looshai Expeditionary Force, to which I was at-

tached. Since returning from the field, I have had the opportunity of observing a mild epidemic still progressing in the 8th and 10th Regiments of Native Infantry stationed at Alipore, a suburb of Calcutta, The epidemic amongst the troops forms a part of the general epidemic of dengue, as the disease is popularly called, which has been prevailing in Calcutta for some months past. The scarlet eruption, described by various Calcutta physicians in past years, was observed in a few of the native subjects of the disease, and was very commonly seen in Europeans. The chief epidemic of the year, however, was that at Burdwan, to which both the Chittagong and Calcutta epidemics are traceable. As pointed out in page 217 of this work, the non-eruptive disease in the Burdwan and other districts adjoining Calcutta communicated the eruptive and milder variety to the residents of the wealthy and well-cared-for metropolis. I regret that it is not now practicable to insert in the text accounts of these three contemporary epidemics, as well as of other epidemics in past years, regarding which I have recently gathered information. I am desirous, however, of referring to an epidemic, not in the text, which occurred in Calcutta during the months of June, July, and August, 1836, described by Walter Raleigh in the *India Journal of Medical and Physical Science*, vol. i., new series, for 1836. It would appear from this account that the duration of the fever was four or five days, and occasionally longer; and the eruption appeared generally on the second day. The occurrence of relapses was not noted. No mortality ensued, and the disease was not considered to be contagious.

I have devoted much care and labour to the Historical Section, in which and in the references to the writings of observers therein contained, will be found the data for checking, as it were, the pathology

and etiology of the disease here laid down. The clinical illustrations are few in number, as, not having in my possession the notes of cases observed in the Punjab, I have been restricted to the few cases which I met with in Calcutta. I take this opportunity of acknowledging the kindness of those gentlemen who permitted me to observe their cases of fever in the wards of the Presidency General Hospital, and who supplied me with the books from which I have compiled the history of relapsing fever.

ALIPORE, CALCUTTA,
22nd July, 1872.

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RELAPSING OR FAMINE FEVER.

SECTION I.

Definition.

A CONTAGIOUS fever, generated by starvation, chiefly met with among the poorer classes, and occurring as an epidemic during seasons of scarcity and famine. It may be intermittent, remittent, or continued; or partly intermittent and partly remittent or continued. Its average duration varies from five to seven days, but is sometimes shorter and occasionally longer. Its symptoms are,—an abrupt invasion, but occasionally some premonitory symptoms (such as languor, loss of appetite, diarrhœa, restlessness, or muscular pains in the loins or limbs) precede the attack for a few days; quick, full, and often bounding, pulse; white, moist tongue, becoming dry, brownish, or even black; tenderness at the epigastrium; nausea and vomiting; often jaundice; enlarged and painful liver and spleen; constipation, but occasionally diarrhœa; skin hot and dry; generally no eruption, but in one variety a scarlet eruption, disappearing on pressure, occurs on the second or third day, and remains from twenty-four hours to five or six days, and occasionally large watery vesicles appear; urine high-coloured or tinged yellow in the jaundiced cases; severe headache and pains in the back and limbs; great debility and restlessness, and occasionally delirium or coma; generally an abrupt cessation or marked mitigation of these symptoms on the termination of the fever, with or without free perspiration or diarrhœa. After a complete apyretic interval, varying from two to fourteen days, but rarely longer, an abrupt relapse, which runs a similar

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course to the first attack, but generally milder; the duration of the relapse rarely exceeds four or five days; sometimes a second relapse, or even a seventh relapse. The mortality bears a direct ratio to the circumstances of the sick, being small in the better classes, and in the poor who receive care and attention; but great under circumstances of neglect. Death due to suppression of urine and coma, and rarely to syncope; often to some serious complication. After death no specific lesion, but usually enlargement of the liver and spleen.

The characteristic features of the disease are, fever of a few days' duration, attended by vomiting, often jaundice, enlargement or tenderness of the liver or spleen, or of both, generally constipation, headache, and pains of the body and limbs, considerable debility, followed by an apyretic interval of a few days, with the recurrence of the fever, which endures for a few days, and is followed by a tedious convalescence. No anatomical lesion, but the liver or spleen is generally enlarged.

SECTION II.

Nomenclature.

The following are some of the designations which have been applied to relapsing fever: bilious fever, Hunter, 1804; three days' fever, Cavell, 1824; rheumatic fever, Robinson, 1825; bronchitic fever of infants and young children, Adams, 1828; remittent fever of the Bengal rainy season, Twining, 1832; jungle fever, McDonell, 1833, Eyre, 1847; epidemic rheumatic fever, Twining, 1835, and old authors; epidemic congestive fever, MacNab, 1836: epidemic remittent fever, Spencer, 1836; catarrhal fever and gastro-hepatic fever, R. H. Hunter, 1836; bilious remittent fever, Shirreff, 1837, and old authors; bilious intermittent and remittent fever, Graham, 1839; yellow remittent fever, John Murray, 1839; bilious intermittent fever, H. J. Carter, 1843; peculiar form of eruptive fever, Henry Goodeve, 1844; fever like the Scotch

epidemic of 1843, Lyell, 1853; typhus, Farquhar, 1853, Bengal Sanitary Commission, Chuckerbutty, Partridge, 1864; remittent fever complicated with jaundice, and ardent continued fever, Morehead, 1856 and 1860, Peet, 1864; dengue, scarlatina rheumatica, Peet, 1864; relapsing fever, Gray, De Renzy, 1864, D. B. Smith, 1866, Hugh Clark, 1868; contagious jaundice fever, Bateson, 1866; relapsing contagious fever, Green, 1866; relapsing or famine bilious remittent fever, Sutherland, 1866; febris e fame, Udoy Chund Dutt, 1866; epidemic ague, or jungle, or bilious remittent fever, Eteson, 1869; Peshawur fever, Bellew, 1869; yellow relapsing fever, Bryden, 1870; red fever, Norman Chevers, 1871.

SECTION III.

Historical Account of Relapsing Fever.

It is necessary to preface the following history with a few remarks explanatory of the grounds on which the diagnosis has been made of a disease which, until within the last few years, had not been recognised in India. It will be seen that it was very prevalent in former days, and was probably a more destructive pestilence than cholera; and that many epidemics of it occurred in almost every part of the country, and in almost every year of the present century. The chief guide in ascertaining the nature of the majority of these epidemics was the appearance of jaundice in the course of a severe and fatal fever. In my own experience, this symptom has been met with only in relapsing fever. I am not aware that any other observer has seen it in this country in connection with the other forms of specific fever; and although it has been known in Europe to appear in the course of typhus and typhoid fever, the circumstance has been looked upon as rare and exceptional. It has been alleged, however, by the highest authorities, that jaundice is a not unusual accompaniment of malarious fever. This statement is opposed to my own experience, and I am further disposed

altogether to doubt or deny the reality of this form of fever as a distinct disease. It must be patent to all, that under this name has been comprised every form of specific fever now recognised as existing in this country. One after the other have typhoid and relapsing fever and typhus, as they were recognised by various observers, displaced or reduced the prevalence, so to speak, of malarious remittent fever. The universal and constant occurrence in the past of this disease, was in fact due to the non-recognition of the specific fevers, which were accordingly promiscuously set down as malarious remittent fever. Its prevalence in the future will, I believe, be reduced to still smaller dimensions, as the practical knowledge of the specific fevers becomes more generally diffused. Its existence appears to depend upon the circumstance that the specific fevers are not always recognised, and that their symptoms are in many instances obscure, or modified in this country in a manner which has not yet been fully investigated.

The occurrence of relapses has afforded a safe index, unembarrassed by the imaginary risk of confusion with malarious remittent fever, as this characteristic is not attributed to the latter disease by the systematic writers. Unfortunately, several of the accounts contain no statement regarding relapses; but the omission has been ascribed to the shortcomings of the writers in all cases where the general symptoms are consistent with the natural history of relapsing fever. In some of the accounts it will be observed that the narrators have overlooked the relapses in the description of symptoms, but have accidentally, as it were, in the course of the narrative, amply supplied the omission. It will not, therefore, be deemed to be altogether arbitrary to infer that those writers who have not mentioned the occurrence of relapses in an epidemic which in its general features was one of relapsing fever, had failed to note an incident which had actually transpired. It should also be remembered that relapses do not invariably happen, while in many instances they are so moderate as hardly to attract the attention of an observer who is not specially on the watch for them.

With regard to some of the minor epidemics, I have felt

justified in giving them a place in the text, when they are alluded to as bilious remittent or jungle fever by contemporary writers, who have given a description of the disease so named, of the nature of which I have been thereby enabled to judge.

The earlier epidemics were imperfectly described by the old writers, but sufficient information regarding them has been recorded to satisfy me regarding their nature. Some of the symptoms, moreover, are not usual in the disease as it appears in the present day; but those who have had the opportunity of observing epidemics, will probably not fail to discover in the unusual symptoms which, in the olden days, had epidemic proportions, a marked similarity to exceptional cases which came under their notice.

The history here compiled, being the first of its kind, it has been considered just and essential, in order to enable the reader to form an independent judgment, to state in detail the symptoms of the earlier epidemics. The accounts of a few of these are given verbatim; of the others, the original descriptions have been condensed, the language of the writers, however, being as far as was possible retained, as well as the views or opinions expressed by them. It must not be considered that this history is exhaustive, for the author has not had the opportunity of searching the entire literature of fever. It will be observed, however, that while Calcutta and the upper provinces of the Bengal presidency have been frequently visited by epidemics of relapsing fever, the districts of Lower Bengal appear to have enjoyed a remarkable exemption from the scourge. Within recent times, the newspapers have contained notices of the ravages of most awful epidemics of fever: villages being said to have been exterminated and whole districts devastated, so that large tracts of cultivated land have reverted to jungle from the destruction of the people. The accounts of these recent epidemics are vague and obscure. For instance, a disease alleged to be a malarious fever, of which the symptoms are those of malarious fever, and of which the cause is malaria—which is not contagious, but spreads over the country by means of atmospheric waves—is hardly intelligible. Other accounts are equally difficult of com-

prehension.* The disease, moreover, is authoritatively declared not to be relapsing fever; no form of fever answering to the accounts, is to be found described in the works of the systematic writers, nor to be met with in Calcutta, the metropolis of Lower Bengal. From the absence of intelligible accounts of these epidemics, I have been constrained to regard them as of unknown nature; but considering the circumstances of famine or want which, it is distinctly stated, were their predisposing causes, it would be inconsistent with the history of fever in Europe, if the Lower Bengal epidemics were not of typhus or relapsing fever, and out of keeping with the history of fever in this country if they were not of relapsing fever. The confusion and ambiguity of the accounts were probably owing to the intermixture with relapsing fever of typhoid fever, which is endemic in Calcutta, and also doubtless in the districts around the metropolis.

But although I have excluded the history of these epidemics from the text, there are not wanting statements by competent observers that the disease was relapsing fever. In the Report of the Charitable Dispensaries of Bengal Proper for 1866, Dr. Green, the Inspector General, thus writes of the Burdwan epidemic, p. 13: "The fever sprang up at the end of the rains. In the villages and particular parts of the district, the seat of the outbreak of fever, three-fourths of the population were found to have suffered under the fever. The mortality in some places has been in greater proportion than one to three attacked; and those who have escaped with life from the fever, have been left prostrated, anæmic, and with enlarged spleens, and anasarca. The disease may be designated relapsing fever; many are jaundiced; the fever sets in with severe symptoms at once, headache, high fever, gastric irri-

* See the Account of the Fever Epidemic of Lower Bengal in 1866–68, by Dr. Juggo Bundo Bose, read at the annual meeting of the Bengal Branch of the British Medical Association: *Indian Medical Gazette*, for June, 1868. Dr. Chuckerbutty also has felt a difficulty in comprehending these accounts of the fever. He says, "Nor can I make out its exact pathology and symptoms from the reports submitted to Government by Dr. Elliott and the Epidemic Commission." Chuckerbutty on Typhus: *India Annals of Medical Science*, no. xviii., p. 126.

tation; adynamic typhoid symptoms, dysentery and diarrhœa often supervene; death occurred in the worst cases on the eighth or tenth day, sometimes on the third or fourth; some of the cases were very protracted, and lasted for several months, the spleen becoming much enlarged; relapses occurred in others, followed by death on the twentieth day of the disease or so. Dr. Mantell considered the disease to be analogous to the severe fever of 1863–64: to be a highly concentrated malarious fever, and not to be contagious. Dr. Sutherland, who has had a large experience, calls it relapsing or famine bilious fever, and considers it to be infectious and contagious." In the report for the following year, Dr. Green, the head of the Indian Medical Department, repeats the same view of the fever. He says, "The fever has been a malarious one of an intensely poisonous and depressing character. It has also borne the features of the relapsing contagious fever. . . . It is to be feared that it became contagious in the crowded and wretched huts and dwellings of the poor." Dr. D. B. Smith's report, published in the *Calcutta Gazette* of July, 1869, contains no description of the disease; and the same omission was made by Dr. Elliott in his report, published in the *Calcutta Gazette* of June, 1863.

A few epidemics which occurred in extra-Indian territory have been given a place in the text. It will be observed that all the accounts of epidemics reflect more or less light upon each other, and that the fuller and more complete descriptions of some writers help to supply the deficiencies of the less perfect accounts. Inaccuracy, incompleteness, confusion, and even some inconsistency, are naturally to be expected in the accounts of a disease which was not understood, which was mistaken sometimes for other diseases, and confounded with the other forms of specific fever, and the very existence of which in India even in the present day has been denied by the highest authorities. These are considerations to be kept in mind in forming an opinion regarding the nature of each of the epidemics related in the text.

The earliest example of the disease in India is found in Mr. Holwell's account of the catastrophe of the Black Hole

of Calcutta. One hundred and forty-six individuals, exhausted by continual fatigue and action, uncertain as to their fate, depressed in spirit, and doubtless weakened by scanty provisions and badly cooked food, were crammed on the 20th of June, 1756, in an apartment used as a prison in old Fort William. The apartment is described by Mr. Holwell, the governor, and one of the survivors, as a cube of 18 feet, shut in by dead walls and ventilated only by two barred windows. Orme states that the dimensions were 18 feet by 14, and the height 18 feet. The space available was 4536 cubic feet, and 252 square feet. Each individual thus obtained less than two feet of superficial space; and the cubic space equally divided was 31 cubic feet to each. There was neither draught nor escape of vitiated air. There can be no doubt that under the above circumstances, the victims who first died were simply asphyxiated; the next series died poisoned with foul air; a third series might be reasonably supposed to have died of some disease that was set up by the conditions which existed. The symptoms of this disease are described by Mr. Holwell to have been profuse perspiration, great thirst, difficulty of respiration, delirium with wild cries and ravings, becoming ultimately outrageous and ungovernable, pain in the breast, and palpitation of the heart. These were the symptoms of the most severe form of the disease, and probably not one of those who had these symptoms survived. The survivors, who were those who were fortunate in obtaining places near the windows, escaped the more violent symptoms of the disease; in them the mental faculties were not impaired, they retained comparative calmness of mind, and were able to render assistance to each other; they were capable of being under control, and of devising measures and contrivances for their own relief. On the opening of the door on the morning of the 21st June, some of these were found insensible; and Mr. Holwell states that he had himself become insensible for a short time, but revived. All were in a putrid fever. Mr. Holwell was unable to stand, and could not walk without support; his tongue was dry and without motion; he could not articulate at first, but was

able to speak after a little while on being allowed a drink of water. He had, however, complete possession of his mental faculties. He and some of the other survivors were conveyed in a hackery to Mhir Muddon's camp: it may be inferred from this, that they were not able to walk. On the night of the 21st, Mr. Holwell became covered with boils, and until these appeared the fever did not leave him. On the 22nd, the captives were marched to the Dock Head; here they remained on the 22nd and 23rd, and during their stay the others broke out with boils all over their bodies. This eruption of boils, Mr. Holwell states, attended all who came out of the Black Hole, and he speaks of it as a happy circumstance. The disease is thus shown to have been identical in all of the survivors, and in connection with Mr. Holwell's previous statement regarding himself, it might be inferred that the fever left or abated on the appearance of the boils. On the 24th, the party proceeded up the river in a boat. They were convalescent, but in a state of debility, and tormented with the boils. Mr. Holwell's hands were free from imposthumes, and he fed and nursed the others: he was in fact their medical attendant, being by profession a surgeon. That his prostration of body was not extreme might be judged from the fact that he was able to walk on compulsion a mile and a half with fetters on his feet, on the occasion of an incident which occurred during the journey up the river. On the afternoon of the 7th July, he was seized with a painful inflammation in the right thigh and leg, followed during the night by fever, which terminated on the second night in what he considered the gout in the right foot and ankle. Regarding the other sufferers, Mr. Holwell does not speak.

In the above account the facts stated are the existence of fever on the night of the 20th June, which left after the eruption of boils on the following night; a state of debility not amounting to absolute prostration; no impairment of the mental faculties. On the 7th July, or seventeen days after, occurred the relapse, which continued for about two days. This illness resembles relapsing fever more closely than any other known form of fever. It

would also appear that all the survivors suffered in the same way, at any rate as to the primary fever. No proof of the spread of the disease exists; but it should be remembered that the prisoners were detained in the open air, and were isolated; and under these circumstances the spread of the fever is hardly to be looked for. Furthermore, the mere absence of proof of the spread of the fever does not necessarily imply that it was not contagious, for although no instance of communication of the disease came under the observation of the narrator, who was a prisoner, the fact may have been that such instances did take place.

A second example of the disease in the last century was the illness that proved fatal to Admiral Watson, the member of council whose signature was forged by Clive in the red or false treaty with Omichund. A short history of Admiral Watson's last illness is given by Henry Goodeve, in a note to his "Sketch of the Progress of European Medicine in the East," published in the Appendix to part ii., vol. viii. of the *Transactions of the Medical and Physical Society of Calcutta*, 1842. The admiral was attacked with fever on the 12th August, 1757, which continued to the morning of the 15th August; it returned with increased violence in the evening, and proved fatal on the following morning. In the course of the fever, the admiral retained his mental faculties, and was able to read letters, but he became confused and comatose on the evening preceding his death. On the third day of his illness, "his eyes were a little yellow," and restlessness was, further, a prominent symptom at first.

I have not sought for other instances of relapsing fever in the last century; the accounts of epidemics which occurred in remote periods are too vague to enable one to form definite conclusions regarding their nature. European writers having discussed the subject of the nature of the fever that attacked the survivors of the Black Hole imprisonment, I have considered it necessary to state the result of my examination of Mr. Holwell's melancholy narrative. Murchison, in his "Treatise on the Continued Fevers of Great Britain," rejects the view that the disease

was typhus. I concur with him: for the short duration of the fever and the relapse are circumstances opposed to the disease having been typhus, but favourable to the opinion that it was relapsing fever. It should also be remembered that relapsing fever has in many instances occurred in this country under circumstances similar to those that existed in the Black Hole Prison in old Fort William on the night of the 20th June, 1756: namely in civil jails, crowded with prisoners in a debilitated condition of body. Relapsing fever has been the Indian jail fever of the past. Murchison refers to the trajedy of Ujnala in the Punjab, by Mr. Frederick Cooper, C.S., in 1857, as an occurrence similar to that of the Black Hole of Calcutta. The victims of the Punjab tragedy, however, were asphyxiated, and none were found living on the opening of the door. The fact that Admiral Watson's last illness was relapsing fever is supported by the strong probability that this disease was common in the fleet, as well as in the army, in the last century. In 1763, Lind wrote: "In the fevers concerning which we are treating, the patients are very subject to relapses." In the selections from the records of the Presidency General Hospital of the last century, published by Mr. Alexander Grant in vol. v., for 1858, of the *Indian Annals of Medical Science* are two cases of fever with jaundice, both of which were probably relapsing fever. Case 2, James Humphries, admitted on the 10th August, 1797, was a soldier; and case 6, William Pintlebury, admitted on the 30th July, 1797, was probably a sailor.

The medical literature of the present century is rich in descriptions of epidemics of relapsing fever; and although the disease was not understood by the earlier writers, the accounts are in general tolerably full and complete, and the more prominent symptoms had been noted; so that a definite opinion can be formed regarding the nature of the disease. The first accounts in the current century are contained in a work by Mr. William Hunter, Marine Surgeon at Calcutta, styled "An Essay on the Diseases incident to India Seamen or Lascars on Long Voyages," printed in 1804, at the Honourable Company's Press at Calcutta. Mr. Hunter describes the fever which destroyed the lascars of

the Company's Indiamen, and he notices the remarkable fact that the disease was contracted in England. For the explanation of this circumstance a reference is necessary to the history of relapsing fever in England. Murchison states that, at the close of the last century and the beginning of the present, a terrible epidemic of fever prevailed in England and Ireland; and it was then that the first fever hospitals, for the separate treatment of fever cases, were established. The epidemic was a mixture of typhus and relapsing fever; for Barker and Cheyne, who wrote regarding it, observe, "Certain it is that the fever in 1801 very generally terminated on the fifth or seventh day by perspiration, and that the disease was then very liable to recur, and that the poor were the chief sufferers by it." Huxham described frequent relapses in the fever which prevailed at Portsmouth in the middle of the last century, as also did Dr. John Clark, at Newcastle, in 1777; and there can be little doubt that the disease prevailed at the English ports to which the East Indiamen proceeded in the initial years of the present century.

Mr. Hunter writes: "A few cases occurred on board the *Mornington*, the *Arran*, and the *Countess of Sutherland;* but it prevailed to an alarming and fatal degree on board the *Aurora*, the *Lucy Maria*, and the *Marian*. As far as any conclusion could be drawn from the imperfect account received of the symptoms, these fevers appear to have been of the description usually termed bilious, which chiefly prevail in hot climates." He proceeds to remark that the predisposition to the disease was contracted in England, by the inclemency of the weather and irregularities of living: and that its exciting causes were the neglect of cleanliness in the persons of the lascars, keeping on their wet clothes after going below, indolence, and want of sufficient ventilation in their berths. "In two instances," he says, "the disease was ascribed to contagion; but the evidence is very defective, and some circumstances are adverse to that supposition."

It would appear that the Indiamen rarely carried surgeons; so that Hunter was compelled to obtain his information from the captains and officers, the crew and

passengers, "who were entirely unacquainted with medical affairs." This circumstance should be borne in mind, and taken in connection with the fact that Hunter's knowledge of fevers was imperfect, because the study of fevers in his day was not so far advanced as it is now. The omission of important symptoms in the accounts will be seen to be due, not to their non-occurrence, but to their not having been observed and recorded, the attention of the non-medical narrators having been attracted to the alarming and more prominent complications. Hunter correctly included all the outbreaks of disease which will be spoken of here under the common heading of fever; but he erred in regarding some instances of the fever as hepatitis and dropsical swellings, having failed to perceive the dependence of these complications on the primary disease. Of hepatitis he remarks, "Of this two men died on board the *Lucy Maria* soon after the vessel sailed from England." Regarding dropsical swellings, he writes: "This disease occasioned the most alarming devastation on board the *Mornington*, the *Arran*, and the *Exeter*." A short account of the epidemics on board each vessel will be interesting and useful, not merely as displaying the history of the disease, but also as affording some illustrations of the protean forms assumed by it.

1800. The *Exeter* Indiaman sailed from Gravesend on the 7th December, 1800, proceeded to Portsmouth, and on the 16th sailed on the voyage to India. The crew had remained ashore at Gravesend for five weeks: they consisted of twenty-five Europeans and fifty-three lascars. The latter soon became ill. "The eyes of the sick were very yellow, with some feverish symptoms; their bodies then began to swell, with difficulty of breathing, which gradually increased till death. The duration of the complaint was from five to twenty days. By the 2nd January, 1801, the distemper had got to an alarming height." On getting into warmer weather the disease abated, but it returned with greater virulence on entering a colder climate to the southward. No death occurred between January the 18th, in latitude 20° north, and March the

18th, in latitude 40° south. The complaint was now exactly the same as that which occurred on board the other two ships, the *Mornington* and *Arran*, and as rapid in its progress. The sick had not now that yellowness of the eyes which accompanied the first indisposition. In one case, the fatal difficulty of breathing was not attended with any perceptible swelling. This young man, on the third day of his illness, during which he kept the deck as usual, in drinking about a pint of water, lay down, and in a few minutes expired without a struggle. On the 15th May the vessel arrived at Madras; the number of deaths amounted to twenty-four. On the voyage home, and during the stay of the ship in England, eight men had died; so that on the whole voyage thirty-two had died. Some of the remaining people had pains in their legs, but speedily recovered at Madras.

The account of the sickness in the *Mornington* Indiaman was obtained from the commander, the officers, the sirang, one of the tindals, and a European passenger. The *Mornington* sailed from the mouth of the Ganges on the 23rd February, 1800, with eight Europeans, including the officers, ten native Portuguese, and seventy-two lascars and sepoys. Up to June 18th, when St. Helena was reached, no sickness occurred, though fresh gales, hazy weather, and rains were encountered. Towards the end of July, in latitude 34° N., one of the lascars was taken ill with a swelling of the body and difficulty of breathing. He died on the 29th August, in the mouth of the Channel; and the next day died a sepoy, of a week's illness, with the same symptoms. A few lascars were ill with the same complaint when the ship arrived in port, but speedily recovered. None of the Europeans were ill on the passage home, nor any of the native Portuguese, except one man who died of a fever on the 5th June. In England she shipped, in addition to her former crew, twenty Europeans, seven Portuguese sea-cunnies, natives of India, and nineteen lascars. Sailed outwards on the 15th December. Feverish complaints, usually termed bilious, prevailed amongst the crew before crossing the line to the southward: these were cured. On the 28th February, off Gough's

Island, in latitude 40° S., a lascar was taken ill with swelling, which began in the legs, and spread rapidly up to the body; and he died on the next day. The weather before reaching Gough's Island was clear, though cold; afterwards it became hazy with rain, and then the number of sick increased fast. On the 28th March the island of St. Paul was made; and in this interval twenty-eight men died. Got the pilot in the Bengal river on 2nd May, 1801, when the whole number of deaths amounted to fifty-six. Almost all the native crew, lascars, and sepoys, were affected with the distemper, but they soon recovered on shore. The Europeans and native Portuguese were exempted from its attack.

With respect to the progress of the symptoms, the accounts given by different observers do not agree. According to some, the first symptom was a swelling of the feet, generally pitting on pressure. While it was confined to the feet, which was sometimes for a day or two, the men were able to go about, and did not complain. But the swelling rapidly extended upwards, attended with difficulty of breathing; and after it reached as high as the stomach, the sick inevitably perished in the course of a day. For some time before death they had severe pain in the pit of the stomach, increased by pressure; and about this period many had bilious vomiting. The whole duration of the complaint, from the first seizure to the fatal termination, was often comprised within the space of two days.

According to other accounts, the swelling in the feet was preceded by pains of the knees, ankles, and elbows, difficulty of breathing, and pain of the bowels. Others alleged that a pain at the region of the stomach, with hardness and swelling of the part, occurred before the swelling of the feet. The face was swollen and bloated, particularly the cheeks, temples, and over the eyes. The patients had much thirst during the whole disease, but it greatly increased a little before death. The urine was scanty, and voided with difficulty. The sick were in general costive, but often concealed this as long as they could, from an aversion to medicine. The gums were perfectly sound in every respect:

no swelling, sponginess, nor bleeding. There were no spots or sores on the limbs, nor on any part of the body.

The lascars were comfortably clothed; they had slops served four times during the voyage, consisting of jackets and trowsers of blue broad cloth. They were also supplied with hammocks, one to each man. But it appeared that the greatest attention was hardly sufficient to enforce cleanliness among these people. The persons of the generality are represented to have been extremely filthy; many had not taken off their clothes for several months after leaving England, and the stockings of one man were found to have eroded the surface of the leg in several places. The berths of the lascars were on the gun deck. There were no scuttles; and the ports, though formed on the sides, had never been cut out; but the place was ventilated by windsails at the fore and main hatchways. But the air was much confined, and the place, while the crew was on board, was very offensive. By its closeness, perspiration was copiously excited while they remained below, and was liable to sudden suppression when they came on deck in cold and wet weather. The Europeans were also lodged on the gun deck, abreast and abaft the main hatch, so that the ventilation in their berths was nearly as bad as in that of the lascars.

The disease which occurred on board the *Arran* Indiaman was of the same character. This vessel sailed from Calcutta on the 15th March, 1800, having on board twelve Europeans and forty lascars, and arrived at Falmouth on the 1st September. On the passage the crew were healthy, and she lost but three men: one died of a fever, and two of an eruptive complaint which they had before leaving Bengal. In England she took in forty-nine native passengers, and sailed from Portsmouth on the 7th December. One man died on the 17th December, after an illness of six or seven days. Before his death several others were affected. A second man died on the 31st, off Madeira, with cough and purulent expectoration, and other symptoms of consumption. On January 13th, two men died. It was observed that while the sick could be prevailed upon to take exercise, and thus inhale fresh air on deck,

the disease made slow progress; but it advanced with hasty steps to the fatal period from the moment they indulged their propensity to rest. On the 1st March the Cape was reached. In this interval the deaths had been very frequent, sometimes two or three in a day. On the 22nd, 23rd, 24th, and 25th February, the people died three or four daily. The number of deaths before arriving at the Cape was 35; 28 were sick at the time, of whom six died in hospital at the Cape; the others speedily recovered. She sailed from the Cape on the 15th March, and arrived in the river on the 25th May, 1801. During this time none of the crew died, nor did the swellings appear amongst the people. Three of the Europeans had fevers, but none of them were affected with the swellings. On dissection of one man, who died of the disease, a quantity of water, not exceeding three quarts, was found in the cavity of the abdomen. The cellular tissue all over the body was much distended with water. The liver, kidneys, stomach, and intestines had no morbid appearance. The thoracic viscera were also perfectly sound, and no water exceeding the natural quantity was found in the chest or in the pericardium.

Hunter refers to the circumstance that Mr. Crawford, surgeon of the *Earl of Middlesex* Indiaman, had described a disease in many respects resembling that which was the subject of his investigation, which prevailed among the crew of that ship on her passage home from China in 1770–71. On dissecting the body of one who died of the disorder, its cause was found to be an enormous enlargement of the liver.

A disease very exactly resembling the above affected the troops in the Carnatic in 1782 and 1783, as described by Mr. Dick in the 10th volume of the Medical Commentaries. The duration of the complaint was various; in the most rapid cases a fatal termination took place within twenty-four hours.

Hunter adds: "One striking singularity is, that during the voyage to England, although the ships encountered more bad weather, the people enjoyed good health; this fatal distemper appeared only in a few cases, and that

towards the close of the voyage; whereas it began to spread very soon after leaving England." The history of relapsing fever in England at the beginning of the century, as previously alluded to, supplies the solution of this singularity; and it might fairly be conjectured that St. Helena was not free from the scourge.

The above disease is what Hunter calls dropsical swellings; it will be observed, however, that he records that a few sporadic cases of fever occurred on board the *Arran* and *Mornington;* that the disease characterized by dropsical swellings was the same as that which occurred on board the *Exeter* in the latter part of her voyage, and differed from the disorder which had occurred in that vessel shortly after leaving England only in the circumstance that yellowness of the eyes was absent. In the succeeding narratives the disease assumed the form which is often observed in the present day.

The *Aurora* Indiaman sailed from the Hooghly on the 9th April, 1801, with a crew of 68 men, mostly natives; and after a passage of eight months, she arrived in England with the loss of one man, who died of flux. About the middle of March, 1802, she received on board 45 lascars of the crews of the *Surat Castle*, *Thetis*, and *Eliza Anne*. Disease had been very fatal to the men of the *Surat Castle* on shore, and one man died of a relapse of fever, soon after being received on board the *Aurora*. The ship left England on a date not stated. On the 27th April, a man died of fever. In May, eight men died: four of the ship's company, and four of the men received as passengers. In June, six men died: four of the crew and two of the lascar passengers. On the 8th July, a man died of fever; on the 15th, one of the lascar passengers died of the scurvy; and on the 17th, one of the ship's company died of the same disorder, which now began to be prevalent amongst the crew. All the sick and passengers were sent ashore at Madras on the 18th, and two of the crew died on the following day, of scurvy. The men who had died of fever, complained much of headache, difficulty of breathing, and weakness. Their eyes were yellow; and they were subject to frequent vomiting. The above account was gathered from

Captain Gilmore, the commander, Captain Clarke, a passenger, Mr. Rab, chief officer, Mr. Steven, third officer, and the first tindal. "Without a more accurate account," writes Hunter, "of the symptoms and progress of the disease than can be obtained from those entirely unacquainted with medical affairs, it is difficult to ascertain its origin with precision, or to say in what manner it can be avoided. Captain Gilmore attributed the origin to contagion, communicated by the people of the *Surat Castle;*" but in this view Hunter hesitated to concur.

The *Lucy Maria* Indiaman quitted the pilot in March, 1801. It was not till she had left St. Helena that the crew began to get sickly. On her return passage from England, she took part of the *Surat Castle's* crew, who had previously been much debilitated by disease. The fever first appeared off Madeira: it came on with a cold fit, the face shrunk suddenly, the eyes became yellow, violent pains were felt in the loins, and dull pain in the head, with a sense of weight. In the course of eight or ten days, the fever left; the sick complaining only of great weakness and pain in all their joints, which gradually went off. Those in whom the disease terminated fatally, were much worse on the third day, and died on the fourth or fifth. They rejected everything from their stomachs; their tongues were dry, with a black hard coat upon them. They soon became delirious, and their extremities were affected with spasms. Hepatitis was the first complaint.

Great mortality occurred in the return voyage to Calcutta on board the *Marian* Indiaman. Sickness made its appearance among the crew soon after leaving England. It came on generally with pains in the loins, severe headache, flushing of the face, suffusion of the eyes, and strong pulse. These symptoms, with much delirium, did not abate for four or five days. The tongue became parched, dry, and black; the eyes yellow; hiccup followed, which soon ended the scene. Mr. Cubison, chief officer, thought the origin of the disease was contagion, caught from three men received from the ship *Hope*, which they found afterwards had been very sickly. The daily numbers of sick on board the *Marian*, ranged from six to 19. Cudbert Thornhill, master-

attendant, and James Hare, assistant-surgeon, in charge of the Marine, Fort William, February 16, 1803, certified, "The most remarkable part of this report, as well as some preceding ones is, that disease seems to be contracted in England."

Hunter likewise gives an account of the same disease, with swellings of the feet gradually mounting upwards, etc., related by Mr. Knox, a passenger from England in 1800 in the *Anna* Indiaman. Mr. Knox was of opinion that the disease was not scurvy, and he compared it to beri-beri.

The histories of a few other Indiamen are also to be found in Hunter's work. In all, in the homeward passage, the crews were healthy, up to St. Helena: there they began to get sickly. The return passage was always attended with the disease above described.

1810. In the year 1810, a terrible epidemic occurred in the southern division of the Madras presidency; it prevailed chiefly in the collectorates of Madura, Dindigul, Coimbatore, and Tinnevelly. In one year, it destroyed 106,000 persons, or somewhat more than $5\frac{1}{2}$ per cent. of the population. It continued through 1811 to the middle of 1812. In 1816, the disease reappeared in an epidemic form in the same districts, and apparently with greater virulence than before. A report upon these destructive epidemics was prepared by Drs. W. Ainslie, A. Smith, and M. Christy, by order of the Madras Government in 1816. *Madras Quarterly Journal*, vol. iii., for 1861, p. 168.

1819. In the year 1819, a detachment of H.M.'s 67th Foot, consisting of five officers and twenty-one privates marched from Surat to Candeish: of these, only one officer and two privates arrived at their destination; the rest had died on the road, of a disease which appears to have been relapsing fever. In the same year, a detachment of fifty sepoys and a European officer, proceeded to Surat in September, from Candeish, and returned in October: all the sepoys were affected with fever, and the officer died. In the following year, sixty men performed the duty at the

same season, nearly all of whom died, and the officer escaped after a lingering illness. *Transactions of the Medical and Physical Society of Bombay*, no. iv., for 1861, p. 86.

1823. "In October, 1823, an epidemic swept through the barracks at Meerut. It was of an ardent type; and although the admissions, twenty-four per day, with severe symptoms, were alarming, it yielded to modern practice." No further particulars are given of the disease, but it was probably of the same nature as the epidemics which occurred in the following years. *Transactions of the Medical and Physical Society of Calcutta*, vol. ii., for 1826, p. 296.

1824. In the months of June, July, and August, 1824, a great epidemic occurred in Calcutta, which has been well described by Twining. As the disease had the peculiarity of an eruption, it will be necessary to quote Twining's account somewhat fully. The first cases occurred on the 23rd and 24th May, a few days before the commencement of the rains. In ten days, great numbers were ill, and before the end of July, nearly half the population of Calcutta was affected. Through July, the disease continued unabated, attended with considerable debility, but without fatality: numbers were unable to follow their ordinary avocations. Towards the latter end of July, primary attacks were comparatively rare, there being few only at that time who had escaped the fever. Relapses were frequent; a second, and even a third, relapse. The relapses in general were not equal in severity to the original attack, there was less suffering from pains in the limbs, the cessation of pyrexia was less abrupt, and the effects of the relapse subsided gradually in three or four days. After the 11th August, Twining did not know any person to have a first attack of the fever. In September, a few bilious remittents occurred, but they were not of a dangerous character. Some who had got over the fever, suffered from dysenteric symptoms. Relapses did not occur in all cases. In the early period of the disease, the Europeans suffered; afterwards the natives, and then the Europeans contracted

the fever from them. Twining believed that the fever was not communicable, for the following reasons: the fact that many escaped, although exposed to the fever; it arose at the same time in remote parts of the town; and it affected persons who had not had any communication with sick people.

During the early period of the epidemic, the attack was sudden, without previous sensations of any deviation from perfect health; at a later period, the approach of the fever was indicated the day before by anorexia, languor, restlessness, and white tongue. The fever usually commenced with a slight creeping sensation in the loins, succeeded by aching pains there, and cold extremities. Twining knew of no case which set in with rigors. This was followed by intense headache; suffused and watery eyes; a bloated and swelled countenance; dry heat at the scrobiculus cordis; a tongue covered with a white paste; a frequent pulse, varying from 100 to 140. Extreme prostration of strength occurred, with severe pains in the loins and in the muscles of the limbs, especially the legs, anxiety, and jactitation, extreme febrile anguish in many cases, and aching in the back of the neck. The suffering from pain was a leading feature. After forty-eight hours, on the second and sometimes the third day, a large number of cases were affected with a rash, which bore some resemblance to rubeola; it covered the body and extremities, and portended a mitigation of the more distressing symptoms. In most cases the eruption faded in great part at the end of twenty-four hours, in some it continued for two days. In these the eruption had more the appearance of urticaria, affecting more particularly the extremities: the fingers, hands, and feet becoming swollen, red, and afflicted with a distressing itching and burning combined. There was also sleeplessness from headache and the pains in the body; delirium never occurred; the thirst was slight, and not in proportion to the symptoms. In the earlier stages there was no perspiration, but when it occurred it gave relief. The urine was copious and pale; the stools, which were somewhat frequent, were dark green, glutinous, and scanty. In one instance, swelling of the parotid gland took place on the fourth day. Young

children did not escape. Females underwent the disease in its severe forms during various periods of pregnancy, without any tendency to abortion. The convalescence was tardy, and there was a great tendency to repeated relapses; pains in the ankles, and dull aching in the joints of the fingers and toes, continued for many weeks after. In about a month the patients were able to say that they were quite well.

In general, the disease was of extreme severity, so far as related to the sufferings of the patient, but of unexampled mildness as regards mortality. Many cases were very mild, and bore a resemblance to febricula, though the latter illness is unattended with such severe pains. A few cases appeared anomalous. In one a succession of vesicles occurred for twelve days; in another hæmorrhoids, with subacute inflammation of the liver, and slight jaundice; in a third severe bilious remittent on the ninth day after commencement, which subsided after eleven days. Twining heard of only a single death, that of a Hindoo, aged fifty, who had no medical aid. No locality escaped; neither mode of living or temperament ensured exemption; only from two to five per cent. of the inhabitants of Calcutta escaped the epidemic.

Twining mentions that during the epidemic a friend's dogs contracted the fever, and their eyes became yellow.

Mr. Cavell has likewise described the same epidemic, and he has added a few important particulars. He says that the disease had prevailed before in Calcutta; conductors and non-commissioned officers had informed him that they were acquainted with it, and had given it the name of the "three day fever." Three hundred cases of the disease came under Mr. Cavell's observation in Fort William. The premonitory symptoms were chilliness, followed quickly by general pains, stiffness, soreness, and heaviness of the eyes, so that opening them was painful, and an intense headache, and reddened conjunctiva. The skin was hot and dry, with an almost uniform blush; in some instances it exhibited patches of an inflammatory appearance, in others a papillary, and in one or two instances a vesicular, eruption. There was a disposition to the vomiting of bilious matter; the bowels were usually costive; the urine

scanty and high coloured; the tongue covered with a dirty white fur; thirst; and a disagreeable bitter taste. Regarding the eruption, he remarks, that in one class of cases it belonged to the class papula; in another to exanthema; in a third, vesicula; in a fourth, bulla; in a fifth, wheal. Notwithstanding the affection of the eyes, there was no intolerance of light, once the eruption was out. The fact of the frequency of relapses, noted by Twining, was entirely overlooked by Mr. Cavell.

The account given by Mr. Mellis, the Marine Surgeon, agrees with Twining's; but he adds a few particulars. Bleedings from the nose were observed by him; also confusion of thought, and sometimes much delirium; in some cases abscess of the perinæum; small exfoliations of the cuticle; the lungs and salivary glands were sometimes affected: the secretion from the former was very copious in many instances, and the latter swelled and salivation occurred, although no mercury was given; in one instance, swelling of the scrotum and one testicle occurred. He describes the eruption as similar to the roseola or the lichen simplex of Willan.

Twining states that a few sporadic cases occurred in other parts of the country, and an eruption of the same character occurred amongst the troops at Rangoon. He saw a resemblance between the Calcutta epidemic and an epidemic of bilious fever which occurred in H.M.'s 89th regiment, at Madras, in April, 1824. The regiment proceeded to Rangoon by sea: during the passage of sixteen days, forty cases of bilious fever occurred, and every one recovered. The regiment landed at Rangoon on the 6th June, 1824, and was employed on active service. The disease continued amongst them in the form of bilious fever, and the greater part of the regiment suffered from it before the 16th August; at that time the fever began to assume the intermittent form, and a few cases the remittent form. H.M.'s 13th regiment embarked from Calcutta and arrived at Rangoon early in May; the men were affected with an ephemera, in many respects resembling the Calcutta epidemic. Mr. Hamilton, the surgeon, described it as purely inflammatory, ushered in with more than usual

artual pains, readily yielding, and leaving only a weakness of the knee-joints, and painful rigidity of the tendo Achillis. The disease disappeared about the 20th July, 1824.

It would appear that the disease returned in the following year. Rankine states, "When the army marched from Prome, on the 1st December, 1825, the troops were exposed for several days and nights, without tents, and obliged to bivouac on the ground; the consequence was, that a great number of the soldiers were attacked with remittent and intermittent fevers of the most malignant forms I ever witnessed. While in cantonments the force had been pretty free from these diseases, but in the course of a week the field hospital was literally crowded; at the same time it must be remarked, that many of the men were suffering from debility, induced by former disease, fatigue, and the want of proper nutritious food, which rendered them particularly susceptible to the effects of miasma." *

Mr. Mellis confirms Twining's account of the spread of the fever. He states that he first heard of the disease in a letter from a friend in Rangoon, where the disease first showed itself about the end of May or beginning of June. On the 10th June, a large portion of the troops were seized with fever, after prolonged exposure to incessant and heavy rain. The disease was at its height at the end of June or beginning of July, when it declined, and again revived. He dates the commencement of the epidemic in Calcutta about the beginning of June. The disease extended to Chittagong, the south-eastern extremity of Bengal, and to the Madras Presidency.

Dr. R. H. Kennedy observed the same disease as epidemic in Guzerat during the hot months of the year: it was severely felt at Baroda during the last week in May and beginning of June, 1824. The natives termed the disease *toohutia*. The throat and fauces were affected so as to render deglutition painful. No fatal case occurred.

* Robert Rankine on the Medical Topography of Sarun. Printed by order of Government, 1839.

Transactions of the Medical and Physical Society of Calcutta, vols. i. and ii.

In the following year, 1825, a similar epidemic occurred at Berhampore, and was described by Dr. J. Mouat. The general characters were the same: a scarlet or crimson eruption; vomiting; severe pains in the head, loins, shoulders, arms, wrists, hips, thighs, and ankles, and sometimes in the fingers and toes; want of sleep; ophthalmia; cough and pleuritic affections; in two instances, hepatitis; and in several, pains, tormina, and tenesmus, indicating the intestines to be implicated. The ordinary duration of the fever was three days, and it seldom continued beyond the seventh or eighth day. Dr. Mouat overlooked the relapse. The disease prevailed from the end of March to June, 1825, at the European depôt at Berhampore. There were 112 severe cases which required treatment in hospital, viz., five men, sixty-six women, and forty-one children. One child only died.

Dr. Mouat describes the eruption minutely. It was exactly like the roseola of Willan, and appeared on the face, chest, and person, going off in two or three days. In some instances it appeared more like the erythema papulatum of the same author; and in other cases like purpura simplex, not disappearing on pressure, indicating it to be an exudation from the vessels, and not vascular distension. Occasionally it resembled roseola miliaris, or lichen tropicus, only more florid. Some individuals had boils, and others small acuminated vesicles with hard bases; and four or five children were affected with urticaria, and large watery vesicles, which sometimes formed ulcers; and in one case the sloughing was so deep, the ulcers so foul, and the fever so high, that convulsions came on, and the child died.

The left wing of H.M.'s 31st regiment, recently from England, arrived at Berhampore in the first week of July, 1825. In a few days the epidemic appeared amongst them. Out of eighteen officers, only two escaped; its prevalence amongst the men was alike considerable and severe. The eruption remained longer in the 31st regiment, appearing in many cases with minute vesicles, and ending in a scurf like a branny desquamation of the cuticle.

Transactions of the Medical and Physical Society of Calcutta, vol. ii.

To the above accounts, Mr. J. Adams, Secretary of the Medical and Physical Society of Calcutta, and of the Medical Board, has added a few valuable particulars. He states that the epidemic extended to many other places during the rains of 1825. It was particularly severe in the large and populous towns of Patna, Benares, and Chunarghur; at the latter place not fewer than ten thousand natives were said to have suffered from the disease at one period. Mr. Robinson, Superintending Surgeon, on 18th August, 1825, reported that the disease was prevalent generally from Buxar to Benares, Chunar, and Mirzapore, as well as at Ghazeepore, where hardly a person, European, or native, of any age or sex, escaped. Mr. Robinson's letter is given in full in page xxxviii. of the Appendix to vol ii. of Annesley's great work. He describes it as fever of a rheumatic form, which generally commenced with a severe pain in the loins and small of the back, pains in the wrists and knees, drowsiness and headache. It seldom continued beyond four days, but was followed universally by a very great prostration of strength. In many cases, the cause appeared to have been a very great accumulation of bile; in several the head was much affected. The epidemic commenced at Buxar, and gradually went up to all the stations on the river. It appeared to confine itself almost entirely to the course of the river, and inland villages did not suffer. Numbers of the soldiers of the European regiment at Ghazeepore were attacked; from fifteen to twenty-five came daily into hospital. In the cities of Benares and Mirzapore, the sickness was prodigious, and the mortality very great; in cases where a relapse occurred, dysentery and cholera terminated the patient's existence.

In the same year, Mr. W. Stevenson met the disease in Arracan. He describes six cases of fever attended with jaundice, of which four died: one on the fourth and three on the twelfth day. The two survivors continued long in hospital, and had repeated relapses, attended with dropsical symptoms. In the fevers which proved fatal in

Arracan, the spleen was sometimes and the liver always found enlarged. He ranks the disease amongst intermittent and remittent fevers; and considered it to be the same as the yellow fever of the West Indies. He says that it was like the Bulam fever described by Mr. Pym: the characteristics of which are "the sudden nature of the attack and the rapidity of its progress, attended with great thirst and heat of skin, a red and fiery eye, black vomiting, a slight yellowness of the skin, or a livid appearance, and occasionally vibices, and hæmorrhages from the nose, mouth, and ears." The Arracan fever differed from Bulam fever in remitting, being non-contagious, and attacking the individual more than once. *Transactions of Med. and Phys. Soc. of Calcutta*, vol. iii.

Mr. R. N. Bernard likewise speaks of a fever, with jaundice, which prevailed between April, 1825, and January, 1826, in Arracan. He divides it into two varieties: in one the colour was bright yellow, and the mortality great; the colour in the other was a sallow muddy tint, less deep in hue, and the mortality trifling. Cases of the first variety were numerous; of the other scarce. *Ibid.*, vol. ii.

1826. Mr. D. S. Young likewise met with cases of fever in Aurungabad in 1826, which were "so similar to the descriptions given by our Transatlantic brethren of the yellow fever, as to leave no doubt of their identity." *Ibid.*, vol. ii.

1828. In the months of June, July, and August, 1828, an epidemic of what was considered bronchitic fever of infants and young children, occurred in Calcutta, and is described by Dr. John Adams. Not one child out of a hundred of four years of age escaped. A child would suffer for a day or two from a cough or a cold, when suddenly fever would set in, with a pulse of 130, and tongue whitish, or having a circle of white enclosing a dot of red. In one instance only was there any redness of the conjunctiva, with watery eye, and sneezing in two,

such as occurs in measles and catarrh. There was no flushing of the face; but, on the contrary, a paleness, and considerable restlessness, without any apparent cause of disturbance. Extreme drowsiness occurred in some instances from the commencement; in the majority there was great oppression of respiration; the condition of the bowels was as in health. The difficulty of breathing was the main feature of the disease: the breathing was stridulous rather than sonorous, as if the air in its passage was obstructed by the presence of thin fluid; it was not like the loud ringing noise of croup, nor the wheezing of asthma. In the fatal cases, the breathing changed to a rattle, and the child died from suffocation. This conclusion has taken place in the short space of twenty hours, and twelve from the time the child was considered in danger. In general, it did not happen till after the second day of the disease. The elder children complained of headache at the commencement. The oldest child treated did not exceed four years, and the youngest was not under two months. The general age of the fatal cases was from three to seven and eight months; the disease was more fatal to the younger than to the elder children. Beyond the second year no child died. For the most part the victims were vigorous infants at the breast. Relapses were frequent, but were much milder than the original attack. In one child examined after death, the lungs were found full of serum, and the bronchi of a thin mucous fluid. There was no adventitious membrane in the trachæa, nor decided marks of inflammation. The abdominal viscera were healthy.

The epidemic spread from the city and suburbs of Calcutta to many stations in Lower Bengal, to Chinsurah, Bauleah, and even as high as Muldah. At Burdwan, every European child was attacked with it; in some it was attended with very high fever, which seldom lasted above twenty-four hours. Native children, too, suffered considerably, as well as adults, with this difference between the two, that the children had a troublesome ophthalmia; but, though the sickness was great, the mortality was trifling. At Bauleah, the first case occurred in the middle

of August, 1828; all the other cases occurred in September; with one exception all were above two years of age. The children were sadly reduced, and did not regain their health and flesh for several months. The symptoms were the same, with this exception, that purgatives produced very black and offensive evacuations.

The peculiarity of this epidemic was, that it was confined to children in Calcutta; and, if the statement be correct, it is unique to that extent. Fifty-nine European children died of the fever in Calcutta in June, July, and August, 1828. *Ibid.*, vol. iv.

1829. In 1829, Superintending Surgeon Langstaff reported the occurrence of an epidemic of fever in the Meerut division, in the months of April, May, and June. It prevailed in the district of Hurrianah and at Delhi, and spread to the opposite bank of the Jumna. It assumed the bilious remittent type, while milder cases were intermittent. Europeans and natives were equally liable to attacks. A bilious tinge was observed in the majority, and in many this symptom existed to a great degree. The latter stages of the disease were attended by a remarkable and protracted debility, dejected aspect, and despondency of mind; the greater number lingered through a protracted convalescence, and the ratio of mortality was very small. "In some cases, quinine proved unequal to arrest the disease." The native troops suffered severely, as far as regards numbers attacked. At some stations the disease was very mild, and exceedingly severe at others. Frequent relapses occurred. *Ibid.*, vol. v.

Dr. A. Murray reported a similar epidemic which occurred in the Sirhind Division during the same period. The disease commenced at Hansi about the 20th of April, 1829; was very extensive but mild; the sickness decreased in June, and from the 20th of that month to the middle of July the station was considered healthy; but soon after this there was a great increase of the disease, and all classes suffered equally, the European officers and their domestics in the same ratio as the native troops, but there were very few fatal cases. Among the native inhabitants

of Hansi the disease was more fatal. *Transactions of the Medical and Physical Society of Calcutta*, vol. v.

1830. In the year 1830, a few cases of relapsing fever occurred amongst the European soldiers at Bellary. In the *India Journal of Medical and Physical Science*, for March, 1841, p. 261, Dr. Henderson gives an account of fifteen cases of remittent fever, in which the patients were suddenly attacked with fever, followed by vomiting, great restlessness, and in some instances with yellowness of the skin.

In the same year, 400 native toops in Candeish marched from Malligaum against some tribes in the neighbouring hilly country during the most unhealthy season; only 120 came back; of five officers, one died and three left on sick furlough. Many of the horses also suffered from distinct hot and cold fits of fever, and ten died out of about one hundred. *Transactions of the Medical and Physical Society of Bombay*, no. iv., for 1841.

1833. In the year 1833, an epidemic occurred in Calcutta. Twining writes: "A considerable number of catarrhal fevers occurred in adults, in which affections of the mucous membrane of the throat were severe, occasioning much hoarseness, and in some cases suppression of the voice; there was also pain and stiffness in the muscles of the neck, with some oppression of the chest; and several of these patients had a red efflorescence over the whole skin, on the second or third day of the fever." On the 22nd May of this year, a great gale and inundation occurred between Calcutta and the sea, whereby numbers of the inhabitants and cattle were destroyed, the cultivation ruined, and extensive districts rendered unhealthy. A succession of patients from the ships that had been exposed or wrecked in the course of the gale, crowded the wards of the Presidency General Hospital for many months. These patients suffered from repeated relapses of fever. When the rainy season came on, the gradual approach of the formidable remittent fever gave warning of what was going to happen in Calcutta.

"It is needless to relate," says Twining, "the alarming extent of the sickness which prevailed in July and August; it is too well remembered by every one." The above meagre account, and another by Corbyn, equally concise, are the only ones extant of this great epidemic; but they reflect much light upon the nature of the disease called by Twining the remittent fever of the Bengal rainy season. The epidemics of Lower Bengal, in recent times, were probably of the same nature. *Transactions of the Medical and Physical Society of Calcutta*, vol. vii., for 1835.

In the years 1833 and 1834, the Dindigul district of the Madras presidency was again ravaged by a severe and fatal epidemic. This statement is made on the authority of the editors of the *Madras Quarterly Journal of Medical Science.* See vol. iii., for 1861, p. 168.

In the year 1833, relapsing fever occurred amongst the native troops employed in the operations against the hill tribes of Goomah and Kimedy. The epidemic is described by Mr. McDonell, under the name of jungle fever in the Northern Circars. The account is minute and consistent, and the production of an acute observer. Mr. McDonell clearly describes the disease known to the old physicians as jungle fever, the circumstances under which it arises, and the results of treatment. It is the best history of jungle fever extant in medical literature; and from it I obtained a knowledge of the nature of this disease.

The Kimedy hills are described by Mr. McDonell as covered with lofty trees, and a dense and almost impenetrable thorny underwood; between the hills are numberless small valleys. On the 26th June, 1833, 240 sepoys were concentrated at a village called Goomah, about 36 miles distant from Kimedy. At this season there was a general want of water, as the hill streams were dried up; still the general appearance of the country was green. The men underwent much fatigue, exposure to showers of rain, and were under the necessity of remaining in wet clothes for hours, and on some occasions for two or three days, as they had no tents. To these misfortunes was added privation of diet, for Goomah was without supplies of any kind, every living thing having been driven to the hills. For two days

after their arrival, the men were particularly pinched, as the supplies coming from Kimedy were cut off by a party of hill men; and even when the supplies were more abundant, the rice was described as bad, and the allowance to each soldier was insufficient, and there was a total privation of the usual condiments. The water was also impure, containing in solution great quantities of vegetable matter. "It may be safely stated," says Mr. McDonell, "that fatigue, bad diet, wet, a powerful sun, and the men having suffered from former attacks, were the most prominent debilitating and predisposing causes." Up to 6th July, the men continued to enjoy pretty good health; but on the 5th, 6th, and 7th, a few men complained of affection of their bowels and other ailments. On the 8th, 26 men fell out with fever; and on the 9th, a similar number became affected. The officer commanding the post, under these circumstances, seeing the impossibility of maintaining his position, fell back to Kimedy, where he arrived on the 13th July. On the 18th July, a body of sick affected with fever, belonging to the above detachment, was sent into Chicacole, where they came under Mr. McDonell's care; on the 20th July, 18 more; and on the 26th, 20 sick were likewise received from Kimedy. Of the rear-guard of the Goomah detachment, consisting of 250 posted at the village of Gibah at the entrance of the Kimedy valley, only five men escaped the fever. Of the original detachment of 240, only 120 remained fit for duty; and they likewise were attacked to a man. The escorts of the supplies to Goomah, although they went there only for a day or two and returned, were attacked. Many of these men were in good health, never being sick while in the hills, were stout, muscular, able-bodied men, fit for any labour. Of the five European officers, three were out the whole time, two only for a few days; they were all attacked. Strangers from the plains, peons, and civil servants detailed among them on sircar business seldom escaped.

The above facts convinced Mr. McDonell that malaria was the cause of the fever; that moisture in any great quantity was not necessary for the formation of malaria; but that moisture and heat generate fever in increased virulence.

He remarks, "the application of the predisposing cause does not appear to produce its effects till some time has elapsed after its introduction into the system; and a fortnight seemed to be the general time necessary for this end, as the men marched on the 24th of June, and the sickness broke out about the 8th or 9th of July: but although this was generally the case, yet men who were at Goomah had fever thirty days after they had ceased to be exposed to malaria."

Mr. McDonell describes the fever as partly intermittent and partly remittent. He classed under the head intermittent all those cases where the paroxysm was distinct, although the paroxysm did not contain all the essentials of an attack of intermittent fever: for instance, the cold stage was often wanting, or so mild as not to be observed; or the heat of the body cooled gradually to the natural standard without perspiration. Under the head of remittent, he classed all those cases in which the paroxysm extended to thirty-nine hours and upwards, without a distinct intermission. In this arrangement, he says, he is aware that many of the intermittents might be considered as imperfect remittents; but as it is quite evident that, however classed, this fever arose from the same causes, any little inadvertence on this head was not of much consequence. Remittents constituted nearly one-third of the whole; but this enumeration cannot be considered as accurate, as many of the intermittents relapsed into remittents.

His account of the symptoms is minute. In those cases which came under his own observation at Chicacole, loss of appetite, irregular bowels, and debility, sense of restlessness, and often pain in the limbs, were the symptoms generally present for a few days previous to the attack of fever, which was generally ushered in with a rigor, but not always. Rigors did not occur again in the course of the fever; although imperfect intermissions and remissions were observed, there were no distinct paroxysms; perspirations, sometimes profuse, took place in the duration of the fever; and these generally terminated the attack. The tongue was generally foul, white, and loaded; sometimes furred, brown, and dry. The biliary secretion was in great excess, as

indicated by the profuse discharges at stool; the evacuations were principally yellow and bilious; and in severe cases, green and black; generally returning to a natural appearance as the several symptoms abated. There was a sense of severe heat and fulness referred to the abdomen; but in no instance was there pain. The urine was high coloured. The pulse was at first full and above the natural standard, even in the interval of the attacks; but in the later stages feeble and slow. As long as its fulness remained, the individual was never safe from a relapse. In the protracted cases, the heart became irritable; the pulse being from 100 to 120, with a threatening of effusion into the cavity of the chest: and the fatal cases were all connected with this irritability. A symptom generally complained of was pain all over the body, which remained in many cases after the febrile tendency had disappeared. With the exception of vertigo, there were no symptoms of affection of the head. Mr. McDonell does not state the average duration of the fever. The cases called remittent, were in many instances very severe, running a course for days, without an intermission so distinct as to warrant the exhibition of quinine or bark.

The complications of the fever were the following. Dysenteric symptoms were present in some cases, but not to any great extent, with the exception of one case, a young man, who died. Round worms in many cases were present: in these there was an obstinate state of the bowels, which required large doses of medicine. Irritability of the stomach was not often observed, but in the case of one of the officers this symptom was very distressing. On the subsiding of the severe and more protracted cases, œdema was a very common symptom, particularly in those cases which relapsed frequently. In the milder forms, the effusion was confined to the legs, with some puffiness of the face; but in other cases it was more general; and in the severest forms, attacked the chest; and there was great irritability of the heart. This effusion generally made its appearance after the subsiding of the fever; yet there were a few exceptions, where it occurred in combination with continued fever; and in this state one of the cases proved

fatal. Most of the deaths from this fever were caused by effusion into the chest, and two had symptoms of beri-beri, viz., throbbing of the heart and paralysis; but only one had numbness; and they both seemed to be cases of the third or suffocating variety of beri-beri. One was apparently recovering, *i.e.*, he had no fever, when he complained of much weakness in his limbs, and numbness, with puffiness of the face: in two days he died. The second was a protracted case, and all along showed great irritability of the heart; the effusion very suddenly appeared, and rapidly terminated fatally. There were several other cases where the effusion was external, and where there was no irritability of the heart.

Relapses were very common, and many of them occurred after the individuals had been free from fever for upwards of fifteen or twenty days, and were on the eve of going to their duty. Many of them assumed their original type, a few intermittents became remittents, but generally they were intermittents ushered in with a rigor. In certain cases of relapses, one of which proved fatal, the return of fever was marked with great oppression, even amounting to insensibility; the jaws were locked, and were with difficulty opened; if the hand was seized, it was drawn back with a jerk; and to common impressions the individual was almost insensible. The breathing was rather hurried; pulse weak and frequent; skin dry; the eyes were shut, but had no peculiar expression; in one case they were a little suffused. These symptoms came on suddenly and unpreceded by a rigor; they appeared to take the place of the cold stage, for after continuing for two or three hours, the skin became hot and the sensibility returned.

In many of the mild cases, the first attack of fever was marked only by heat in the night, there being no distinct paroxysms; but this, though mild, was often exceedingly obstinate. These mild cases, in which there was no fever for some days, were, from want of accommodation in the hospital at Chicacole, allowed to go to their own homes, and ordered to attend morning and evening. These men, without one exception, had a recurrence of fever, and it

was absolutely necessary that they all should be placed under some restraint and the ordeal of treatment. Some of these turned out to be severe relapses. In August, ninety-eight men were discharged from hospital for duty, but evidently weak; of this number before the end of the week thirty-five were readmitted as relapses.

"A conspicuous difference," remarks Mr. McDonell, "in the nature of this fever in its tendency to relapse, from the fever which I may call the Chicacole fever, was very well marked. The Chicacole fevers, though assuming the intermittent and remittent types, are more to be referred to dissipation, exposure to the sun, catching cold, etc., and are sufficiently tractable. The severe forms are in general in connection with the irritation of worms. They generally yield under treatment, having but a very slight tendency to relapse. The other varieties of remittent generally yield under treatment, and seldom if ever relapse. But the fever now under consideration shows this tendency, indicating a poison superadded to the ordinary fevers of the plains, and which, although checked for a time in its operations, still was present, and ready to break forth even to the fourth and sixth time occasionally with renewed virulence."

Mr. McDonell's account of the treatment pursued by him is instructive, as throwing additional light on the character of the fever.

The cases on first admission, he states, called loudly for the exhibition of purgative medicines; but he cannot attribute the cure of the fever in any one instance to their effects. The action of purgative medicines on the bowels was very uncertain; they often remained in the bowels inert; sometimes two ounces of the common black dose produced copious dejections, while in other cases this quantity and jalap in the ordinary doses produced no effect at all. Sometimes he observed a purgative appeared to produce fever for the day; but the attack was mild, and did not appear to interfere with the progression of the patient.

Calomel was of essential service, indeed it held the first place, and was always prescribed with relief to existing symptoms; but he could not attribute the cure to calomel

alone, in any individual case. In several instances it was pushed to the effect of full salivation. While the system was under its influence, the paroxysm of fever was arrested; but no sooner did its effects wear away than the fever returned with its former virulence.

A decoction of the neem-tree (*Melia azadirachta*) bark in connection with cordial spices was tried. Two ounces of this bark was put into a quart of water, and boiled down to a pint, and given in the same manner as the cinchona. Great numbers of the men took this decoction, and at first it appeared to arrest the attack of fever, and certainly in many cases kept off the paroxysm for many days; but without an exception sooner, or later, the cases all relapsed. During its use it was conspicuous, that although the fever was kept at bay, yet the pulse did not come down or lose its fulness, nor was the feeling of returning health perceived by the patients.

In some cases, he continues, when the fever was arrested, and the pulse languid, he gave the sulphuric acid, naturally enough supposing that as tone was given to the system, the tendency to relapse would be overcome; and although in one or two instances this took place, yet generally speaking it entirely failed. Fever, it is true, was kept off for several days, but the prophylactic virtues of this medicine may be classed with the neem decoction.

He was after these failures obliged to have recourse to bark as the sheet-anchor of cure. "The continued use of bark and quinine was necessary for a long time after the first check of an attack. Wishing to economize these valuable means, the number of patients requiring bark being very great, I diminished the quantity daily; but in several instances where this economy was carried to excess, relapse was the consequence. The tenacity of the poison in the system and its virulence on the constitution were marked by the period in which it was necessary to continue the exhibition of this medicine; for although it was given for a fortnight and in many cases longer, yet relapses took place, but always modified from the original attack. In those cases where great debility followed, and where bark was indicated for a long period, infusion of cinchona was

prescribed; but its febrifuge qualities, to the extent of from three to four ounces daily, were not at all equal to the powder when given in half drachm doses, and consequently several under its use relapsed. In those cases where the fever assumed a more definite form, *i.e.*, where the attack was expected at a certain hour, the bark was given in drachm doses every hour for some hours before the expected attack, and in this way from four to six drachms were taken; but in many cases, from the very uncertain intervals from the remission to the next attack, the bark was given every second hour during the day, so that six drachms were taken during the twenty-four hours, when no attack took place during its exhibition; but in many cases from the anticipating nature of the attack, not more than three to four drachms were given when the exacerbation came on, yet its virulence was always mitigated even when two doses of medicine were given, and generally speaking the succeeding attack was retarded. It has been stated that in some instances after the violence of the fever had abated, and there were no distinct paroxysms, yet during the night, there was a sense of heat, and want of sleep for a few hours, and that such cases yielded to bark, and bark only, given during the day. Again when the fever was arrested for several days, if the bark was discontinued, the pulse did not come down to its natural standard, but remained full and frequent, which always indicated a return of fever. One of the effects of bark in these cases was to lower the irritability of the heart, and bring the pulse down to the natural standard, inducing sound and refreshing sleep, and an improved appetite. But if bark was useful, sulphate of quinine was doubly so. It seldom failed to produce relief, and in no instance did it produce any untoward effect. In the first instance, the sepoys required great persuasion to take the quinine, but latterly, seeing its beneficial influence, and the facility of taking it, all cried out for the white bark in contradistinction to the pulv. cinchonæ (which in many instances loaded the stomach and produced a very unpleasant sense of fulness). Quinine was prescribed in much the same circumstances as the bark, only its use was reserved to those cases where

the latter disagreed, and the severe forms of fever. From ten to fifteen grains of it were necessary to arrest the attacks, given in divided doses every hour before the expected exacerbation, and I had recourse to it in this way owing to the accelerated and retarding periods of attack. If the above quantity was given in the intervals, the attack, if it was not arrested *in toto*, which was often the case, was much modified; and when a complete intermission took place, the fever was generally effectually checked in a day or two; yet, as in the case of bark, it was necessary to continue its use in smaller quantity for a considerable period before the poison seemed to be eradicated from the constitution. The quantity daily used was accordingly lowered to six grains, gradually to three, and even to one grain and a half; yet here relapses took place after an interval of from ten days to a fortnight. Some of these relapses may, however, be fairly attributed to overloading the stomach. In no case can I attribute to the use of quinine the production of any irregularities of the secretions. The immediate effect of the quinine was to supersede the cold and hot stages, and to produce a warm glow over the whole surface, with a tendency to perspiration; indeed, the latter was in many cases most profuse."

Mr. McDonell gives an illustration of the action of quinine in the fever. "A young mussulman, who had suffered severely from the fever, and had, at the same time, a tendency to beri-beri, was cured in the first instance by bark, and the fever was kept at bay for many days. The quinine was omitted, and the sulphate of iron was prescribed in its place: that very day the fever returned, showing the strong hold the disease had taken of the constitution."

His conclusion regarding the influence of quinine was the following:—"Quinine, in this fever, did not come up to my expectations; yet still it was the only means that I can put the least trust in; and it required to be administered in large doses. Nothing less than eighteen or twenty grains could be depended upon to check an exacerbation of fever. It was also necessary to continue its use for a considerable period; indeed, I consider it would be desirable

to do so till the patient entirely shakes off the febrile poison." *

1834. In the months of June and July, 1834, an epidemic of fever occurred in Howrah, and was described by Dr. Duncan Stewart. This gentleman's practice was amongst the English and East Indian residents of Howrah, and he remarks that, on this occasion, "Pandora's box seemed to have flown open." He gives an illustration of the fever. Mr. B—— took ill on the 8th July with high fever; had griping pains, after purgative medicine, of great severity. On the 10th July the conjunctiva became yellow; there was incoherency in answering, and confusion of mind; no fulness on the right side, but pain on the left. On the 11th July he was quite cool, having perspired freely over night. He expired at noon on the fourth day. Mr. Stewart remarks: "In August and September, annually, there have prevailed along both banks, I believe, of the river (*i.e.*, at Garden Reach, as well as at Bishop's College and the Botanic Gardens) a good deal of fever, remittent or intermittent; but I have not known before an epidemic of this sort prevail so universally as the present, which, at Bishop's College, attacked in turns all the professors and their families, the students, and all the servants, in such sort that it was at length resolved to break up the establishment entirely for two months." Fifty-two cases of fever occurred in Dr. Stewart's practice, but they included all forms of fever. That jaundice was not unusual is apparent from Dr. Stewart's remarks regarding another case, which terminated fatally on the eighth day, that "no jaundice occurred, and he was sensible to the last;" and in this case enlargement of the liver was observed. None of the cases could bear quinine during convalescence. Mr. Stewart was more interested in expounding the treatment than the disease. His account is imperfect and confused, but there is little doubt that the

* This account is taken from the *India Journal of Medical and Physical Science*, for March, 1841. It originally appeared in the *Madras Quarterly Medical Journal*, edited by Samuel Rogers, Esq., for October, 1840.

main disease was relapsing fever. This view is supported by the fact that in 1833 and 1834 a few cases of relapsing fever were recorded by Spens and Twining in the case books of the General Hospital for these years. *Transactions of the Medical and Physical Society of Calcutta*, vol. vii.

1836. In the year 1836, an epidemic occurred at Poona, in H.M.'s 2nd, or Queen's Royal Regiment, and is described by Mr. R. H. Hunter. He says, at Poona, measles, catarrhal fever, and catarrh, all of which had set in some months previously, continued prevalent till the month of February, when they were put a stop to apparently by a few days of hot weather. Of measles, the cases were numerous, but very irregular; only children were affected. In some, the eruptions were out one day, and disappeared on the next or following days, without desquamation. Others had every character of the fever without the eruption. Two cases terminated fatally, one by convulsion; in both, the desquamation was succeeded by an aggravation of fever and pneumonia.

In April, during some stormy weather, catarrhal fever again made its appearance.

Soon after the arrival of the regiment in Bombay, catarrhal fever of a well marked remitting type made its appearance, and continued very prevalent in Fort George during the whole monsoon. As the season advanced, catarrhal symptoms became more and more prevalent till August. It still continued very prevalent in October, taking on a tertian intermittent character; but during that month the great majority were readmissions. Relapses also were frequent at this time. Some, indeed, relapsed so often that they were sent away to Coloba for change of air; there they soon recovered.

In November and December the fever again assumed the remitting type, in some instances complicated with gastro-hepatic symptoms. This, the bilious remittent of most authors, was altogether a more dangerous fever, but rare.

In one body examined, no organic disease whatever was found.

In the catarrhal fever, during the south-west monsoon,

quinine answered well, but in the gastro-hepatic form it did not answer so well. When the mouth was made sore by mercury, then an apyrexial period occurred; and if quinine was then administered, convalescence ensued rapidly; but if not, they were almost certain to relapse, as the mercurial action wore off. In one case Mr. Hunter found an hepatic abscess. *Transactions of the Medical and Physical Society of Bombay*, vol. i.

In the same year a destructive epidemic occurred in Zillah Mainpuri, and is described by Dr. D. MacNab, under the name of epidemic congestive fever. His observations were made in a jail or gang of convicts working on the Grand Trunk Road. Amongst the convicts, the first cases occurred at the end of December, 1836; but the disease was probably communicated to them, as at Eta and its vicinity the epidemic had prevailed for a month or more before the convicts reached the place. "The same disease annually, for two or three years, had occurred in some part or other of the Mainpuri district. On these occasions the disease had been extremely general; few escaped, and the attack was generally fatal. The inhabitants of the town of Mainpuri were terror-struck. Many of the better classes fled from so terrible a visitation, to seek refuge elsewhere; and ventured to come back to their homes and occupations, deserted while the panic lasted, not until the hot winds had been for some time gradually producing an amelioration in the severity, as well as prevalence, of this formidable calamity. The epidemic was usually observed to disappear under the influence of the hot winds. No part of the Dooab was entirely exempt from this evil some time or other, but it seldom pervaded the district in its whole extent in any one year."

He continues, "We may seek in the habits of the people themselves, causes highly conducive to the production of an epidemic disease. Generally speaking, the poorer orders are neither well fed nor well clothed; more especially when the day-labour fails, as in this case, to furnish the usual livelihood which they regularly look forward to."

He was convinced of the contagiousness of the disease. He says, "My conclusions were derived from what, to me,

were obvious facts, and I could not cast about for difficulties in disregard of natural connections which appeared plain and unambiguous. To my simple apprehension, the presence of contagion was often indisputable." He gives the following list of persons to whom the disease was unequivocally conveyed. Washermen, two; native doctors, two; brahmin cook, one; sweeper, one; bunniah, one; oilman, one; convicts attending on sick, seven; patients in hospital for other diseases, four; burkindazes, three: total, twenty-two. Nearly half of these died.

Mr. MacNab does not state the average duration of the fever, but from his general remarks it would appear to have been of short duration, not exceeding on the average five days. Few or no relapses occurred. The mortality was very great. The fever seldom remitted; there was reason to believe that the intestinal mucous surfaces were many times the seat of lesion, but post mortem examination had not been made; hiccup for several days consecutively was a very fatal symptom; there was pneumonia; also bronchial irritability, with copious expectoration; restlessness; unusual pains; burning heat of the stomach; jaundice; the bowels were by no means torpid, but, on the contrary, easily acted on by medicine; and there was hepatic complication. Quinine was considered hurtful, and one death was directly attributed to its use. *Transactions of the Medical and Physical Society of Calcutta*, vol. iii., part ix., appendix, p. 230.

In the year 1836, Mr. William Spencer met with an epidemic in the Moradabad jail, which he named epidemic remittent fever. In March, a fever of a serious nature and fatal tendency prevailed at Bareilly; soon after it reached to Rampore, between Bareilly and Moradabad. In the middle of April it was recognised at Moradabad, and an increase of fever occurred at the jail. There was nothing violent or peculiar in the symptoms of the first cases of fever that occurred in the jail. About the 20th April, the peculiar yellow appearance, with cerebral affection, occurred. Early in May, the hospital became crowded to excess, the number of patients varying from forty to sixty, and many cases were serious. The men in attendance on the sick con-

tracted the fever, and patients with sore legs and wounds were attacked. The intensity of the epidemic was reduced by the removal of the sick to the civil jail, and thence into choppers under trees; but on the setting in of the rains in June, the sick were put back into the jail hospital, and in July the epidemic resumed its formidable character. The admissions became numerous, and the attendants were constantly falling sick. The epidemic declined in October.

The jail hospital could only accommodate twenty-four patients, allowing six superficial feet to each, and had a privy sufficient for one man at a time, and the men were obliged to relieve themselves on a plaster terrace within the ward.

Mr. Spencer describes the fever as a pure remittent, with one paroxysm within the twenty-four hours, and in the early stages a clear intermission. The attack was preceded by weariness and pains in the limbs, succeeded by heat of skin, occasionally pain in the head and restlessness; the bowels were bound; the first evacuations obtained by medicine were uniformly dark, many quite black as ink and offensive; collapse was rather frequent, with cold and clammy skin, low delirium, and sanguineous evacuations. Jaundice occurred in most cases, generally about the fourth day. Death in fatal cases occurred from the eighth to the eleventh day. Pain was not admitted by the sick, but much pressure could not be borne on the epigastre. The tongue was various, natural or with a thin yellow coating, like a sheet of white paper; relaxed, or sometimes loaded with a thickly encrusted fur of various colours. The eyes were bloodshot in some cases. Stupor occurred in many cases. The bowels were obstinately constipated; some could not be moved at all, while some others suffered a fatal collapse on the operation of the first means used. The disease was most formidable in the robust and young men. Many suffered from relapses.

The sequelæ were dysentery of an intractable kind and large abscesses. In one case an abscess formed in the cellular tissue around the rectum; in another in the neck, and in a third over the masseter muscles of each jaw. Blistered surfaces ulcerated or sloughed.

At post-mortem examinations the liver was generally found enlarged; the intestines healthy, except patches of congestion; and the spleen slightly enlarged and hard.

The disease was unquestionably infectious, and was probably propagated by that cause alone.

In the town of Moradabad not one of six attacked recovered. When the fever entered a house or family, every one in succession became affected, and the natives considered it was the height of good luck to recover. The class of people who had the fever was the poorest; the circumstances that favoured attack was poor diet, bad clothing, dirt, and all the evils attending a closely compacted and poor population.

Regarding the same epidemic, Dr. F. F. Stuart, writing officially to Mr. Playfair, superintending surgeon, recorded the following observations. "Persons living in well ventilated places entirely escaped this epidemic. Only one gentleman's servant was attacked. One sepoy experienced a slight attack. Persons who afforded themselves good food, even though living in indifferently ventilated situations, provided they avoided exposure to the infection, also escaped. Not one of the prisoners confined in the debtor's jail had it, though their wards are built in the form of a confined square, within the prison wall; and are not nearly so well ventilated as those of the criminal jail. They have no communication with the convicts. No European here has suffered from it, nor have any of the wealthier natives in the city died of it."

Mr. Stuart thus speaks of relapses: "Every hospital attendant was laid up three or four times, in consequence of their necessarily close intercourse with the sick."

"It is worthy of remark," he adds, "that the Terai near this, which is swampy and skirted by a belt of grass jungle, between which and the hills the belt of forest is from twelve to fifteen miles broad, has continued unusually healthy, during the prevalence of this epidemic." *Appendices to the Report on the Malignant Fever, called the Pali Plague.* By James Ranken, M.D., 1838.

1837. In the year 1837, a terrible epidemic occurred in

the Bareilly jail, of which Mr. H. Guthrie has written an excellent account. He notices the prominent symptoms: the fever setting in with a rigor; dark crusted tongue, which was sometimes tremulous and awkwardly protruded; the teeth covered with sordes; the brain variously affected, from slight frontal headache to delirium and deep coma; the eyes now and then streaked with red vessels, and too frequently yellow or saffron-coloured. Severe pains in the lower extremities, even during convalescence; hiccup in protracted cases; pain and fulness in the hepatic region; the spleen was seldom affected; the abdomen tumid, hard, and sore; a ravenous desire for food; the bowels were easily moved and often spontaneously; great prostration and emaciation; ophthalmia. In most cases the fever was remittent; but it differed from remittent fevers in general and common intermittents in the following points,—in the saffron eye, the state of the tongue, the ravenous desire for food (the latter he considered hurtful; so also he regarded bitters, bark and quinine being hurtful in this fever), and finally in the fact that there was a cold fit in the first paroxysms only. He omitted to note the duration of the fever, in common with almost all the old writers, and also the relapses. That the latter occurred, and more than once, is clear from the measures which he took for the suppression of the epidemic. The sick on recovery, he states, were removed from the hospital to a large tiled house, and placed under a jemadar whose duty it was to see them washed, fed, exercised, "and instantly, as relapses occurred, to send them back to the hospital bungalow;" from these again a selection was daily made as they recovered, and removed to another out-house under a native doctor, "and if these did not in five or six days suffer a relapse, they were sent to the jail as cured." He thought the indulgence in food was the cause of relapses. Mr. Guthrie gives a graphic account of the difficulties he laboured under, and of the deplorable condition of the Bareilly jail.

He adds that a similar fever occurred in the jail in 1813, sacrificing 300 victims; again in 1818, from July to September, causing great mortality; and also in 1834 for a few days, destroying eighteen convicts. From October,

1836, to March, 1837, 119 died of the fever; it was still going on at the time Guthrie wrote his account.

He was convinced of the contagiousness of the fever, as the attendants on the sick took the disease. He adds the remarkable fact, that when the town was devastated, the convicts had it not among them; but on this occasion it was *vice versâ*. In the neighbouring terrace the fever was dreadfully destructive, and one unfortunate village was said not to have one inhabitant left alive.

Mr. Guthrie could not tell how the epidemic arose. "Into the dark caverns of nature," he says, "whence emerge these destructive and periodic epidemics, not even a scintilla of philosophical light has been thrown." *Transactions of the Medical and Physical Society of Calcutta*, vol. viii., part ii.

In the same year, 1837, an epidemic occurred in the Paniput and Rhotuck districts, of which Mr. William Shirreff is the recorder. He calls the disease "bilious remittent fever"; in mild cases, however, it assumed the intermittent form; but generally it was remittent, and not unfrequently continued, when intermittent, quotidian and tertian types were common, and sometimes quartan. The latter, under native treatment, were equally fatal as the remittent, though they ran their course for a longer period. In some cases the urine was high coloured and scalding; in other cases totally suppressed. Cough and difficulty of breathing supervened in some cases, and even caused death. The fever ran its course in seven, eight, or nine days. Excruciating pain in the head was a prominent symptom for one or two days. Stupor and coma were common enough, but were not observed in any of the patients with well marked bilious suffusion; these on the contrary were usually anxious and restless in the extreme. Jaundice occurred in one half of the cases, but not always in the severest. Pain in the right hypochondre was a constant symptom towards the end of the disease. Sore throat, with swelling of the lymphatic glands, was a common symptom at some villages during the first days of the epidemic. The mortality was very great. The young and previously healthy suffered the most. According to

native reports three fourths of those attacked died. At Faridpore, the police reported that, out of a population of five hundred families, nearly two hundred individuals died within six weeks. At Pakism, two hundred and thirty are said to have died within twenty-seven days out of a population of one thousand: in one division of the village almost every one died who was attacked. At Bhow, Mr. Shirreff saw the head of a family who congratulated himself on having lost only seven out of sixteen inmates of his house within a month, while, he said, others in the same village had lost all, or perhaps none were left to feel the loss. The disease was believed by the natives to be infectious: free ventilation, however, rendered it innocuous. *Appendix to Ranken's Report on the Pali Plague.*

1839. In the year 1839, an epidemic occurred in the 22nd regiment Bombay Native Infantry. The account is by Dr. J. Inglis, the surgeon of the regiment. It is described as a remittent fever of a greater degree of intensity, and more malignant nature, than it is seen to occur amongst natives in the Guzerat fever. In most of the cases the subjects were young men, Mahrattas, who had lately joined the regiment, and who never were in Guzerat; nearly all the casualties took place amongst them. The symptoms were hot, dry, and harsh skin; tongue rough and furred, dry and hard like a piece of board, or loaded in the centre, with the edges and tip of a red colcur; intense thirst; irritation of the stomach, with nausea and vomiting; quick, small, and contracted pulse; great restlessness and jactitation; bowels generally costive; urine scanty and high coloured; no complaint was made of pain in the region of the liver (though jaundice was not uncommon), and only occasionally in other parts of the abdomen. A slight remission of all these symptoms occasionally took place, but without any regularity, and the disease continued for days without alteration.

Some cases were complicated with inflammatory action in the thoracic viscera, inducing cough and dyspnœa. The most frequent complication was an inflammatory affection of the brain, approaching meningitis. In these

cases, in addition to the symptoms above enumerated, there was a wild and stupid staring appearance of the countenance; inability to answer questions correctly; the pupils at first generally contracted and obedient to the light, latterly dilated and fixed; great anxiety and nervous agitation and excitement; tremulous motion of the fingers and tongue; subsultus tendinum; frequently jaundice; followed by drowsiness, insensibility, stertorous breathing, involuntary stools, coma, and death. In some, there were short outbursts of outrageous delirium.

Regarding the mortality Dr. Inglis is unable to speak, as the regiment left Tatta while the epidemic was going on. One hundred and seventy sick and twenty-two convalescents were left behind at Tatta. Regarding these, he says, he was not able to ascertain what number died, but the mortality must have been considerable, as the disease is said to have increased much in virulence and fatality after he left Tatta; so much so, that the greater part of the troops were moved on to Garrah as being a more healthy place. The epidemic at Tatta prevailed during the latter half of September and during the month of October.

In his account of the symptoms of the fever, Mr. Inglis entirely overlooked the relapse, but he supplies the omission in his account of what took place on the departure of the regiment from Tatta. He says, "Many men who were anxious to accompany the regiment were permitted to do so, although considerably reduced in strength by previous fever. I have since had reason to regret having acceded to their wishes, as a number of them have had relapses, and besides the two casualties which have taken place since we came with the boats, several others have been on the point of death." *Transactions of the Medical and Physical Society of Bombay*, no. iii., for 1840, page 29.

In January, 1839, six hundred recruits traversed a jungle between Malwa and Candeish. On their arrival at Malligaum, nearly sixty were admitted into hospital with fever: some of these men had suffered for several days, and were beyond the reach of medical aid when they arrived; only seven of the number died. The complication was chiefly bronchial, of a very intense character. In the progress of

the disease the air cells were ruptured and their connecting tissues, and thence the air, without rupturing the bronchial lining, escaped by the root of the lungs to the cellular membrane of the thorax, forming emphysema of the neck, face, and around the clavicles. Hæmorrhages likewise took place from the nose and throat. In one or two cases deafness occurred. Mr. A. Graham considered the disease to have been a bilious intermittent and remittent fever. His account is headed, "The Jungle Fever of Candeish." *Transactions of the Medical and Physical Society of Bombay*, no. iv., for 1841.

In the same year, Dr. John Murray, who retired in 1870 from the service as Inspector General of the Bengal Medical Department, met with relapsing fever at Meerut. His account is contained in a pamphlet on "The Topography of Meerut," written when he was Assistant Surgeon of the 1st Brigade Horse Artillery, and printed by order of Government. As it is very interesting, it is extracted in full. Dr. Murray called the disease "yellow remittent fever":—

"Since the commencement of the last cold weather the natives have suffered from a very dangerous remittent fever, with yellowness of the skin and conjunctiva; they seldom complained of local pains. The most prominent symptoms at the commencement were suffused eyes, slight headache, and great prostration of strength, with early delirium during the hot stage; the remissions, at first well marked, became indistinct after the second day, and yellowness of the conjunctiva, great prostration of strength, sordes on the teeth, quick, feeble pulse, low muttering delirium, and coldness of the extremities, followed.

"The emaciated ghastly appearance of the patients on admission after the third or fourth day of the attack, made me doubt their history of the disease, till it received confirmation from several cases that occurred amongst the attendants and patients in the hospital. It was evidently contagious. One man attending on his friend caught the disease, and lay four days comatose; his brother caught it while attending on him, and died, so that it evidently was not rendered milder by transmission. The treatment was

leeches to the nape of the neck, a mercurial purgative, followed by an antimonial solution; sulphate of quinine was given when a distinct remission was obtained. They were generally admitted after the second day, and had delirium on the first accession of the hot stage; and after the second accession they remained dull, rather comatose, with yellowness of the conjunctiva and sordes on the teeth. They then sunk into a low muttering delirium, with coldness of the extremities; blisters were applied to the nape of the neck, and quinine given alone when the remission was perfect, and combined with calomel when imperfect. In several cases where the collapse was great, powdered capsicum and quinine were given till reaction took place. The treatment was then regulated by the symptoms that appeared. The bowels were kept open by enemata or mild laxatives. Free evacuation was avoided, as it induced very great prostration of strength. I attributed the death of one patient, who was beginning to rally, to the moderate action of an ounce of castor oil. Hiccup was a troublesome symptom in some of the cases that used the capsicum: it was relieved by effervescing draughts and assafœtida, with a blister to the epigastrium. The gums were affected, but free ptyalism was not induced in any case. An inordinate flow of urine was the first favourable symptom in many of the cases. The convalescence was tedious. A change of air, merely to the lines, was found very beneficial in the convalescence of some cases. The following case shows clearly the early morbid appearances. In all that died there was serous effusion in the brain.

"Lalloo Syce, first troop, has been ill with fever for five days, is now delirious, with tenderness in both hypochondria, conjunctiva yellow, pulse quick, skin hot. App. Hirud. xviij. epigastrio. ℞ Tart. antim. gr. i., Subm. hydr. gr. iij.; m. ft. pulv. tertia quaque hora repetendus. He died on the accession of the hot stage, thirteen hours after admission.

"*Sect. cadaveris.* There was a copious red serous effusion under the arachnoid, and at the base of the brain; the pia mater vascular, with numerous bloody points in the substance of the brain. The thoracic viscera were healthy;

the blood dark and liquid; the liver was enlarged, dark, and friable; the spleen much enlarged. There were no other morbid appearances.

"This disease has become much milder and more tractable since the hot weather commenced."

1841. In the year 1841, Mr. A. Wright met with relapsing fever in the 25th Regiment Native Infantry, while at Quetta, in Afghanistan. He says a few cases of fever approached the form of remittent, in general unaccompanied with any particular visceral derangement. In July and August, at Kelat, a few cases were complicated with diarrhœa and congestion in the brain, and most all of them with jaundice. Relapses are not spoken of. *Transactions of the Medical and Physical Society of Bombay*, no. v., p. 155.

Mr. W. T. Babington observed an epidemic at Kotra in Upper Scinde in the same year. He writes, "In January, 1841, I arrived at Kotra with the left wing 1st Light Cavalry (Lancers), and from that date until April, little or no sickness had occurred. About the latter end of this month, or the commencement of the hot season, a fever of a bilious remittent character broke out amongst the troops, attacking both Europeans and natives, which, if treated at an early stage, was easily subdued; but in consequence of the excessive heat of the place, patients were a long time recovering from the debility caused by a few repeated attacks. It was not by any means of a fatal kind; only two or three casualties having occurred amongst the men of the wing under my charge; and even in these, organic disease had previously existed." *Ibid., Appendix.*

1842. In the year 1842, Mr. Alexander Beattie described an epidemic which prevailed in the Allahabad jail in the months of February, March, and April, of fever of a continued and inflammatory type, believed to be contagious, from the circumstance of two native doctors and several of the attendants on the sick being attacked. Both the native doctors died of it. The fever rarely came on with a rigor, but generally with a cold creeping sensation, or short hot

and chilly fits alternately, with languor and prostration of strength, followed by hot and dry skin, great thirst, tongue dry, furred, brown, and stiff; in some cases it was black, and so hard and dry, it could not be protruded; the bowels were generally costive; the urine scanty and high coloured; in some cases headache; the eyes in all were bloodshot and very much tinged with yellow; and there was great tenderness of the scrobiculus cordis, and upper abdominal regions. The complications were inflammation of the liver, spleen, and of all the abdominal viscera. Relapses are thus alluded to: "Many of those whose constitution was broken down by age or previous disease, suffered a relapse, with dysenteric symptoms; and these were the cases which chiefly proved fatal." Mr. Beattie attributed the epidemic to the inadequate quantity of food supplied to the prisoners under the system of reduced diet allowance put in force by order of the Court of Nizamut Adawlut. He gives the following statistics. Average strength of prisoners, 963½. Mortality from all diseases, 135, or 14·01 per cent. *India Journal of Medical and Physical Science*, edited by G. Eveleigh; New Series, vol. i., pp. 171 and 202. Calcutta, 1843.

In the same year, the disease appeared in the 34th N.I., at Mercara in Coorg. Speaking of the fevers at this station, Mr. J. Lawrence, the surgeon of the regiment, states that they were of greater severity than those usually met with. Anasarca occurred after a few days of quotidian fever; swellings of the hands and feet, and sometimes puffiness of the face. In some in whom the fatal termination had been rapid, effusion into the pericardium apparently took place. Hydrothorax also commenced with the same symptoms, *i.e.* with intermittent fever. In these diseases, and frequently in rheumatism, the patient often complained of loss of power and sensation, and walked with a tottering gait; these symptoms being sometimes preceded and sometimes followed by œdema of the feet and hands. This affection was almost always preceded by slight fever. The symptoms approached very nearly to beri-beri, when the partial paralysis and œdema only existed. The heart was generally irritable, and there was a tendency to effusion into the chest. "There was a remarkable tendency to relapse

in cases of fever, rheumatism, anasarca, and partial paralysis." *Ibid.*, p. 525.

1843. In the year 1843, a batch of recruits of the 22nd Bombay Native Infantry, while marching from Mhow to Bombay, was attacked by a fever characterized by a formidable train of symptoms, which Dr. A. Arnott thus describes. "The most important were dry, furred tongue, rapid pulse, being in one case that proved fatal 150, great restlessness and prostration of strength, general tremor, frequent involuntary evacuations in the later stages, yellow turbid suffused eyes, dyspnœa, and hæmorrhage from the nose and mouth." *Transactions of the Medical and Physical Society of Bombay*, no. vii., for 1844.

During the autumn of 1843, a very serious epidemic broke out among Sir Charles Napier's troops in Hydrabad in Scinde. Mr. H. J. Carter thus describes the disease as he observed it in his own regiment, the 21st Bombay Native Infantry. He states that the symptoms of derangement of the biliary organs which accompanied it, entitled it to the specific designation of "bilious intermittent." Its commencement was sudden. Pains in the body and limbs, bilious vomiting, high-coloured urine, and costive bowels, were sooner or later followed by a severe paroxysm of fever. The type was generally quotidian, sometimes tertian, sometimes the periods of intermission were irregular, and occasionally the fever was remittent, rarely continued. The paroxysm generally lasted from eight to ten hours, and was complete in all its stages of cold, heat, and perspiration. There were, however, several instances of irregularity, in which the development of one of the stages was incomplete, two of the stages existed without the third, and it was by no means uncommon for the patient to experience the cold stage only when the fever made its appearance. The accession generally took place about twelve o'clock, or towards the hottest part of the day; while at a subsequent period, when the nights began to grow cold, it as often came on at midnight. Its liability to recur at short intervals was certainly the worst character of this disease; the average period between the attacks, including convalescence, *i.e.*, from the

time the patient was discharged from the hospital to the date of his readmission, did not exceed four days. Local inflammation seldom presented itself, but the symptoms of local congestion were occasionally severe. The fever frequently commenced with vomiting of blood, always of bilious matter; and sometimes it terminated by a discharge of blood from the anus; profuse bleeding from the nose attended it, singing in the ears, amaurotic affections, and violent nervous pains of the head; and towards the end of the month of November, when the patient had become reduced to a state of extreme debility by repeated attacks of the disease, the throbbing pain of the head, deafness and vertigo that occurred on lying down, frequently terrified him from assuming the horizontal position. When in the first part of the autumn a fatal case occurred, it generally took place during an attack of quotidian fever; after several severe accessions, insensibility came on during a paroxysm, and terminated in death. Latterly, however, dysentery supervening upon a debilitated constitution, rapidly put a period to the existence of all who were attacked by it.

This awful epidemic affected all the troops collected at Hydrabad, after the battles of Meanee and Hydrabad. The native regiments were quartered in the deserted houses and villages of persons who had either perished in action, or who with their wives and families had fled from homes no longer welcome to them under the dominion of a foreign power. The epidemic began in April and persisted to the conclusion of the year, beyond which Mr. Carter's account does not extend. The network of irrigation canals, the stagnant condition of the water, the physical characteristics of the locality, and the meteorology of the year are fully entered into; but there is no history of the food-supply of the troops, or of the inhabitants of the country, and of the existence of fever amongst the latter. The statistics of the monthly mortality are somewhat vitiated by the fact that in the total number of cases in each monthly statement are included those which remained in hospital on the end of the previous month. The average rate of mortality cannot, in consequence, be calculated from the figures. Out of a

body of troops, consisting of a troop of horse artillery, two companies of foot artillery, two regiments of cavalry, and six regiments of native infantry, no less than 319 men died of relapsing fever from April to December, 1843. All the medical officers and hospital establishments were at one time or other attacked by the fever. *Transactions of the Medical and Physical Society of Bombay*, no. viii., for 1847.

1844. In the year 1844, an epidemic occurred in the 1st Grenadier Regiment (Bombay), while serving in Scinde. Mr. N. H. Davidson, the medical officer of the regiment, thus briefly describes it :—"In the month of May, fever of the bilious remittent type was very prevalent, and attacked every one in the regiment, both officers and men. . . . The severity of the epidemic lasted for a few weeks; and on the occurrence of cloudy weather, generally prevalent in the months of June and July, the regiment regained its usual health. . . . Two cases proved fatal at Kurrachee during the prevalence of the epidemic there. In both cases, after a severe paroxysm of fever, a state of collapse, resembling that in cholera, followed, from which the patients gradually sank. A few similar cases also occurred, but which eventually recovered." Quinine was considered useful in the treatment of the fever. *Ibid.*, no. vii., for 1844.

Dr. H. Goodeve has described a "Peculiar Form of Eruptive Fever," which occurred in Calcutta in 1844, which probably was the same in character as the epidemic of 1824, described by Twining. It was a remittent fever, attended by a peculiar eruption resembling scarlatina. The character of the cutaneous eruption and the symptoms were so well marked, that Dr. Goodeve was inclined to regard the disease as a distinct exanthem. The eruption was critical; it appeared after a preliminary fever of some days' duration, and it was certainly epidemic. He believed that it never attacked a patient a second time, but further observation was necessary. He did not believe it to be contagious, and was not aware that it had appeared in other parts of India.

The fever continued for a period never exceeding seven

days. The eruption first appeared on the palms of the hands and the soles of the feet; extended rapidly to the fingers and toes, and to the back of the hand and foot; and, subsequently, covered the arms and legs. The face was next attacked, and was usually very deeply tinged with it, even to the roots of the hair; and the eyes and lips became very red. The eruption frequently passed from hence down the neck on to the chest. It rarely reached the abdomen, though cases occurred in which the body was wholly covered, scarcely a spot as large as a rupee remaining uncovered. On the third day the eruption subsided, and entirely disappeared on the fifth or sixth day. It resembled scarlatina. It occurred in irregular patches of a bright red colour, scarcely elevated above the level of the skin; and the spots were usually confluent. It was attended with tingling and itching, which was so distressing as to prevent sleep. As it faded, the cuticle usually scaled off in small flakes; but occasionally the marks continued for some time, appearing whenever the skin was heated. The eruption had no affinity with urticaria or lichen. The disease differed from scarlatina in the total absence of irritation or ulceration in the fauces. The fever always subsided upon the outbreak of the eruption, and never reappeared in the secondary form nor did any local affection attend or follow the eruption. The disease was of a mild character, and no fatal case occurred. The usual sufferers were Europeans newly arrived in the country. It chiefly affected young people; but all ages were liable to it, and even young children occasionally. Dr. Goodeve never saw the disease in Europeans born in the country, nor in East Indians who had never been out of it. He attributed the disease to malaria.

Dr. Goodeve's account of the "Peculiar Form of Eruptive Fever" of Calcutta was read at a meeting of the Medical and Physical Society. In the discussion which ensued, Drs. Egerton, Stewart, and Finch stated that the roseolous or rubeolous eruption, accompanied with swellings of the hands, which Dr. Goodeve had fixed upon as demonstrating its distinction from every other known form of fever, was only a casual symptom, which occurred in the

persons of new-comers of fair complexion and light-coloured hair on their first attack of fever. Dr. Stewart further remarked that "the disease did not merit the designation of an epidemic, as it had been confined to a few persons, and those new-arrivals." *Transactions of the Medical and Physical Society of Calcutta*, vol. ix.

1845. In the year 1845, an epidemic occurred in the months of June and July in the 34th Regiment, or C.L.I., stationed at Mangalore, and was described by Surgeon J. Lawrence. The fever was of a continued and intermittent type, marked by a duration of four or five days. There was headache, with pains in the back and limbs, and red and coated tongue; nausea and vomiting were rare. The most remarkable feature in the disease was the extreme debility caused by it. In June there were thirty-eight cases, and in July seventy cases. Quinine, it is stated, prevented the recurrence or relapse. Paralysis was a frequent complication. Convalescence from paralysis was protracted, and retarded by a temporary recurrence of the earlier symptoms; whether these were increase of circulation, œdema, or febrile heat, the paralytic symptoms were always increased at the same time. Mr. Lawrence thought indulgence in food during the intermission was the cause of the relapse. He says: "All the patients who were limited to the smallest quantity of food have grown gradually better, without suffering any relapse. On the contrary, those who neglected this precaution, not only protracted the acute symptoms, but subsequently, on increasing their food, reproduced the quickness and force of the circulation, the febrile heat, and sometimes the œdema, the paralytic symptoms increasing also in the same proportion." Effusion into the pericardium also occurred. Mr. Lawrence apparently mistook the complications of the fever for distinct and independent diseases; he speaks separately of carditis, paralysis, and beri-beri. He describes the heart's action in carditis as a forcible and confused or fluttering motion. His cases of paralysis are instructive. *Medical Reports selected by the Medical Board. Madras*, 1850.

1847. An epidemic of jungle fever occurred in 1847 in the 18th Regiment Madras Native Infantry, during the field operations in the Goomsur valley, and was described by Surgeon E. W. Eyre. The regiment marched from Seetabuldee for Russelcondah on the 11th January, 1847. On the 23rd February, Boad was reached. Here difficulties were encountered at the Puddam-tullao pass, leading from Khondistan to the low country. The toil and privations endured by the officers and men were great; and water being to be had with difficulty, added much to the sufferings of man and beast. Provisions, too, had become scarce since leaving Boad, the stores of grain intended for the supply of the troops having been wantonly destroyed. The efforts to procure grain elsewhere were attended with but partial success, and it became necessary at length to put sepoys and followers on allowance. On the 5th March they reached Koont-loo, where grain was in abundance; on the 13th March, Nowgaun; and on the 3rd April, Russelcondah. Detachments were at once sent off to occupy posts in the jungles. Fever began from the 20th March, and was epidemic. In the latter part of March and in April, the fever was of the quotidian intermittent type, with some tertians; there were universal bilious symptoms, vertigo, without vascular excitement, pungent heat of skin, nausea, and ardent thirst. In April, there were 157 admissions, and four deaths. The fever persisted all through May. On the 19th May relapses began, the average time after the primary attack being ten days. The fever was of the same type as in April. The tongue in a good many was highly florid, shining, and glazed. There were 298 admissions in this month, and four deaths. In June, the fever still kept on. On the 24th, nearly all the men of a company lately returned from Coorminghia, a post on the summit of a pass, went into hospital; there were 155 cases and six deaths in this month. In July, the fever became milder, but dysenteric complication occurred; number of cases 166, and one death. In August, enlarged spleen was found in cases of relapse; and intermittents passed into remittents, and *vice versâ*. There were 203 cases and one death in this month. In September there

were no complications, except enlarged spleen; the fever was observed to come to a close in four paroxysms; number of cases 205, and five deaths. In October, the fever became more obstinate; wakefulness was complained of, even when no fever was present; number of cases 289, and two deaths. In November, fifteen and upwards were daily admitted, and the fever assumed a graver character. Few cases were cured till they passed through five paroxysms. Catarrh was universal, and the more severe forms of pulmonic affections occurred. The cases were very intractable, and relapses frequent. The fever was of an asthenic character, and the complications chiefly pulmonary: number of cases 414, and eight deaths. In December, the cases were fewer in number, but more severe. Many entered from the outposts; and men in hospital, who had been many days free from fever, had a recurrence of it; dysentery and diarrhœa were the complications: number of admissions 470, deaths 6.

Mr. Eyre remarks that in the hot season the types were quotidian, with a few tertian; the fever was mild and the deaths few. In the cold season the fever took on an asthenic form, and the deaths were many. Ten cases proved fatal from cerebral affection, marked by a degree of mental aberration and coma. Mr. Eyre states that a case of intermittent fever would change into continued. Again, a case of intermittent fever on recovery would, after a few days, get a relapse of continued or remittent fever. There were several cases of pulmonary and pleuritic inflammation; and abdominal complications, such as diarrhœa and dysentery, affected many. Functional derangement of liver was frequent; and one instance of considerable hypertrophy. No allusion whatever is made to the presence of jaundice in any case. Enlargement of the spleen was common. In ten cases œdema of the lower extremities occurred. Of twenty-one officers three only escaped the fever; the young officers suffered the most. Of the whole corps very few indeed escaped; 2331 admissions were actually registered, but 3000 would better represent the number of cases, as many men did not enter hospital.

Mr. Eyre thought that malaria was not the cause of the

fever. He observed the following remarkable circumstance, viz., "the seizure of the numerous patients on the same day with fever, some of them recent admissions, some free from paroxysms several days, others convalescent, and this would take place for two or three days, and then there would be a sudden change for the better in all the sick. It seems more reasonable to explain this by a modification of the atmosphere at such times, than by a sudden emanation of malaria from the surface of the earth." The officers attributed the fever to lunar influence. With regard to quinine, Mr. Eyre felt at a loss to explain the inutility of a remedy, so potent elsewhere, in the treatment of Goomsur fever. He never again gave quinine in remittent fever after the experience gained in this epidemic. He says, "large quantities of quinine have been expended to ward off the endemic of Goomsur, and with what success? None, it may be confidently affirmed."

In September Mr. Eyre thought better of quinine. In most cases he found the fever ran a definite course, and terminated spontaneously in four paroxysms, without any treatment at all; but when quinine was employed in other cases, it was found that only one paroxysm on the average was experienced. One objection to the disuse of quinine, on the ground that relapses will be more likely to recur, had not been found to possess any weight. In November, when the disease was graver, quinine was carried to the extent of thirty grains without avail; bark and arsenic were inert. In December, Mr. Eyre specially put quinine to the test; in order to ascertain its efficacy in warding off relapses, patients were kept on its use for many days, eight and more, after the fever had been cured. When discharged they were not sent to duty at once, but by degrees, as their strength admitted. No success followed the plan, for the cases were back again in a few days with a relapse.

One remarkable circumstance was observed by Mr. Eyre. The sepoys' families, followers, etc., in Russelcondah did not suffer from the fever, although the sepoys at the outposts did. The families kept free till December, when fever began to appear among them, and several deaths

were reported. On instituting an inquiry, it was found that the subjects of the disease had been up to Chakapad, an outpost in which the disease manifested an aggravated form, to visit their friends, and a few days after returning were attacked.

Mr. Eyre also alludes to another remarkable circumstance which was observed at Chakapad. Two companies of the 18th N.I. and one company of the 41st N.I. were posted there: while every man of the former suffered the fever, the latter hardly suffered at all, and the cases that did occur were of a mild description.

Mr. Eyre makes a reference to the epidemic which invaded the 50th N.I. in the previous Goomsur campaign in 1836. He says that the fever which occurred at Moojoo-goodoo, reported on by Staff Surgeon McDonell, was not met with in 1847. I regret that I have not succeeded in finding this report.

Mr. Eyre noticed three cases of palsy in the course of the fever: these were fatal. They were attended with œdema, and were mistaken for beri-beri. In one case the palsy occurred in the primary attack, in another in the relapse, and a third in the intermission. In one of these cases the fever lasted thirteen days. *Ibid.*

1849. In July and August, 1849, an epidemic occurred at Peshawur, in the 1st Bombay Fusiliers and H.M.'s 60th Rifles. In the former regiment, of 798 cases admitted during these two months not a man died. Dr. F. S. Arnott states that the symptoms on admission were often very urgent: there was pungent heat of skin; great thirst; parched, red and dry tongue; quick, full and strong pulse; racking pains in different parts of the body, and acute headache; with flushed countenance, throbbing of the temples, restlessness, nausea, and vomiting of bilious matter. Relapses were frequent and gave much trouble; but the symptoms in the succeeding attacks were never so violent as in the first attacks, and the men generally returned to their duty on the fourth or sixth day. *Transactions of the Medical and Physical Society of Bombay*, no. x., for 1851.

In a subsequent account Dr. Arnott thus describes the fever. "In the majority of cases, either simple uncomplicated quotidian, or irregular tertian intermittent, fever is seen, the paroxysm coming on about 11 a.m., and terminating about 3 p.m. The first attack is generally the most severe. It seems to confer an exemption from future severe paroxysms, but at the same time it creates a greater predisposition to a return of the disease, insomuch that many men never fail to have a relapse after a slight excess, irregularity, exposure, or inattention to the bowels, and at each phase of the moon; so that in a year, perhaps, the same person is admitted ten or twelve times for this disease. Relapses from fever make up a large proportion of the admissions, but they are always easily subdued, and do not seem to injure the constitution in any serious degree. In a paroxysm, especially of a first attack, there is pain of the head, back, and loins, heat of skin, full bounding pulse, dry tongue, flushed face, anorexia, costiveness, and scanty high-coloured urine, very often considerable irritability of stomach, thirst, nausea, retching, and vomiting of bilious matter. Functional derangement of the stomach and biliary system is generally present, and the headache seems to depend upon it." *Ibid*, no. ii. New Series for 1853 and 1854. Art. "Report on the Health of the 1st Bombay Fusiliers, from 1st April, 1840, to 31st March, 1854," by F. S. Arnott, M.D.

1852. The 19th Regiment Bombay Native Infantry, stationed at Kolapore, suffered, in 1852, from an epidemic which endured from the beginning of August up to December. The narrator, Dr. D. Wyllie, states that it affected all classes and ages indiscriminately, and its causes appeared to be connected with an objectionable site of camp, and an unusual amount of rain. The local corps stationed at Bhowrah, a distance of three miles, continued healthy, while fever was extensively prevalent among all classes in camp. The objections to the site were, 1st, general lowness of position; 2nd, the immediate vicinity of two large sheets of water; and 3rd, the existence of extensive cultivation in the middle of the camp and its

neighbourhood. The recruits suffered the most in proportion to their numbers, a circumstance which Wyllie attributed to "low living, inadequate clothing, and a want of other comforts which the sepoy enjoyed," but which the recruits were unable to obtain, because they were in debt on joining the regiment. The symptoms of the epidemic, which consisted mainly of intermittent fever, were the following. Headache, nausea, and bilious vomiting, occasionally followed by yellowness of the eyes, were the ordinary accompaniments in the cases of intermittent fever. The usual statement of the patient on admission was, that he had been suffering several days from weakness, languor, pains in the loins and limbs, and loss of appetite. After a varying interval these symptoms were followed by shivering and a paroxysm of fever; the cold stage marked by nausea and bilious vomiting; the hot fit by headache, urgent thirst, and a burning sensation at the stomach. It was usually at this period of its development, the first or second day of attack, that the patients presented themselves at the hospital. The irritability of stomach and bilious characteristics were more marked in Purdessies than in Mahrattas or Concanees, in whose cases headache, giddiness, and constipation of the bowels were more common features. The quotidian type of fever generally yielded to treatment after five or six days. The symptoms were invariably most severe at the outset, when the paroxysm often resembled the continued or remittent form. The intermission, however, was seldom delayed beyond the second day, and then under the influence of remedial measures the complaint gradually disappeared, or passed into a tertian type, in which it often proved obstinate. The simple cases, in which no local symptoms existed, and where the intermittent character of the attack was distinctly marked from the beginning were generally more tedious than the others, and showed a more decided tendency to relapse during convalescence. The more prominent symptoms, bilious vomiting, nausea, sensation of burning at the stomach, and urgent thirst, were always most marked at the commencement of the attack; and, as a general rule, subsided within one or two days after the intermission had been established.

Moreover, these symptoms were generally only witnessed during the first occurrence of the complaint, and rarely happened to any noticeable extent in relapses, or during subsequent seizures. Headache and giddiness, on the contrary, especially when accompanied with a sense of fulness or throbbing, were symptoms that frequently proved obstinate, often persisting for days after the febrile symptoms were subdued. Out of 445 cases of intermittent fever, only one death occurred after repeated attacks; not a few, however, resembled the continued or remittent forms, and of these another died in addition to the fatal case of intermittent fever. With regard to the prevailing winds, Dr. Wyllie remarks, "The unwholesome influence of easterly winds, particularly in November and December, was well exemplified, not only in a great increase in the amount of admissions, but also on the frequency of relapse in fever, and the large number attacked of those under treatment during the prevalence of the wind." The latter circumstance affords proof of the contagiousness of the fever, although Wyllie otherwise accounted for the seizure of the sick in hospital suffering from ordinary illness. Quinine administered during the intermission, to the extent of ten to fifteen grains daily, proved a powerful remedy; its use, however, was restricted to severe and obstinate cases. Bark and creat generally proved sufficient to control the ordinary forms of the complaint. *Transactions of the Medical and Physical Society of Bombay*, New Series, for 1851 and 1852.

In the same year an epidemic occurred in the Eusufzai valley in the Punjab, and was described by Dr. Robert Lyell. This gentleman was the first observer in India, who remarked the identity of the disease with the relapsing fever of Europe. The epidemic was widespread and the mortality considerable. In the village of Dowlutghai-ka-kote, thirty-eight cases occurred, with twenty-eight deaths: in the large village of Dowlutghai, there were 410 cases with 216 deaths. In the whole valley, containing 55,000 souls, the mortality amounted to 8,353. Dr. Lyell clearly described the symptoms of the disease; its short duration, the intermission and the relapse; the more

prominent complications, and the fact of its contagiousness. *Indian Annals of Medical Science*, no. iii., for October, 1853.

1853. The epidemic continued in Eusufzai to 1853, and a description of it in this year was written by Dr. Thomas Farquhar. This gentleman observed the spread of the fever across the Indus to the tract called the Chuch in the Rawul Pindee district, from visits paid to friends on the opposite bank of the river by the villagers of Eusufzai. Dr. Farquhar called the disease typhus, and it is not improbable that some instances of this disease actually were observed by him in the epidemic, though the main disease was relapsing fever without doubt. *Ibid.*, no. iv., for April, 1855.

In 1853, an epidemic occurred in the criminal jail at Admednuggur, in the months of July and August. Dr. D. Wyllie remarks that the cases differed in no essential point from the ordinary observed forms of fever, unless in the great degree of consecutive weakness that resulted. While convalescence was tedious and protracted, even in ordinary cases, those of a more severe character were followed by anasarca, derangement of the assimilative functions, and atrophy. In the remittent form, calomel was chiefly relied upon in bringing about the remission; but the remedy, although successfully employed in mitigating the paroxysm, seemed less effectual than usual in preventing its recurrence. Of ninety-two cases of intermittent treated, one death resulted from exhaustion, consequent on repeated attacks. This form of fever was by no means severe, and on no occasion did the usual remedies fail to control it. There was however a great tendency to relapse, especially in the debilitated, and convalescence was thus tedious. *Transactions of the Medical and Physical Society of Bombay*, no. ii., New Series, for 1853 and 1854.

In the year 1853, an epidemic of fever with scarlet eruption was prevalent at Calcutta during the hot and rainy season, and was described by Dr. Edward Goodeve, who states that he witnessed an analogous epidemic in Cawnpore in 1847. He also expresses his belief that the epidemic was of the same character as that described by

Twining in 1824, by Mouat in 1825, and by his brother, Henry Goodeve, in 1844. The invasion was generally sudden: a rigor followed by fever, without previous disturbance of the system, except in some cases in which colic and diarrhœa preceded; all cases did not begin with shivering. The fever was generally paroxysmal, but continuous in a few. Sometimes copious perspirations occurred, and in some cases pyrexia was not well marked. The time was variable between the invasion of the fever and the appearance of the eruption: in two cases, for instance, the eruption set in with the first paroxysm; in six cases within twenty-four hours; and in two cases not till the third day. The symptoms generally were hot or warm skin, headache, pains in the loins and limbs; languor and prostration; suffused eyes; quick pulse, ranging about 100, but sometimes lower; great restlessness. At times the remission was marked by great prostration and a prolonged sweating stage, before the eruption showed itself. In some cases the depression and coldness excited anxiety in the friends, but the hospital cases did not show prostration to this extent, though some of the patients were much exhausted. The fever did not cease on the disappearance of the eruption, but continued for some days after, but it was then generally milder. The relapse was clearly not well marked, but such as it was, it was noted by Dr. Goodeve, who says, "there was at times a degree of febrile excitement, as evidenced by warm perspiring skin, and quick pulse, though the dry heat and more marked symptoms of pyrexia had subsided."

The eruption was red or scarlet in colour, and varied in intensity and extent. In the Europeans, the regions most distinctly and constantly covered were the whole circumference of the neck, as far as the clavicles, upper part of the thorax, face and forehead up to the roots of the hair. These surfaces were sometimes vividly red. The efflorescence appeared to commence on the face and neck, and extended to the hands, and sometimes appeared on the lower extremities. It was always fainter on the lower extremities than on the face and neck: sometimes it appeared simultaneously on the hands and arms and on the face.

On the abdomen it was less distinct; but in a few instances it was distinct in this locality. The colour varied from bright red to the faintest rose tinge. Dr. Goodeve did not notice the eruption to be elevated, except in one case. In all cases the colour disappeared on pressure. The duration of the eruption was irregular: the shortest period being forty-eight hours, and the longest period five or six days. The blush after it had faded quickly returned during excitement of any kind, but momentarily. During decline the efflorescence had at times a somewhat bluish tinge, but not at all livid. Desquamation of the cuticle occurred in one case only, but in that instance it was complete: the whole of the epidermis on the trunk came off in bran-like scales, but on the legs, feet, and hands, in large scales. In one patient vesications occurred on the face. In natives the eruption was distinct enough, with a little management of the light; but this was not always necessary. In some the skin presented a dark or dusky hue, merely a shade of red superadded to the natural colour. In one case the hands, feet, and ankles were swollen and tense, resisting pressure like firm œdema, and the fingers were stiff, and not readily bent.

Dr. Goodeve refers to several cases of the disease which came under Professor O'Shaughnessy's observation, of which the following is a sample. "I saw," says Professor O'Shaughnessy, "a gentleman who, a few days after his arrival in one of the screw steamers from England, was attacked with slight febrile symptoms accompanied with a red eruption which commenced on the face, and ultimately spread over the greater part of the chest and extremities. This was attended with considerable swelling: the eyes were closed for three days. It terminated by vesication and desquamation like common cutaneous erysipelas, which indeed I consider it to have been; but I mention it, as showing its tendency to the eruptive form of fevers of the season. I saw several other cases of the same character exactly as these I have described."

Besides the red eruption on the skin, the mucous membrane of the throat and mouth was involved, both in Europeans and in natives. In well-marked cases, the gums

were bright red, rose-pink, or damask, and also the mucous membrane of the lips, cheeks, fauces, uvula, and the posterior third of the palate. The follicles of the mouth and fauces were enlarged and prominent in many cases; in some as large as mustard seeds, in one case of the size of a split pea. There was no exudation on the fauces. Mr. Shircore saw a case in which there was ulceration and swelling of the tonsils. The Schneiderian membrane was involved in some cases, and was red: the natives thought such cases to be nakra. When the colour in the interior of the mouth declined, it assumed a bluish tinge. In two persons there was a slight tendency to bleeding from the gums.

Local complications were not prominent: the chief were gastric irritability, griping and looseness of the bowels, and in some severe colic for two or three days. One patient had symptoms like cholera, vomiting, and purging of rice-water stools, etc. Catarrh and congestion of the bronchial membrane attended some of the cases. In one case only was albumen found in the urine. The cerebral functions were not severely disturbed, except in one case which was fatal. Enlargement and suppuration of the parotid glands also occurred in one case.

Dr. Goodeve remarked, that simple jaundice, without much disorder of the liver, attacked a large number of persons during the spring of the year 1853.

The above observations were made on twenty-eight cases of the eruptive disease of which notes were kept by Dr. Goodeve. Of these nine were natives, eighteen Europeans, and one East Indian. The cases of the disease admitted into Dr. Goodeve's wards from 1st June to 31st August amounted to between five and six per cent. on the total male admissions. Dr. Goodeve relates four cases: in the first the peculiarity of scaling of the epidermis occurred; in the second the relapse was trifling, but distinct, and I have selected it as an illustration of the disease (see Case V.); the third case was fatal; and the fourth was a patient readmitted on relapse. *Indian Annals of Medical Science*, no. i., for October, 1853.

Dr. Norman Chevers thus refers to the above epidemic

in the number for October, 1871, of the *Indian Medical Gazette*. "I have never seen a case of scarlatina, nor of any really similar disease, in India. Soon after I went to Howrah, the 'red fever' was prevalent, and I treated many cases. The fever was generally strong and continued, and the exanthem, in many cases, was very like that of scarlatina; latterly, it more resembled that of measles. There was no renal complication, and anasarca did not occur in any case. This fever attacked persons of all ages. It did not appear to be contagious. I did not see any fatal case. This outbreak was described by Dr. Edward Goodeve in the *Indian Annals of Medical Science*."

In November and December, 1852, January and February, 1853, Mr. J. R. Taylor observed in H.M.'s. 80th regiment, at Rangoon, some cases of remittent fever which appeared to be identical with the yellow fever of the West Indies, and the bilious fever of Sierra Leone. *Ibid.*, no. ii., for April, 1854.

1854. In the year 1854, Mr. Maxwell recorded an epidemic which occurred in the jail at Dehra Ghazee Khan, and prevailed from the end of May or beginning of June to October. Headache and muscular pains were rare symptoms in this epidemic; the primary fever commonly continued for ten days, and the intermissions were of uncertain duration, sometimes a few days, and sometimes many days. The average duration of the fatal cases was eight days. The epidemic was preceded by a good deal of intermittent fever: it extended far and wide over the country, but whether it originated in the jail and spread from it is not stated. The troops escaped. Mr. Maxwell states that an epidemic occurred in the same jail in March, April, and May, 1852, and was described as "a low type of intermittent fever." In 1853, also, there was an epidemic of continued fever, said to have been "invariably attended with typhoid symptoms:" it was not very prevalent, and was not attended with much mortality. *Ibid.*, no. v., for October, 1855.

1855. "In the following year, 1855, the epidemic re-

turned," Mr. Maxwell states, "suddenly in February, and declined in June. In this epidemic diarrhœa occurred about the fourth or fifth day, earlier in bad cases; gurgling was frequently elicited by pressing the abdomen; there were sordes in some cases; but the mental faculties were clear. Improvement took place about the seventh or eighth day, and relapse occurred, even for the second and third time; in intermittent cases also relapses occurred. There was but little jaundice in this epidemic, which, at its decline, was entirely of intermittent fever. The disease was limited to the jail, and little known elsewhere. Mr. Maxwell made inquiries regarding the occurrence of the fever at other stations: it existed at Kohat, Bunnoo, Dera Ishmael Khan, and Dera Ghazee, but not at Asnee, the last station on the Derajât frontier. It occurred in the jails of these stations. The prisoners only were the sufferers; the troops escaped. Mr. Maxwell adds that three European officers were attacked by the fever. One, a medical officer, at Kohat, died of it. A second medical officer, who contracted it at the jail of Dera Ishmael Khan, recovered. The officer commanding the battery at Asnee died of the fever. *Ibid.*

In 1855, Mr. P. A. Minas met with an epidemic in the Bhutty territory. In the jail at Sirsa, 151 cases occurred, and none died; in the Fazilka jail 77 cases occurred, with two deaths. In the Sirsa dispensary, 301 cases were treated as out-patients, without a single death; and 36 as indoor patients, of whom one died. Many of the above cases were probably not relapsing fever. Jaundice occurred, and miliary eruptions covered the whole surface of the body in some cases. The epidemic began in October and terminated in December. Relapses occurred, sometimes for the second and third times; but the contagiousness of the disease is not alluded to. *Ibid.*, no. vii., for October, 1856.

1856. In a report on the Medical Topography and Diseases of Aden, by Mr. Ruttonjee Hormusjee, it is stated that intermittent fever is not so common there as in India; but the station is not exempt from the occasional visitation of febrile disease of severe type. A fever epidemic pre-

vailed with great severity from February to April, 1856, during which time there were 188 admissions and 60 deaths. The outbreak occurred among the native labourers engaged in the public works, and was attributed to undue crowding in a hot and badly ventilated valley, in close, badly constructed huts, in the proximity of sources of foul effluvia from decomposing animal excreta and other matter, coupled with poor living, and especially an inadequate supply of fresh water. The fever was characterized by evening exacerbations and morning remissions. The complications were various: cerebral disturbance in some, indicated by delirium, drowsiness, and coma, attended with adynamic phenomena, as subsultus tendinum and dry tongue. Pneumonia, bronchitis, dysentery, diarrhœa, and jaundice, were the complicating conditions in other cases. *Clinical Researches on Disease in India.* By Charles Morehead, M.D., 1860.

1857. In 1857, an epidemic occurred in the district of Patna. It broke out at the close of the preceding year, and did not disappear till the setting in of the rainy season. The primary fever continued for five or six days, and the intermission for two days. The relapse was very often fatal. Quinine was given in considerable doses whenever any decided remission took place; but the effect is not stated by the narrator, Dr. J. Sutherland. The disease also appeared in the jail. The epidemic committed "frightful ravages" in the city and neighbourhood of Patna: several villages were decimated. *Indian Annals of Medical Science*, no. xi., for January, 1859.

1858–9. Between the months of October, 1858, and May, 1859, an epidemic prevailed amongst the prisoners in the Sattara jail. On the 4th of August, 1858, the dietary was modified by the assistant-judge in such a manner as to create general discontent, and affect the comfort and health of the prisoners; but the original system was reverted to on the 2nd of October. The prisoners had also been imperfectly clothed during the greater part of the monsoon, and the commencement of the cold season. On the 23rd December, they were removed to the old fort of Sattara,

situated on a hill, in height 4000 feet above the level of the sea, and at a greater distance from their work. All this time they were employed in building a new jail, and marched to it daily at 6 p.m., after a slight meal, and continued at labour till 3 p.m., when they were marched back to the hill, one and a half mile distant, and there obtained their principal meal. "The prisoners were thus exposed," says Morehead, "to greater fatigue in going to and from work, and to greater cold from elevation." The fever and mortality increased; work was intermitted for a time, and the prisoners returned to the old jail on the 15th February, 1859. There were 178 cases of fever, and twenty-four deaths. Slight jaundice was present in sixteen, delirium in five, and epistaxis in two. Of twenty-one fatal cases recorded, all were remittent, with, in some, a commencement as intermittent. Relapses were observed. The jail authorities believed that the fever was contagious, and that newly-received prisoners contracted it on coming into jail. Four prisoners were taken ill while attending the sick. The cases were mostly all a few days under treatment. Six of the fatal cases were under two months' residence; and their ages were, of two 32, and one 35, 48, 65, and 80. *Clinical Researches on Disease in India*, by Charles Morehead, M.D., 1860.

1860. In 1860, epidemics, attended with great mortality, occurred in the jails at Agra, Meerut, Allahabad, Benares, and Ghazeepore, and throughout the length and breadth of the districts in which they were situated. Dr. W. Walker, who has described the epidemic in the Agra jail, showed that the fever was first observed in the neighbourhood of Saugor in Central India about July, 1859.* It did not

* The only account of the Saugor epidemic of 1859, that I have seen, is the "Report on a Species of Malignant Fever, prevailing in Zillah Saugor in 1859," by Captain G. F. S. Brown, Deputy Commissioner of Saugor, in the *Madras Quarterly Journal*, vol. iv., for 1862, p. 423. He states that Dr. Rice called the fever "typhus"; it was preceded by loss of appetite, and pains in the limbs, for three or four days; its duration was two days; it left with a cold sweat, and the patient was in

affect the troops or police to any extent. Dr. Rice, the civil surgeon of Saugor stated that for upwards of a month every third person attacked in the bazaar died, and that many of the villages lost half their inhabitants. From Saugor, Dr. Walker traced the progress of the epidemic eastwards towards the banks of the Ganges, and to the north through the range of country lying between the Ganges and the Jumna.

The epidemic began in the Agra jail about the beginning of March. The strength of the prisoners was 2282; the number of cases 2024; and the number of deaths 299. From Dr. Walker's account, there is not a particle of doubt that the disease was relapsing fever, although he considered it typhus. Dr. Murchison has detailed the points of difference between the disease described by Dr. Walker and typhus,* but he did not perceive its identity with relapsing fever.

In the Ghazepore district, the disease raged with greater intensity amongst the free population than amongst the prisoners in the jail.

1861. In the *Indian Medical Times and Gazette*, for June, 1867, is a short account by James Brown, of an epidemic which devastated a village in the Rawul Pindee district in the year 1861.

a state of perfect exhaustion; and death occurred if he was deprived of care. Affections of the lungs and copious bleedings from the nose were observed. The people feared the fever worse than cholera, and a panic existed in September and October, 1859. The fever was a new disease; the oldest inhabitant had not seen anything like it. Whole families were cut off and villages nearly depopulated. Young and old alike suffered. Death was rapid; sometimes on the day after attack. The epidemic began in June or July, and disappeared in the cold weather. It was most fatal amongst the poor, the ill-fed, and badly-housed; but the higher classes did not escape. The origin of the fever was traced to the states of Bhopal and Scindiah; and travellers stated that for fifty coss to the west, the same disease was prevalent. The harvest of 1859 was abundant at Saugor, and the poor were well off for food. The extent of the mortality at Saugor was 23,000 souls: the prisoners of the jail escaped. Captain Brown thought the disease was contagious.

* Murchison's Treatise on the Continued Fevers of Great Britain. 1862; p. 58.

1864. In the middle of the year, 1864, an epidemic attended with eruption occurred again in Calcutta. Its historian, Dr. S. G. Chuckerbutty, regarded the disease as typhus; but there can be little doubt that it was of the same nature, though graver in degree, as the disease described by Dr. Edward Goodeve in 1853, and by Twining and others before him. The identity is established by the twelve cases briefly narrated by Dr. Chuckerbutty. He considered the disease to be contagious. Three of the cases came from Lall Bazaar, three others from Tirella bazaar, and two cases were husband and wife. Out of the twelve, five died. One of the fatal cases had petechiæ and vibices, in addition to the scarlet eruption. Dr. Chuckerbutty does not mention the occurrence of relapses; these did not happen, or, more probably, were so slight as to have escaped attention. In an article by the same gentleman on the Pathology of Dysentery, is a case of the eruptive fever in which dysentery supervened; the month and year correspond with the epidemic under consideration. Jaundice, enlargement of the liver, hæmorrhage from the bowels, and a moderate relapse, all happened in the progress of the disease, which terminated fatally. See case of Thomas Karr: No. 8 of Dr. Chuckerbutty's Cases of Dysentery, published in No. xix. of the *Indian Annals of Medical Science*, and No. 6 of the Cases in this work.

Dr. Chuckerbutty states that, at the same period an "epidemic fever" was ravaging the villages of Bengal; and he considered it probable that it was of the same character as the Calcutta epidemic, but he had no opportunity of verifying his conjecture. *Indian Annals of Medical Science*, no. xviii.

The emigrant coolies who were shipped from Calcutta for the colonies suffered on board from a fever, which was attended with great mortality, between September, 1864, and September, 1865. Dr. S. B. Partridge believed it to be typhus, and an eruption which accompanied it, he thought, was mistaken for measles. Dr. D. B. Smith, however, considered that the disease might have been relapsing fever, as it was admitted to have been highly contagious, and distinct relapses occurred. *First Report*

of the Sanitary Commissioner for Bengal, 1868, by Dr. D. B. Smith, p. 534.

The "emigrant or ship fever" apparently was not confined to the years 1864 and 1865, but likewise occurred in succeeding years. The editor of the *Indian Medical Times and Gazette*, in the number for December, 1867, comments on the fever in these terms. "One medical officer, writing of the epidemic, speaks of it as one of *pericarditis*, although he admits, in evidence taken before the court of inquiry, that an epidemic of pericarditis is an unheard-of occurrence; others have characterized it according to the intercurrent lesion which occurred; whereas it was, in fact, an epidemic of fever, similar to the jail fevers of Agra, Bareilly, Lahore, Mooltan, Jeypore (so well described by Dr. W. Walker, Gray, and others), and St. Petersburg." It is to be regretted that the histories of the "emigrant cooly fever" and other epidemics are not available to the public, as individuals not in official positions are unable to form a judgment regarding the nature of the epidemic from the events of the disease, but are under the necessity of arriving at an opinion from odd scraps of information, or of accepting a conclusion formed by others. There can, however, be little doubt that the so-called "emigrant fever" was relapsing fever, and that the difficulty of diagnosing it was due to the occurrence of certain complications, which are, in a measure, obsolete or unusual nowadays, but were common in the beginning of the century on board the Indiamen.*

* In collecting facts for this history, I found in vol. ii., for 1861, of the *Madras Quarterly Journal of Medical Science*, page 303, an account of a remarkable epidemic which occurred in the Bellary jail, in 1854, described by Mr. E. W. Eyre. I recognised the disease as relapsing fever, in which the primary disease, fever, had been probably obscure and overlooked. As the account is modern, I do not feel justified, seeing that important symptoms had not been noted, in assigning the epidemic a place in the text; but it will be interesting to refer to it here, in connection with the view taken by the medical officer of one of the emigrant ships, that the disease which prevailed amongst the coolies was pericarditis. I quote Mr. Eyre's account in his own words:—

"This year appeared a singular and fatal disease, a disease of which it might be said, as of angina pectoris, 'we are sure of what it is as an assemblage of symptoms, we are not sure of what it is as a disease.'

In the year 1864, I witnessed the whole course of a circumscribed epidemic which occurred in the 20th Punjab

(Latham.) I shall give a summary of the reports made of it. It was in July that some of the prisoners out of and in hospital complained of swelling in the lower extremities, one or both of the feet, in some extending upward as high as the knees, the swelling being hard, tense, and painful. In other cases the wrists and fore-arms were swollen. In all cases there was puffiness of the face. A spongy state of the gums was found in a few; in most, exsanguinous gums and tongue, a small pulse and feeble action of the heart. The only deviation from normal secretions was a scanty amount of urine, but this was not general. The ages of the affected varied from twenty to sixty. Period of confinement from one month to nineteen years, but the majority had been only a few months incarcerated. They were all natives of the ceded districts. The disease prevailed from July to October, then ceased for a while, but reappeared in November. There were in all twenty-eight cases, of which thirteen ended fatally.

"The subsequent course of the disease was marked by no apparent change till, after a period varying from two to ten days, the patient was found breathing with difficulty; in these signs of effusion into the pericardium was discovered. When dyspnœa set in, death was rapid, in some sudden. In the three cases in which fluid in the pericardium was diagnosed, it was found in large quantity at the examination after death, and, besides, deposit of lymph to a large amount on the reflected portion of the pericardium. In two other fatal cases examined, there were found no morbid products in the heart, only effusion into the abdominal cavity. In the chronic cases a singular appearance presented in patches of black discoloration of the skin, affected with œdema. This occurred in thirteen. What was the disease? It was at first thought it might be beri-beri; further acquaintance with it led me to abandon this view; there was absence of the peculiar gait and numbness of the lower extremities so characteristic of beri-beri. I found a report of this jail for 1833 and 1834 (it is appended to Dr. Malcolm's work on Beri-beri), which describes an epidemic malady that prevailed in those years; and so far as the dropsy, with tendency to fatal termination, is concerned, it appears to have been very similar to the present one. There were then as many as ninety-eight admissions, with fifty-one deaths. The prevalence of strong westerly winds was assigned as the cause; it was a season of drought with consequent scarcity, crime, and overcrowding of the jail. But such causes have been in operation several times between 1834 and 1854, without any appearance of this disease. Dr. Malcolmson doubted that it was beri-beri, and Garrison Surgeon Smith 'did not consider the cases to be examples of that disease.' Dr. Turnbull, the medical officer of the jail at the time, writes, 'Several of the cases resembled, in many of their symptoms, beri-beri, but I rather regard it as pericarditis.'"

The following is one of several illustrations given by Mr. Eyre. "No.

Infantry, in Rawul Pindee. The regiment proceeded from Peshawur on the 12th March, and arrived, *en route* to Rawul Pindee, at Hussun Abdal, on the 18th March. Here the first case was admitted into hospital; and after arrival at Rawul Pindee, other cases continued dropping in for nearly three months. Regarding the diagnosis of the fever, I made the following observation in the Annual Medical Report of the regiment, for the year 1864. "I have returned these cases in the Reports as remittent and intermittent fevers, adhering to the designations laid down in the official nomenclature, and making the partial decline or the complete cessation of the febrile condition, as judged by the skin, the grounds of my diagnosis. I believe, however, that the type of the fever, though returned under two designations, to be essentially the same, and due to the same cause, whatever that may have been; the difference being merely in the degree and intensity of the disease." The cause of the epidemic was involved in obscurity; but it was not improbable that the disease was contracted during visits of farewell made by the soldiers to friends and acquaintances incarcerated in the Peshawur jail, which was in those days an unwholesome place of confinement, or from released prisoners of the Rawul Pindee jail, in which an epidemic was at that time raging. The greater number of the cases were complicated with bronchitis, attended with considerable secretion of mucus, periling the life of the patient from suffocation. Relapses took place after an intermission, varying in duration from four to eight and ten days; jaundice also

1, *æt.* 35, eight months in confinement. While under treatment for slight rheumatic affection, was found to be breathing with difficulty; pulse rapid and small; temperature of surface low. There was clear resonance over the chest, except at the præcordial space, where the dull sound was preternaturally extended, impulse absent, and valvular sounds only heard over the third costal cartilage. He died suddenly in the evening. *Autopsy*. Right lung congested, the left emphysematous. Pericardium distended by twenty-three ounces of serum, deeply tinged with blood. The loose pericardium coated over with layers of lymph, and the reflected also, in form of network. Posteriorly, adhesions between the two pericardial coats. The valves normal." The disease continued through the early part of 1855, but with a less tendency to a fatal result, as out of eighteen cases only five proved fatal.

occurred in several cases. Amongst the fighting men the mortality was not great, only two died. The exact number of cases I have no means of ascertaining, but believe the number attacked was between forty-five and fifty. Two or three instances of the disease occurred in the 2nd Goorkha Regiment, whose lines adjoined the 20th Regiment. There was not much communication between the two regiments, as the men were of different races. Some of the "waiting men" took the disease. Amongst the hospital attendants, numbering twelve, the disease was very fatal. One dooly bearer, one cook, one bhistee, and one mehter, died. One of the native doctors and the hospital havildar, the oldest soldier in the regiment, contracted the disease, but both survived. The cause of the great mortality amongst the hospital establishment was the unwholesome condition of the huts occupied by them, which were low, crowded together, and badly ventilated. The above particulars are taken from the official annual report, of which I have a copy.

In the same year, epidemics occurred in several of the Punjab jails, notably in the Lahore Central jail, where the deaths were 406, and in the Umballa jail. Also in the Agra jail, in March, April, and May of that year. The strength of prisoners was 2400, of whom 1340 were attacked, and 250 died. *Indian Medical Gazette*, for May, 1867. Art. "Remarks on the so-called Contagious Fever of Indian jails, by David B. Smith, M.D."

1865. In the following year, 1865, the jails at Allyghur and Futtehghur, in the North-West Provinces, were attacked. The number of jails in which epidemics occurred is great; a table, constructed from Dr. Bryden's statistical tables, is appended at the close of this history, which will illustrate the fearful destruction of life caused by the disease in Indian jails within the last dozen years.

1866. In the year, 1866, a terrible famine occurred in Orissa: a brief account of it was written by Sub-assistant Surgeon Udoy Chund Dutt. In the hospital at Pooree, sixty-two cases of *febris e fame* were registered. "The

fever was characterized by a slight heat of skin, a quick feeble pulse, brown trembling tongue, and sordes on the teeth. Depression of the nervous system in the shape of wandering delirium, or unwillingness to be disturbed, even for the purpose of being fed, was a characteristic feature. There was no evidence to show that it was of a contagious character, or that it had a tendency to spread amongst the people. Many cases got well under treatment; others were carried off by diarrhœa, or gradually increasing asthenia." Dysentery was very common; "it was not so rapidly fatal, nor so unamenable to treatment, as the diarrhœa complicating death from starvation. With food and medicine, the patients lingered on for a few weeks, or they recovered and got relapses, and were ultimately carried off." From July to December, 1866, 2196 cases of dysentery and diarrhœa were admitted, of whom 651 died. "This, however," says Mr. Dutt, "does not account for the relapses, which were known to be very common."* The account is meagre, and the precise symptoms of the disease have not been stated; but under the circumstances that existed in Orissa the occurrence of relapsing fever was a moral certainty. In the March number of 1869, of the *Indian Medical Times and Gazette*, are four cases of hæmorrhagic flux, narrated by the same gentleman, which occurred in the famine year. These appear to be instances of relapsing fever: Case 1 came under observation apparently during the intermission, and died. Case 2 also died during the intermission. At the *post mortem* examination, "the fluid effused in the abdominal cavity was of a deep yellow colour." Case 3 came under observation in the primary fever probably, and died. Case 4 came under observation during the primary fever, which extended from the 2nd to the 6th March, 1866, and was discharged during the intermission on the 11th March.†

* *Indian Annals of Medical Science*, no. xxiii., for 1868, p. 311.

† Small-pox during the Orissa famine, was of a peculiar character. Mr. Udoy Chund Dutt thus describes it: "During the rains, up to the end of September, 1866, the disease continued to be of a benign type. The eruptions, whether discrete, semi-confluent, or even confluent, came out freely, and comparatively few deaths occurred. From October, the

In the spring of 1866, an epidemic occurred in the Umballa jail: 424 prisoners were attacked, and forty-six died, or eleven per cent. It was described by Mr. R. S. Bateson, whose excellent account will be found in no. xxi., for 1867, of the *Indian Annals of Medical Science*. The disease was introduced into the jail by a gang of thirty prisoners received from the Kurnaul jail, in December, 1865. The latter jail was apparently infected by a gang of seven thieves sent in from an out-lying thana, who brought with them a "bad kind of fever, with jaundice," into the jail. From Mr. Bateson's inquiries, it is clear that the fever existed previously among the free population. One fourth of the cases were jaundiced, and three-fifths suffered a relapse. The contagiousness of the disease was apparent from the fact that every attendant of the sick contracted the fever.

In the same year, 1866, various districts of Lower Bengal suffered from epidemics; but the nature of the disease is not clear from the accounts of the medical officers published in the First Annual Report (1868) of the Sanitary Commissioner for Bengal. The year 1866 was one of famine in Orissa, and of scarcity, more or less felt, in other districts; but it is remarkable that descriptions of relapsing fever are wanting in the medical journals and official reports

disease assumed a malignant character. A large proportion of the cases were of the confluent variety; and many died before the eruptions were fully out on the skin. In the severer and fatal cases, the first symptom, after the forty-eight hours' fever, was intense erysipelatous inflammation of the face and eyes. The eyelids were closed, the tongue swollen, the throat sore, and the voice reduced to a whisper. The next symptom would be a general inflammation of the skin of nearly the whole body advancing from above downwards. Upon this, eruptions, first of a papular character, closely set, would appear. These, instead of being filled with fluid in a day or two, became flattened, and resembled in appearance a scaly eruption, covering the whole body. By this time the inflammation of the face had turned into cellulitis, without any eruptions appearing on it, and the patients died by the fifth or sixth day of the eruption." The number of admissions from July, 1866, to March, 1867, was 297; with 91 deaths. No pustules having been observed in any of this large number of cases naturally raises a doubt as to whether the disease described by Mr. Dutt was small-pox, or the eruptional disease of Twining, Mouat, and Dr. Edward Goodeve.

of the time. The sub-assistant surgeon of Midnapore, recognised no more than three cases of relapsing fever, as stated in p. 406 of the "Sanitary Commissioner's Report." In these, the duration of the primary attack was seven days; the secondary attack occurred on the fourteenth or fifteenth day; a third, fourth, fifth, and even a seventh relapse occurred at intervals of a fortnight. Dr. Bedford Allen states that the endemic fevers of Midnapore, are intermittent quotidian and bilious remittent; and that "hepatitis is a common disease in the station and district; especially that variety known as biliary congestion, and frequently complicated with remittent fever" (p. 406). These extracts indicate that relapsing fever was met with at Midnapore. As the history of epidemics in other parts of India is conclusive on the point that typhus and relapsing fever, and chiefly the latter, have been the prevalent diseases, it is singular that they have not been met with to a larger extent in Bengal. Dr. D. B. Smith, the Sanitary Commissioner, writes (p. 534) that the "epidemic fever" of Lower Bengal, is not relapsing fever: it is a "typical malarious endemic fever, due to local causes, such as want of drainage, partial or complete stagnation of watercourses, and saturation of the soil with moisture. It is not characterized by a relapse, or a crisis; and is not contagious. . . . The study of masses of recorded facts, proves this beyond doubt."*

* In the accounts of epidemics given in Dr. Smith's Report for 1868, the symptoms and course of the fever, are so imperfectly related, that no definite or safe conclusion can be formed regarding the type. Some of these accounts comprise the entire reports on the subject made by civil surgeons. The following are abstracts of a few of these accounts. At Jessore, in 1846, an epidemic occurred, and was reported by the civil surgeon. In the last week of October and the whole of November, 1846, the station and jail were very unhealthy. The amount of fever was perfectly appalling, and the mortality most excessive. In the city of Jessore, with a population of about 6000 people, ten deaths occurred daily. Out of thirty-three European or Eurasian inhabitants, twenty-two were under medical treatment during the month. "The epidemic from which they all suffered, was a very peculiar description of fever, which, in general, commenced as a common quotidian intermittent, but which, after the first few days, from the first to the fifth, assumed a continued type, the remissions or intermissions being scarcely perceptible,

In connection with the epidemic which occurred in Bengal in 1866, it is interesting and important to allude to the epidemic of fever which occurred in the same year in the

and the cold stage being merely a species of transient horripilation and shivering, which only lasted a few minutes, which was followed by great heat of skin. This was only occasionally followed by a cold clammy perspiration" (p. 33). The complications were principally of the head and chest. The disease was attributed to the lateness of the rains, and the drying up of the river Bhyrub. No other epidemic of fever occurred at Jessore up to 1865, in which year there was a great outbreak in all the adjoining districts, which was believed to have originated at Jessore. The epidemic was reported on by Dr. Elliott; but no extracts are given from his report, so that no opinion can be formed regarding the nature of the disease. It appears that the inhabitants consider an outbreak of fever in September, October, and November, of each year a normal occurrence: only exceptional outbreaks, such as those of 1846 and 1865, occasion alarm.

In 1865, the 11th Regiment of Native Infantry lost some 250 men at Pattakowah in the Julpigoree district, and suffered greatly in its march through the Terai. The fever is not described; but simply said to be "malarious." (p. 213, *op. cit.*)

In 1866, "epidemic fever" occurred at Burdwan; the following account of it is derived from the civil surgeon's report, given in page 230 of Dr. Smith's Sanitary Report for 1868. The disease spread from the Hooghly and Nuddea districts to a large number of villages near Mymarree and Culna. The predisposing cause was the famine of 1866; during which the poorer classes suffered very severely; and of these classes the village population is almost entirely composed. The existing cause was a malarious atmospheric wave gradually spreading in a north-west direction, and poisoning every village through which it passed. "It is very difficult," says the reporter, "to assign any other cause for this highly malarious fever." The symptoms are those of malarious fevers generally, but more violent. Death in some cases occurred in three or four days. The most serious circumstances in connection with the fever were the complications, which were congestion and permanent enlargement of the spleen or liver, followed in a few months by dropsy, dysentery, or chronic diarrhœa, all which were past treatment. In the early stage, the brain suffers to a great degree; delirium and coma being common. In both the intermittent and remittent forms, the spleen becomes greatly enlarged in a few hours. The remittent type is succeeded by the intermittent; and recurrence is very common on the breaking up of the monsoon and the greater part of the cold season. The sequelæ are hypertrophied spleen or liver, or both, extreme anæmia, anasarca, ascites, œdema of the lower extremities, glandular enlargements, cancrum oris, and sloughing buboes, dysentery, and chronic diarrhœa. The mortality results more from the sequelæ, months after the primary attack, than from the early attacks of ever. About three-

Mauritius. A report on the Mauritius epidemic will be found in page 442 of the Blue Book, called "Army Medical Department Report, for the Year 1866," vol. viii., by Surgeon-Major John Small, and Assistant Surgeon W. H. T. Power, B.A., 2nd Battalion, 13th Light Infantry. These gentlemen arrived at the conclusion that the epidemic "was entirely of malarious origin, and in every form, they might say, perfectly curable by the administration of quinine in large doses; but that, from the intense character (or amount of malaria), the fever, if untreated, rapidly produced a low and depressed state of system, by which the great mass of deaths were caused. That the 'bilious remittent,' and other such forms, were complications mixed up with the fever, and due, in most cases, to prior attacks of fever, or to long exposure to a powerful malaria; and that such low cases were not seen amongst the soldiers, owing to the fact that they had the advantage of having their attacks treated by full doses of quinine and stimulant treatment of various kinds; consequently it is unnecessary, nay, untrue, to suppose the fever to have been anything more than a malarial fever, whose danger depended chiefly on want of treatment and proper food, unless the absurd proposition is held that it differed in very important particulars, according as it attacked civilians or military" (p. 453). Three forms of "malarial fever" occurred; viz., intermittent, remittent, and continued. Vomiting of the contents of the stomach, and sometimes of bile, occurred in about 33 per cent. of the cases; in 8 per cent. looseness occurred; in 91 per cent. the bowels were regular; and in a very few cases there was marked constipation. Delirium was rare; a cold stage of some sort occurred in most cases.

fourths of a village suffer from the epidemic during an outbreak, and the mortality amounts to six per cent. Quinine is not of much use in the remittent type. The fever is said to be not contagious or infectious. Since 1866, the epidemic has not disappeared. In the Selimabad division of Burdwan, consisting of 123 villages, containing 51,925 persons, 884 deaths occurred from "epidemic fever," or 17 per mille. In the Gangoria division, containing 38 villages with a population of 27,221; the deaths were 1259, or 46·1 per mille. This mortality occurred in three or four months. From the above description, it is difficult to form an opinion regarding the type of the fever.

The "mild malarial continued fever" terminated in a profuse sweat on the third, fourth, or fifth day. Relapses were frequent. No woman or child escaped the fever; the children especially had relapses after relapses, and many died. Dysentery was common. The relapses were attributed to a sudden fall of temperature. The fever was not considered contagious, the proof being:—1st, at Flat Island, none of the whites and blacks there resident contracted the fever during the six weeks that the regiment was there stationed, though they mixed much with the regiment, of course, excepting those who had visited Mauritius during the time of the epidemic; and, 2nd, no sailor on board the *Himalaya* had an attack of the fever during our passage home. One of the medical practitioners in the Mauritius held a contrary opinion, but he was apparently the only one.

Messrs. Small and Power describe "Bombay fever" in these terms: "It merely means a fever especially prevalent amongst coolies who had come from the Bombay Presidency, and that it was, in past years, for the most part confined to them. That this was a malarial fever, occurring in a people who had come from a malarial country, and whose constitutions had been malarialized there; consequently we can suppose a very small amount of malaria (or exposure to a lower temperature than usual) would cause relapse of their old complaint, but which was not sufficient to give fever to those who had never before suffered from the effects of malaria; and it was amongst these malaria-poisoned and others who had had repeated attacks of fever, unchecked by medicine, that the more serious kinds of fever were found, such as much bilious vomiting, yellowness of the skin, etc." (p. 454). In a note, Mr. Small adds that the "Bombay fever" included two distinct fevers, viz., true enteric fever, with the characteristic lesions in Peyen's patches, and ordinary malarial fever; but in many cases of the fever, "the *post mortem* signs of malarial fever" were superadded. Enteric fever likewise occurred amongst the soldiers, and was discriminated from the other form of fever which was considered malarial. Jaundice did not occur in the regiment, except in two instances.

Regarding the existence of "malarial fever," prior to the

great epidemic, it is said: "This is a somewhat difficult point to settle, as what is called 'Bombay fever' in Mauritius (a bilious remittent fever) occurs almost entirely amongst a people who had been subject to malaria in their native land, and, consequently, relapses occurring amongst them might be due to mere effects of fall of temperature and the like. It is, however, certain that occasionally a few cases of genuine intermittent fever occurred in past years in the hot season, but to a very inconsiderable extent; at the same time, from the general non-recognition of true 'enteric fever,' numbers of this fever were put down as 'Bombay fever,' or 'continued fever'; and seeing the mode of life in Indian settlements in Mauritius, it would afford most excellent opportunies for a spread of 'enteric fever' (p. 468).

These gentlemen speak highly of the efficacy of quinine in the treatment of the disease, and attribute the great mortality of "malarial fever" amongst the civil population to the sparing use of the drug. The civil practitioners appear to have withheld the use of quinine, from a belief of its inefficiency (p. 457).

In the same year, 1866, an epidemic occurred in Lahore, and in the large lunatic asylum in that city. Surgeon-Major J. T. C. Ross, Secretary to the Inspector-General, Bengal Medical Department, writes: "Relapsing fever was prevalent in the city during 1866. It obtained an entrance into the asylum, and spread rapidly among the inmates, notwithstanding every effort to keep infected patients apart. The patients, says the Report, were most unamenable to medical treatment, many of them refusing all nourishment from the moment they were attacked; so that as many as 20 per cent. of the total number of inmates perished from the disease. In 1867, quarantine wards were built outside the walls of the asylum for the accommodation of both male and female patients on their first arrival." In 1868, fever again invaded the asylum. It is described by Dr. Smith, the superintendent, as "a type of low fever that assumed an epidemic and contagious form." It prevailed in the months of September, October, and November; and within this period thirty casualties occurred.

The same disease was prevalent in the city and neighbourhood. *General Report on the Lunatic Asylums, etc., in the Bengal Presidency*, 1868. By Surgeon-Major J. T. C. Ross, F.R.C.S., Official Secretary to the Inspector-General of Hospitals, Indian Medical Department (pp. 20, 21).

1867. In 1867, Dr. John Meredith met with cases of continued fever, with jaundice, in Assam. *Indian Medical Gazette for July*, 1867, p. 167.

In the same year, Mr. H. Cookson met with a few cases in the Shahpore jail. On 11th January, 1867, Gul Jehania, a prisoner in the quarantine ward, was found suffering from continued fever. He was moved out of the jail on the same day, and died comatose on the 10th January. He was intensely jaundiced three days before death. On the 4th February, two others, and on the 11th, a third prisoner (young men who had been in quarantine with Gul Jehania) were attacked. These were immediately removed from the jail. On the 25th February, the attendant on these three sick men was attacked. All these three men recovered. Three were jaundiced; two had bleedings from the nose; three had one relapse, and one had two relapses. Gul Jehania had been sentenced on the 7th January, four days before his attack. He was a powerful, well-fed man, from the village of Gerowt, in the Shahpore district. Mr. Cookson ascertained that one case of relapsing fever had occurred in the village in December, 1866, and another early in February, 1867. *Indian Medical Gazette for July*, 1867, p. 103.

1868. From March to June, 1868, Dr. Hugh Clark observed relapsing fever at Buxar and Karuntadhee. His cases, seventeen in number, comprised both sexes, from nine to fifty years of age. The fever ceased generally on the sixth day; after an interval of about a week it abruptly returned, and continued for about four days. Jaundice occurred in four cases, three of which proved fatal. Dr. Clark does not speak favourably of the efficacy of quinine in the disease; and expresses his belief that relapsing fever

is not uncommon in India. *Indian Annals of Medical Science*, no. xxv.

In the months of August, September, October, and November, 1868, an epidemic occurred among the Punjab Muleteers of the army of Abyssinia, on their return to the Punjab. Its historian is Dr. Robert Gray, from whose inquiries it would appear that the disease began at Bombay. (Paragraph 8 of his Report.) A few cases of "fever, complicated with jaundice," occurred in the hospital at Zoula in Abyssinia, and these might have been relapsing fever also. The epidemic broke out on the passage up the Indus from Kotree to Mooltan; and on the arrival of the various detachments at the latter station, where they came under the observation of Dr. Gray, they were stopped and kept in quarantine until the disease completely disappeared. The crews of the river steamers and flats contracted the fever from the muleteers, and several died. Out of a strength of 4160 muleteers, 635 were attacked with relapsing fever. The mortality from this disease alone is not stated; but the total mortality from all diseases at Mooltan was 171, or 4·1 per cent. of the total strength. *A Sketch of the Medical History of the Native Army of Bengal for* 1868. Compiled by Surgeon-Major J. T. C. Ross, F.R.C.S. Appendix, p. xix.

1869. In the year 1869 an epidemic occurred at Roorkee in the corps of Sappers and Miners. It is described by Surgeon Alfred Eteson, who thus writes: "The symptoms were precisely those of jungle or bilious remittent fever in a supposed diluted form. The liver seemed to be the only organ implicated. Owing possibly to the immediate attention and treatment which the sepoys received, there were few head symptoms, although elsewhere I had opportunities for observing that the fever, if unchecked, would rapidly tend to delirium during exacerbation, and subsequently coma. The severe pain in the loins and high-coloured urine were due to the double excretory work thrown on the kidneys, and soon disappeared. I had one or two doubtful cases of subsequent enlarged spleen, but even this cherished organ of ague was practically unhurt.

Headache, irregular pains, lassitude, furred tongue, nausea, and sometimes vomiting, loathing of food, and depression, were all prominent, and pointed to irregular flow and non-secretion of the bile. There never was any difficulty in getting each case under control, but long after the clean tongue, bright eye, and alert step, spoke of restored health; the poison still lurked in the system, and reappeared after an interval generally verging on fourteen days. 128 men were admitted once, 80 twice, 25 three times, and 6 four times." Of an average strength at head-quarters of 363, 239 were attacked. Mr. Eteson believed that the epidemic was not "locally born"; the civil community suffered as well, and the disease is said to have extended to "the limits of Jubbulpore and Rawul Pindee"; the cause, in Mr. Eteson's opinion, was "the reflux tide of easterly winds laden with the pestiferous miasma of the Oudh and Rohilkund Terai." In the early weeks of the epidemic the treatment was purgative and saline; very few cases required anti-periodic remedies. Later in the season the bilious remittent faded into pure intermittent, and antiperiodics were relied on. "The most valuable, undoubtedly, was quinine; but arsenic and sulphate of zinc were likewise most useful." Mr. Eteson regrets that he had not employed quinine more liberally for the object of preventing relapses. The epidemic was considered to be one of ague.

Regarding the diagnosis, Dr. Beatson, the Deputy Inspector-General of Hospitals, remarks, "The type of fever is demonstrated, I think, to have been mild, since only one death occurred between January and October inclusive. It is said to have been purely intermittent, but of this I have much doubt, since biliary derangement was the most prominently marked symptom, and a mere fraction of the cases showed any splenic congestion. Besides, quinine administered early, before the function of the liver was restored, and the bowels had been well acted on, produced no good effect; a highly probable result *a priori*. . . . For four months the fever alluded to above may fairly be said to have been epidemic, embracing all classes and colours. At first the well-housed, well-clothed, and well-nourished European seemed to enjoy an immunity; but later this

exemption disappeared, and all the soldiers, officers, and civil residents at Roorkee suffered just as sorely as the natives. *Medical and Sanitary Report of the Native Army of Bengal*, for 1869, pp. 90–101.

1870. Dr. Alexander Garden describes relapsing fever as raging in the district of Saharunpore at the fall of the years 1869 and 1870, which were years of scarcity. It is the rule, he says, for every member of a family to suffer once, twice, or oftener, during the months of August, September, and October. "The first attacks were mild, commencing with slight rigors, bilious vomiting, headache, white furred tongue, etc. The type is, as a rule, continued, the attack lasting from six to ten days. In some cases there are distinct intermissions. After an irregular interval of from four to fifteen or twenty days, there occurs a relapse. In a large number of cases the interval is four days, and so regular did this appear at one time, that I fancied this might be the law, in fact that it was a regular relapsing fever; but more careful examination showed that, in a large proportion of cases, the interval is from four to twenty-one days. The second attack is more markedly intermittent, and is accompanied with greater prostration of strength, and often ends with an attack of diarrhœa. Vomiting also is a more marked symptom. In a great number of cases there is a third and fourth recurrence of the fever. In these cases dysentery and diarrhœa are more common complications or consequences, with congestion of the internal organs, liver, spleen, lungs, and jaundice. One marked feature is the rapid and so far permanent loss of strength; after the first attack most are incapable of following their usual occupations." The mortality was very great. In the mortuary returns for October, the number of deaths was over 5000 in a population of about 900,000. For some years prior to 1867, the district was almost free from fever; but it had borne a bad name for fever long anterior even to its occupation by the English. *Indian Medical Gazette*, for March, 1867.

Regarding the above epidemic, the following remarks are taken from a review of the "Administration Report of the

North-Western Provinces, 1870," which appeared in the *Indian Observer* of 19th August, 1871. "If the accounts are not exaggerated, and we are sure they are not, these once favourite regions have become simple pest-houses. The whole routine of ordinary life is interrupted by disease. The ripened grain drops for want of hands to gather it. Children, with their little hands, strive to guide the plough, their fever-stricken parents being unable to move. The courts cannot do their work because the suitors and witnesses cannot attend. And if they do attend, it is probably to find the officers themselves incapacitated by sickness. Such was the state of Mozufferghur and Saharunpore last year. Such is probably their condition this year. In the words of the Commissioner of Meerut, 'The people of these districts will die out unless remedies are applied, and at an early date. The physical strength of the living population is decreasing rapidly. Dysentery, chest diseases, every disease to which we are subject, finds an open welcome and its victim; and although I have no sure data, it is a common complaint and notorious, that the generative powers of the male population have deteriorated.'"

The epidemic which occurred in the Peshawur valley in the autumn of 1869, which is described by Mr. H. W. Bellew, under the name of "Peshawur fever," was clearly relapsing fever. It commenced in the middle of October, reached its climax about the end of November, after which it rapidly declined, although it lingered till the end of February or the beginning of March of the following year. After January, few cases occurred in fresh subjects, while relapses were common. Mr. Bellew says that the fever, in its simplest and ordinary form, was intermittent, "but with a very wide range of symptoms"; often it acquired a remittent character, and sometimes appeared to lapse into continued fever. Whole families were prostrated at the same time. In some cases the intermittent type maintained its prominence all through the illness, in others it was hardly traceable, an utter prostration of strength, growing malaise, and progressive deterioration of the blood being the most noticeable symptoms. The remittent type was

asthenic in character, often complicated with hepatic derangement, accompanied by jaundice, and followed by a critical diaphoresis or diarrhœa. Continued fever sometimes replaced intermittent, in which a rapid failing of the vital powers, with usually bilious, sometimes hæmorrhagic, and not unfrequently cerebral lesion, were the common complications. Mr. Bellew endeavours to show that the epidemic was due to marsh miasm; the first step being "an increase of marsh fever in every variety of form and degree of intensity, to be succeeded, perhaps, by epidemics of the bilious remittent or relapsing fever, or of the typhoid or enteric fever. Both these forms of fever," in Mr. Bellew's opinion, "owe their origin, in the first instance, to marsh miasm, modified in its effects by certain conditions of the atmosphere and locality, as well as by the circumstances of life of those exposed to its action." The mortality was very high; about 3000 persons were killed by "the epidemic fever" in the Peshawur valley alone between the months of October and March. Mr. Bellew believes that this figure is under the mark. *Indian Medical Gazette*, for January, 1871.

The epidemics at Roorkee, Saharunpore, and Peshawur, appear to have been episodes of a general epidemic of relapsing fever which overspread the Bengal Presidency in the year 1869. The best accounts, and they are imperfect, are to be found in vol. ii. of the "Medical History of the Bengal Native Army," for the years 1868 and 1869, issued by Mr. J. T. C. Ross, Secretary to the Inspector-General of the Bengal Medical Department. Considerable scarcity, and in some parts of the country actual famine, prevailed in 1869, on account of the failure of rain. The form assumed by the disease was intermittent, but remittent cases likewise occurred. It is to be regretted that medical officers did not recognise the disease; but the three epidemics placed in the text, as well as those referred to in section xiii., clearly show its nature. Dr. Cunningham, the Sanitary Commissioner with the Government of India, in his Review of the Annual Reports of the Local Sanitary Commissioners, for the year 1869, published in the supplement to the *Gazette* of India, July 15th, 1871,

remarks, "Great as was the mortality from cholera and small-pox, the mortality from fever was much greater still." It is extraordinary that not one of the sanitary commissioners recognised the disease, notwithstanding that the presence of its cause, scarcity and famine, was patent. The statistics of mortality from fever in 1869, given by Dr. Cunningham, are a *pilao* of deaths from all the fevers; but as relapsing fever was, without doubt, the most prevalent in the year, the numerical majority of the deaths was due to this disease. The figures are in themselves valuable, as displaying the heavy mortality from febrile diseases amongst the general population. In the North-Western Provinces, 246,838 deaths were caused by fever, or nearly one half of the total mortality for the year. In the Punjab, 272,946 deaths occurred from fever alone, or more than one half of the total mortality. In Oudh there were 87,795 deaths from fever, or 7·8 per thousand of the population. In the Central Provinces, 68,999 deaths from fever, or 39 per cent. of the mortality for the year. In the Madras Presidency, the mortality from fever was 132,346, or 5·3 per thousand of the population, or nearly one third of the whole mortality. From the Bombay Presidency, statistical information was not received; nor was it procurable from the Lower Provinces of Bengal. The meagreness of information of any nature regarding the fever epidemics which have been exceedingly destructive in Lower Bengal during the last decade is most remarkable.

It is highly important to contrast the mortality from fever amongst the general population as above noted, and that amongst the prisoners in the jails, and the native and European armies of the Bengal Presidency, as stated by Ross and Bryden.

In the jails of the Bengal Presidency, the strength, in 1869, amounted to 61,998; the total mortality to 2654; and the deaths from fever to 383, or about one-seventh of the total mortality. Eighty-four of these deaths were due to typhus, which broke out epidemically in the jail at Rawul Pindee in the Punjab.

The strength of the native army in 1869 amounted to 54,469 (Ross), or 40,080 (Bryden): the total mortality to

693 ; the deaths from fever to 147, or nearly one-fifth of the total mortality. The mortality per cent. of deaths to treated of the fever cases was 0·37, and to average strength 0·36 (Ross), or 0·80 (Bryden).

The strength of the European army in 1869 amounted to 34,624; the total mortality to 1485 ; and the deaths from fever to 163, or the ninth part of the total mortality. Typhoid fever was probably the main cause of death.

The early publication (in November) of the Medical and Sanitary Report of the Native Army of Bengal, for the year 1870, by Dr. Kenneth McLeod, the Officiating Secretary to the Inspector-General of Hospitals, has enabled me to add a few particulars regarding the occurrence of relapsing fever amongst the native troops in that year.

It appears from the special report on the "Peshawur Fever of 1870," by Dr. Morton, Deputy Inspector-General of Hospitals, that an impression was abroad that fever "of perhaps some peculiar type" had been prevailing to an unusual extent at Peshawur, and that the Punjab Government had called for a report regarding it. The peculiarities of the fever are said, by Dr. Morton, to have been a tendency to pneumonic and dysenteric complications of an asthenic typhoid character, an obstinate persistency of recurrence, and great prostration. The distinctly intermittent fever had a tendency, later in the season, to assume symptoms of a remittent or continued character. Dr. Morton states that the fever was of the same character as the usual "endemic fever of Peshawur, which rages with greater or less severity every autumn and in the early months of each cold season." All the native regiments stationed at Peshawur suffered more or less, but the camp-followers were the chief sufferers. Dr. Morton says : "In the station hospitals, which are resorted to by the cahars and camp-followers of the commissariat and other public establishments,—just that class of the community who, as a rule, are underfed and scantily clothed,—the ravages of the fever have been excessively great. In the month of November nine died, and thirty-three in December. The mortality in the present month was still continuing very high. Eleven had died up to the time of my visit on the

13th of the month (probably January, 1871). Here the fatal cases almost invariably showed, more or less, the symptoms of the typho-pneumonic complication."

Amongst the native troops, the 15th Regiment suffered the most. The regiment had continued healthy until the beginning of September, when fever began, and increased so rapidly, that by the end of the month 395 men were reported as the number of sick in hospital, besides forty convalescents. At least half of the men attacked with fever, suffered also from enlargement of the spleen; and a great many cases were further complicated by other grave diseases, such as jaundice, dysentery, diarrhœa, and, later in the season, pneumonia of a low, typhoid character. Some of the cases were attended with watery purging and vomiting, cold skin, loss of pulse, and collapse as deep as that of cholera. In other cases, rapid head symptoms supervened, and three men died from "sudden effusion on the brain and medulla." In some cases the cornea ulcerated, the surface appearing to melt away. The cases complicated with typho-pneumonia proved fatal. In the four final months of the year, out of an average strength of 587 fighting men, there were 519 cases of fever of the above description. The number of deaths was nineteen, chiefly due to fever, but some to other diseases said to be "mostly splenitis."

The epidemic in the 36th Regiment N.I., also stationed at Peshawur, is thus described by Dr. Downie, the medical officer. "Of 1511 cases of ague and remittent fever (of which two became continued), five died, or ·33 per cent. to treated. In many of the cases of ague, severe and copious bilious vomiting, and, in not a few, jaundice, was a prominent symptom. In the earlier part of the sickly season, the hot stage was the best marked, the cold least, and the heat of the skin was often ardent. Later, the cold was more developed, and in some was followed by little or no reactive stage. Others had associated with the fever dysentery; and the latter appeared to be very closely allied to the former, and to be caused by a kindred poison, if not a different effect of the same. Œdema of the extremities occurred in a few cases, and appeared to be the result of

impoverishment of the blood by the ague poison. Splenic enlargement, except of a very temporary character, was not met with in a large proportion of cases" (p. 218).

In the same year an epidemic occurred in the corps of Guides, stationed at Murdan in Eusufzai. At the close of August there was a perceptible increase of fever; but in the beginning of October, the disease assumed "formidable proportions." Mr. J. R. Johnson, the medical officer, thus writes: "The type of disease was almost invariably mild. Of 462 cases, 374 were quotidian, eighty tertian, and six remittent, fever. As a rule, the attacks generally yielded to a purgative, followed by a few doses of quinine; but they were frequently followed by great prostration and physical debility; and in many cases agueish seizures recurred at intervals, varying from five to ten days, and convalescence was tedious and protracted. The most frequent complications were congestions and enlargement of the spleen and liver; dysentery and diarrhœa supervened in a few cases, and in a still smaller number of cases the respiratory organs were affected." Mr. Johnson further remarks: "The civil community in the district suffered to much the same extent as the military in cantonments. Few houses or families were exempt from one or more seizures; but while some slight mortality attended the disease in the neighbouring villages, not a single death occurred in the regiment from the 1st of July up to the present time (24th December). The very slight mortality in the district, and total absence of deaths in the regiment, are facts of some importance; and, taken in connection with other circumstances, tend to prove the purely malarious nature of the outbreak." Like Mr. Johnson, all the medical officers of the Peshawur garrison, while directing attention to the existence of dearness of provisions, and the under-feeding of the native soldiers, attributed the epidemic of fever in that station to malaria.

In the large station of Mecan Meer, likewise, an epidemic occurred in 1870, which was apparently a continuation of that of the previous year. Dr. Mantell, of the 9th Bengal Cavalry, states that, at the beginning of the year, the regiment was still suffering from epidemic intermittent fever,

contracted during the latter months of 1869. The disease gradually abated with the approach of milder weather, but the ill effects were manifest for a long time. Many constitutions were considerably enfeebled by repeated attacks; and the dearness of provisions naturally assisted in keeping up the ill effects of the fever, by preventing the men from obtaining that amount and quality of sustenance which is necessary for the maintenance of health." In the 35th Regiment N.I., at Meean Meer, the disease, which assumed the intermittent form, caused much mortality. In January and February, nineteen deaths were due to ague. A fatal complication was pneumonia, or pleuro-pneumonia, which appears to have been as common in the Meean Meer epidemic as at Peshawur. Mr. Birch, the medical officer of the regiment, appears to have doubted that the epidemic was one of relapsing fever. He says, "I believe the Punjab fever of last year (1869–70) has been termed 'bilious remittent or relapsing,' but its nature has hardly been determined to the satisfaction of the unbiassed; and I would ask, How many, who held the doctrine implied by the name 'relapsing,' attempted to combat the disease without the free exhibition of quinine? However, be that as it may, I do not think I am by any means exceptional when I say that I have seen this same form of fever, though in an immensely less degree, every year since I have been in the Punjab." Mr. Birch apparently had no doubt that relapsing fever prevailed amongst the civil community. Speaking of the characteristics of the year 1870, he writes: "The year was characterized by fever of a relapsing type (formerly termed 'autumnal') during January and February amongst the civil population: scarcity and dearness of provisions during the earlier months of the year, an unusually mild summer, a plentiful rainfall, an abundant harvest, and an absence of any epidemic or unusual sickness amongst the civil population during the winter and autumn months, 1870–71" (p. 282).

Mr. G. V. Currie, of the 10th Bengal Cavalry, stationed at Sealkote, met with some cases of relapsing fever in that regiment. He says, "In a few of the cases there was functional derangement of the liver and constipation, fol-

lowed by debility. The conjunctiva in these cases was tinged with yellow; vessels injected; and frontal headache was also complained of. Also uneasiness and weight about the region of the stomach and liver; stools dark-coloured and offensive; urine very high coloured, pulse quick, great restlessness," etc. In one or two of these cases relapses occurred.

At Roorkee, also, an epidemic of relapsing fever occurred amongst the Sappers and Miners, but it was milder than that of the previous year. Eteson speaks of the epidemic in this wise, applying Bryden's phraseology and views regarding cholera to "ague." "From a review of all the cases, I am inclined to believe that the disease was, to some extent, a reproduction of the ague as it appeared in epidemic form last year, modified perhaps by the second year of its existence, and weakened for its revitalization in Roorkee itself,—a district for a fresh invasion from the fever-producing tracts of the Terai, east and north," distant a few hundreds of miles. In the head-quarters of the Sappers and Miners, stationed at Chuckrata, ague was the most prevalent disease. The disease is described as also very prevalent over a very extensive hill region around Chuckrata, affecting people living at from 5000 to 7000 feet above the sea-level, and producing anæmia and general debility, though splenitic complication was exceptional. The writer of the report, Surgeon-Major J. P. Walker, M.D., thus accounts for the disease in this elevated region: "As the disease increases in prevalence and intensity as the valleys of the Umlawah and Koolnoo rivers are approached, it is possible that malarial influences generated there are wafted into the higher regions with the same facility and speed that clouds, formed in the valleys during the rainy season, are transported to the mountain-tops" (p. 153).

Minor epidemics of relapsing fever occurred in 1870 in the 10th Regiment N.I., at Cawnpore; in the 15*th* Regiment Madras N.I., at Banda; in the 8th Regiment N.I., at Meerut; and in a few others. The disease was less prevalent, in the year 1870, in the Bengal army, than in the preceding year.

Jails of the Bengal Presidency 1859–1869.

Table showing the deaths from Contagious Fevers, chiefly of the Yellow Relapsing Type, which have occurred in the more important outbreaks between 1859–1869.

Jails.	Approximative strength of prisoners.	Date of Outbreak.	Number of deaths from fever.
Budaon	285	March, 1859.	54
Agra	1911	End of 1859	243
Meerut	2096	November, 1859	231
Lucknow	663	November, 1859	152
Alipore	—	March, 1860	28
Allahabad	1595	January, 1860	109
Mynpoorie	159	April, 1860	11
Meerut	2189	April, 1861	481
Allyghur	336	May, 1861	105
Umballa	704	July, 1861	235
Thanesur	477	August, 1861	43
Loodianah	—	November, 1861	89
Jullundur	618	August, 1861	147
Agra	2494	February, 1861	23
Agra	2209	October, 1861	55
Agra	2158	Jan. 1863, continued from Dec. 1862.	469
Allyghur	246	September, 1862	46
Bareilly	1768	March, 1862	375
Budaon	253	October, 1862	22
Mutra	184	January, 1863	15
Lahore	2027	February, 1863	335
Mooltan	653	December, 1863	58
Sealkote	220	March, 1863	17
Umballa	866	May, 1864	123
Goojranwalla	330	January, 1864	26
Umritsur	554	May, 1864	78
Futtehghur	404	January, 1864	54
Cawnpore	279	January, 1864	12
Seetapore	779	January, 1864	11
Delhi	299	February, 1864.	22
Rawul Pindee	763	January, 1864	29
Lahore	1964	End of 1864.	70
Goojerat	259	February, 1865	17
Peshawur	358	February, 1865	34
Sirsa	257	February, 1865	15
Bareilly	1697	February, 1865	61
Gondah	951	October, 1865	55
Sultanpore (Oude)	227	March, 1865	38
Jubbulpore	407	February, 1865	36
Nagpore	790	January, 1865	66
Lucknow	2619	November, 1865	232
Baraich	158	February, 1866	19
Allahabad	2403	February, 1866	36
Umballa	698	March, 1866.	40
Gondah	836	October, 1867	105

SECTION IV.

Geographical Distribution.

Relapsing fever has been met with throughout the peninsula of India, in every presidency and province. In the years 1810, '11 and '12, the districts of Madura, Dindigul, Coimbatore, and Tinnevelly, of the Madras Presidency, were ravaged by one of the most terrible epidemics on record. The disease reappeared in the same districts in a more virulent form in 1816. It has likewise occurred on the Malabar coast at Mangalore, and in the inland region of Goomsur. In the Bombay Presidency it has been observed at the metropolis, in Scinde, and in several inland districts. In the Bengal Presidency, it has been met with at various times at Calcutta and Peshawur, and in the intermediate tract of country. In the hilly province of Coorg, likewise, one epidemic at its chief station, Mercara, is on record. Having occurred throughout this vast territory, with its varied climates and local characters, relapsing fever is truly cosmopolitan, and independent of regional peculiarities.

Epidemics have also been recorded in Afghanistan, in the neighbouring province of Burmah, in the Mauritius, and at Aden.

I am not aware that the disease has been observed in Ceylon.

SECTION V.

Description of Symptoms.

A. Clinical Description.

The patient, while apparently quite well, or slightly indisposed, suddenly has an attack of shivering, accompanied by vomiting of bilious matter, giddiness, and headache, or severe muscular pains in the back or limbs. There is also some prostration of strength, and he is generally obliged to

take to his bed. The shivering might, however, be absent at the onset, and it might recur or not in the course of the illness. The fever, which might be intermittent, remittent, or continued, or partly intermittent and partly remittent or continued, sets in usually with considerable force; and the headache and other distressing symptoms increase. The pulse rises; is always over 100, but generally reaches 120, and occasionally becomes even more rapid; it is full, bounding, firm, or compressible. The tongue might be white and moist; but it soon becomes in the severe cases, dry, more or less brown, and even black. Thirst, more or less considerable, is experienced, and the throat might become dry. The appetite is generally bad, but the patient will not usually refuse food, and occasionally the desire for food is very great. In many cases, there is more or less pain at the epigastrium and at one or both hypochondria; and the liver or spleen, or both, might be felt enlarged. Giddiness, nausea, and vomiting are at times felt, and cause much distress. The matters vomited are often bilious. The urine is high-coloured, and, in the jaundiced cases, contains bile. The headache continues to be more or less severe, and the pains of the back and limbs are often very annoying; sometimes they are felt only occasionally in different parts of the body, but in other instances they are not complained of at all. Sleeplessness is almost invariably a most distressing symptom. The intellect is usually clear; but in some instances delirium, or more or less confusion of mind, is observed. Generally there is no characteristic eruption; but a scarlet eruption, disappearing on pressure, might occur on the second or third day, and remain until the fever subsides, or sometimes it might vanish earlier. The eruption might occur in all, or the majority of, the cases in an epidemic. In rare instances large watery vesicles appear in various parts of the body. In a proportion of the cases jaundice usually occurs; but this symptom is rarely observed in association with the scarlet eruption.

The fever ceases on the fifth or seventh day, generally abruptly, and there is a corresponding cessation or a marked mitigation of all the other symptoms. The skin becomes cool, soft, and moist; the pulse falls rapidly, but sometimes

gradually, to the normal standard. The patient declares himself very much better. The fever may terminate without any marked crisis; but not unfrequently profuse perspiration occurs at this period, or diarrhœa. Perspiration might also occur during the course of the fever; but it is rarely or never so profuse. Diarrhœa might also set in during the fever; but it is generally absent, and the bowels are usually costive or moved naturally. The flow of urine is also sometimes observed to be copious towards the conclusion of the fever. Bleeding from the nose or bowels might also occur at this time.

On the departure of the fever, the patient begins to mend; he recovers his appetite, gains strength, leaves his bed, and might even return to his usual occupation after a few days. More often, however, this period is marked by weakness, occasional pains in various parts of the body, and other inconveniences; and the patient feels himself an invalid, and unfit for work. After from two to fourteen days, the fever returns, but is generally milder, though in some instances it might be more severe than the primary attack. The relapse might be intermittent, remittent, or continued; and it seldom persists longer than four or five days. Not unfrequently there is no relapse, or it might be very moderate and hardly noticeable. Occasionally there is a second relapse; and sometimes repeated relapses, even to the seventh time, occur in succession.

After the relapse, permanent convalescence usually sets in. It is always tedious, and might be interrupted and protracted by some complication, or by subsequent relapses, as already stated. Complications might also occur during the primary fever, or in the period following it before the relapse.

The disease might take an unfavourable course in some instances. Great prostration and sinking might come on suddenly, and terminate the patient's life. At other times, death might occur from suppression of urine, with delirium, coma, and even convulsions. In some epidemics, an attack of violent vomiting, with purging of rice-water stools, followed by collapse, resembling that of cholera, might happen, and put an end to life.

B. Analysis of Principal Symptoms.

In the following amplified account of the symptoms of relapsing fever, care has been taken to point out what appear to be the main differences in the disease as it occurs in Europe, according to Murchison's descriptions, summaries of which are given, and as it has been observed in India. Such differences are not numerous, and they might in part be attributed to the influences of climate, and in part to the variation in habits, diet, and to the generally unfavourable circumstances of the people of this country. It might likewise be fairly asserted that some of these seeming differences are due merely to deficiency or looseness of observation, and to the general conciseness of the accounts of epidemics by Indian writers, by whom various particulars, fully entered into by European writers, have been omitted, as not being absolutely necessary to convey an idea of the nature of the disease.

1. *Perspiration.*—Profuse perspirations, sometimes in the course of the fever, and generally at the termination, form one of the most characteristic features of the disease in Europe. I have not, however, observed them as remarkable, either in the Punjab, or in the few cases that have come under my notice in Calcutta. Perspiration was observed by Twining in the epidemic of 1824, and he remarks that its occurrence was attended with relief. McDonell states that in the Kimedy epidemic of 1833, perspirations generally terminated the fever; and they also occurred, sometimes profusely, in the course of the attack. In the Bareilly epidemic of 1837, perspiration seldom or never occurred. In general, the writers are silent on the subject of perspiration, with the exception of a few. Edward Goodeve has noted copious perspiration, and Gray sometimes general perspiration. The latter observer and Dr. Bateson agree in stating that perspiration often terminated the fever.

The "choleroid or sweating disease of India," described by Dr. John Murray, of the Bengal Horse Artillery, in page 45 of Allan Webb's work, called "Pathologica Indica," is probably relapsing fever. Dr. Murray says that many

of the cases bore a resemblance to remittent fever, and that relapses or recurrence of it, in some instances at regular intervals, took place. There was a periodic return of the symptoms. Allan Webb, in a foot-note, points out that Dr. John Kaye, or Caius, described the sweating disease of Europe as "a contagious pestilential fever of one day."

2. The *pulse* in most cases exceeds 100, and it might even rise to 140 or 150; but the average might be set down as 120. The pulse may attain this great rapidity on the second or third day of the disease, and in itself the symptom is not indicative of danger. At the period of crisis, the pulse falls with equally remarkable rapidity: from 140, for instance, in a few hours it may sink to 60. During the intermission, in many cases it is singularly low, not exceeding 45 or 50; and on the supervention of the relapse, it may rise to 120, or upwards, in an equally short space of time to that in which it had previously fallen. It is often full and bounding, and usually of better strength than in typhus; rarely intermittent or irregular, except towards the close of fatal cases. After the cessation of the paroxysms, the pulse is always weak.

Precise observations on the pulse in the different stages of the disease are wanting in this country. Its early rapidity was noted by Guthrie, who states that at first it was 140 or 150, or too quick to be counted, generally weak, soft, and compressible. Twining states that it ranged from 100 to 140, and Edward Goodeve that it exceeded 100, but was sometimes lower. Others have alluded to the pulse in general terms. Inglis describes it as quick, small, and contracted; Bateson, as always quick and small, even with a cool skin, falling immediately after the critical sweating or diarrhœa; Gray states that the pulse is quick, and either small or full; and Hugh Clark, that during the intermission it is full, but might be irregular and sometimes very slow. According to McDonell, the pulse was full and above the natural standard even during the intervals of freedom from fever; and he adds that, as long as the fulness remained, the individual was never safe from a relapse.

3. The *tongue* is usually from the first covered with a white, yellowish, or brownish fur, of varying thickness, but

the tip and edges are occasionally redder than natural. In mild cases the tongue is natural throughout, or covered with merely a film of fur; in rare cases it is red and glazed though moist. In the majority of cases it is moist throughout the attack; but in others, about the third or fourth day it presents a dry brown streak along the centre; or it becomes dry all over; or, in rare instances, dry, brown, and thickly crusted. The latter appearance is only seen in very severe or fatal cases.

Of 200 cases, in which the appearances of the tongue were noted by Douglas, in 119 it was moist throughout; and in 81 more or less dry. Of the cases in which the tongue was partially dry, 7 per cent. died; and of the cases where the tongue was dry all over, with or without crust, death occurred in 16 per cent.

Sordes occasionally collect on the teeth and lips, but they are much rarer than in typhus.

The above account, contrasted with the descriptions by Indian observers, clearly shows the greater intensity of the disease in most epidemics in this country. Few of the writers apparently had seen the tongue natural throughout the attack. In the milder epidemics, as, for instance, in the eruptive fever of 1824, the tongue was coated with a dirty white fur or white paste; in the epidemics of greater severity, the tongue was generally foul, white, and loaded; dry, encrusted with a thick coating of fur of various colours, from white, light shades of brown, grey, and yellow, to black, generally with a red tip and edges. The blackening of the tongue I observed in several cases in the epidemic in the 20th Regiment, accompanied with an extreme dryness of the mouth generally and of the throat, to the extent of preventing the patient from speaking at all until water was given. Hunter noted the occurrence of the dry, black, and hard tongue in the epidemic on board two of the Indiamen, the *Lucy Maria* and *Marian*; Guthrie observed it in the Bareilly epidemic, Beattie in the Allahabad epidemic, and Lyell in Eusufzai. The dryness of the tongue is dwelt upon by many of the writers. It is represented as very great, causing stiffness, fissuring or chipping of the surface of the organ, and inability to protrude it.

Sordes, as might be expected in the severer disease met with in this country, is not uncommon, and is mentioned by several writers as covering the teeth and lips in bad cases.

4. The *appetite* is generally lost during the existence of fever, but returns on its final cessation, and is then as sharp as in the case of the specific fevers generally. There is one feature in connection with this symptom which has never been observed in other forms of fever—viz., an inordinate desire or craving for food during the whole course of the disease. In the Bareilly epidemic, described by Guthrie, it would appear that this peculiarity was very marked, and the cries for food by the prisoners were quite piteous. Bateson also noted that as soon as the crisis came on an unbounded ravenous appetite was the rule; and some other observers of epidemics in jails have made similar observations. I have never, however, met with cases in which the appetite was retained during the primary fever, or subsequently exceeded the sharpness that is usual after fevers. Murchison notes prominently the peculiarity above stated as having been observed both in England in Ireland.

5. As in fever generally, *thirst* is a prominent symptom, and rarely absent. In the epidemic in the 20th Regiment it was very intense, and accompanied with extreme dryness of the throat, amounting to a painful sensation in the fauces. Most of the writers have noted the existence of more or less insatiable and persistent thirst. In some epidemics, however, it has not been a marked feature. Twining states that the thirst was not in proportion to the other symptoms; and in the Umballa epidemic of 1866, Bateson says that there was not much complaint made of thirst.

6. *Nausea* and *vomiting* are common symptoms. They are most frequently seen at the beginning of the attack, but may recur at any subsequent period; and in some cases they persist throughout the primary fever, and may return in the relapse. Nausea alone is more frequent than vomiting; and the latter symptom in some epidemics occurs only as a rare event. Thus, in the Goomsur epidemic, McDonell remarks that irritability of the stomach was not often observed; but in the case of a young officer it was very

distressing. At Mangalore, Lawrence says that vomiting was rare, though nausea was common; Hugh Clark also seldom observed this symptom. With regard to the vomited matters, they consist of green bilious fluid, or simply of the contents of the stomach. Mr. Stevenson, of Arracan, is the only author who has noted the occurrence of black vomit, and he took this symptom as forming one item in the analogy which he perceived between the fever which he described and the Bulam fever of Mr. Pym. The passage is quoted in the history for the year 1825. Bateson makes a special remark that he never observed black vomit in the 424 cases which came under his notice.

In the Scotch epidemic of 1843, Rose-Cormack and Wardell met with several unequivocal examples of black vomit in Edinburgh; and Craigie saw two or three cases. The symptom was observed in the very worst cases, and was regarded as an almost fatal sign. No other practitioner in Scotland met with it but Dr. Arrott, of Dundee, who described it as "very common;" but as he lost only seven out of 672 patients, the occurrence of true black vomit—that is, of blood extravasated from the capillaries of the stomach, and blackened by the acid secretions—is doubtful in these cases; and, in fact, Murchison remarks that in only one of Dr. Arrott's seven fatal cases does there seem to have been black vomiting. Regarding Stevenson's cases, there can be hardly any doubt: of the six cases, which appear to be the whole number which he met with in Arracan, four died; and further, he notes the simultaneous occurrence of hæmorrhage from other parts of the body, the nose, mouth, and ears. So far his account is consistent and credible. In the Hydrabad epidemic of 1843, Carter found that the fever frequently began with vomiting of blood.

7. *Meteorism* and *gurgling*, on pressing the abdomen, are sometimes observed; generally in cases complicated with much diarrhœa. I met with these symptoms in a few instances in the epidemic in the 20th Regiment; Hunter alludes to swelling of the stomach as having occurred on board the *Mornington;* Guthrie says the abdomen was tumid in protracted cases; and Maxwell, that gurgling was frequently elicited by pressing the abdomen, in the

epidemic in the jail at Dera Ghazee Khan in 1855, in which diarrhœa was general.

Abdominal pain and tenderness are very often observed in some one or more parts; but only in exceptional cases are they of a severe character. Hunter noted pain in the bowels and in the region of the stomach, with hardness and fulness of the painful parts, on board the *Mornington;* Spencer states that pain was not admitted by the sick, but much pressure could not be borne on the epigastre; Guthrie remarked that in the protracted stages of the disease there was painful tension in the epigastric and hepatic regions, and the abdomen was hard, tumid, and sore on pressure; Beattie, Lyell, Farquhar, Hugh Clark, and Gray, have all observed tenderness of the epigastrium and upper portion of the abdomen. Tenderness of the hypochondrium is far more common on the right side, over the liver, than on the left side over the spleen; so much so that in the earlier stages of an epidemic it might be taken as an aid in diagnosis. Gray, who had the advantage of observing at least three epidemics, remarks that a quick pulse, from 120 to 140, and the general existence of pain in the region of the liver demand attention as assisting in the diagnosis. Sometimes pain and tenderness occur simultaneously in both hypochondria, sometimes on right or left side only, and sometimes in neither. Besides pain and tenderness, some authors have noticed a sensation of burning or heat, more or less severe, referred sometimes to the abdomen, but more commonly to the stomach. McDonell and MacNab especially speak of this symptom. Hunter and Edward Goodeve mention pain in the bowels and griping, with looseness; the latter author likewise met with some cases in which colic occurred for two or three days. In examples complicated with dysentery, pain in the iliac regions is naturally to be expected, as was noted by Lyell in the Eusufzai epidemic; but when dysentery does not exist in the course of the disease, pain is not usually felt in these parts; its occurrence might thus, in fact, be considered diagnostic of dysentery in most cases.

8. *Enlargement of the liver and spleen.*—In the disease as it occurs in Europe, the spleen often becomes enlarged, in

some instances without pain or tenderness. Occasionally it attains to a great size, and can be felt projecting several inches below the lower margin of the left ribs, and it may cause a visible bulging of the abdominal wall. The enlargement may occur during the paroxysms, or after they have ceased; in the latter case, it has been noticed to be ushered in and accompanied by a symptomatic fever of its own, distinct from the primary fever, in that it yields speedily to the local remedies directed against the spleen, and in subsiding as the swelling disappears. When the enlargement occurs during a paroxysm, it does not necessarily subside with the crisis, but may continue throughout the intermission, though it often disappears spontaneously and rapidly after the crisis. Enlargement of the liver also occurs, but is less common and extensive than that of the spleen.

Murchison's account of the enlargement of the liver and spleen does not apparently correspond in every particular with the condition of these organs in the disease as it has been observed in this country. In the terrible epidemic in the Bareilly jail in 1837, Guthrie seldom or never saw the spleen affected. In the epidemic in the Umballa jail in 1866, Bateson states that the spleen never became enlarged. In the Roorkee epidemic of 1869, Eteson observes: "I had one or two doubtful cases of subsequent enlarged spleen, but this cherished organ of ague was practically unhurt;"—a statement which is remarkable, as Eteson regarded the epidemic as ague or "malarious fever," and attributed its origin to "febriferous miasmata," blown into Roorkee from the jungles of Oude. Indian writers do not prominently bring to notice the enlargement of the spleen in the disease. In the Goomsur epidemic, Eyre observed enlargement of spleen during the relapses of the intermittent fever. In the epidemic in the 20th Regiment in 1864, a few instances of moderate enlargement were noticed. Of the seventeen cases of relapsing fever observed by Hugh Clark, seven had enlargement of the spleen. Others likewise allude to the circumstance, but have not remarked considerable increase of size. The proportion of cases in which the liver was enlarged appears, in several epidemics, to have preponderated, while the increase in size of the organ in some

instances has been so great as to have attracted special attention. The greater frequency of pain in the right than in the left hypochondrium has been already alluded to. The majority of the writers refer to affection of the liver in various terms, as bilious type, bilious complication, hepatic complication, hepatitis, or inflammation of the liver; while some make no mention of the spleen, and the omission is noticeable because the writers regarded the disease as "malarious." Single instances of very great enlargement of the liver are given by Hunter and Eyre. Bateson states that in the Umballa epidemic the liver was tender and constantly enlarged. I met with one instance in which the liver increased to a great size with little pain, while there was no appreciable enlargement of the spleen. In six of Hugh Clark's seventeen cases the liver became enlarged Gray and other writers refer to the enlargement of these organs without further special remark. Beattie is the only observer who has mentioned the occurrence of inflammation of the spleen. In the epidemics at Saharunpore and Peshawur, Garden and Bellew found enlargement of the spleen not uncommon. In the remittent fever of the Bengal rainy season of Twining, which is the relapsing fever of modern pathologists, enlargement of the spleen was constantly met with.

9. *Constipation.*—As a broad rule, the bowels are constipated. Occasionally constipation is universal in an epidemic; as for example, Farquhar says was the case in the epidemic in Eusufzai, in 1853; instances occurred in which the bowels were obstinately constipated for seven and even fourteen days. In most epidemics, however, cases of diarrhœa, more or less numerous, and occurring early in the course of the attack, were met with. Very often diarrhœa was set up by aperient or purgative medicines given for the relief of constipation. A few writers speak of the condition of the bowels as being neither torpid nor lax, but as easily and often spontaneously moved. In some epidemics, diarrhœa appears to have been a prominent feature, as it sometimes is in individual examples of the disease. In the Eusufzai epidemic of 1852, Lyell says there was a tendency to diarrhœa; and in the epidemic in the jail at Dera Ghazee

Khan in 1855, diarrhœa set in on the fourth or fifth day of the fever, sometimes earlier in bad cases.

The stools may be of the natural colour and consistence: aperients, however, are generally administered, so that the stools have rarely been observed to retain the natural appearance. Generally they are of a dark brown colour, dark green, or black as ink, offensive, soft, or liquid; the colour eventually changes to yellow. The diarrhœa which spontaneously occurs towards the termination of the primary fever, I have observed in some instances to have been very profuse, liquid, and bright yellow; and their occurrence preceded by a soft and relaxed condition of the abdominal walls, or tympanitis and gurgling. In two instances I have noticed a deficiency of colour in the stools on some days; and in another instance, the stools were white and formed, and continued so for many days, the consistence only becoming changed after aperient medicine. See the cases of A——d, H——e, and H——ton amongst the illustrations. At times, in the beginning, during the course, or at the conclusion, of the primary fever, violent purging, occasionally with vomiting, occurs, and produces collapse and a condition resembling cholera. In these cases the stools are destitute of colour, and are not distinguishable from the rice-water stools of cholera. In the Peshawur epidemics of 1869 and 1870, these symptoms were often observed by Bellew.

10. *Jaundice*, according to Murchison, is a symptom noticed by almost all writers on relapsing fever. In the Edinburgh epidemic of 1817–18, it was observed by Welsh to have occurred in 24 of 743 cases (or 1 in $30\frac{2}{2}\frac{3}{4}$); this estimate was probably under the mark, as regards relapsing fever, as it included a few cases of typhus. In the Scotch epidemic of 1843, the average proportion of cases in which jaundice occurred, was 1 in 4·84. The symptom was more frequently met with by some observers than by others; thus Wardell, at Edinburgh, met with it in 78 of 955 cases, or in 1 of 12·24; while D. Smith, at Glasgow, found it in 384 of 1000 cases, or in 1 of 2·6. In the epidemic at Edinburgh, in 1847–48, jaundice was less common. Paterson noticed it in 4 only of 141 cases; but at the same time, in London, Jenner met with it in nearly one-

fourth of his cases. It would thus appear that jaundice varies greatly in frequency at different times and places. It rarely appears before the third, fourth, or fifth day of the primary fever; it may occur during the first paroxysm only, or in the relapse only; and in rare cases it is seen in both, and does not disappear in the interval. As a rule, it does not last more than a few days. Most observers have agreed in making jaundice a formidable symptom in relapsing fever; but on the other hand it is met with in a large number of cases, in which it is unattended by dangerous symptoms.

Jaundice has been very generally met with in the relapsing fever of this country. Hunter repeatedly mentions yellowness of the eyes as having been observed on board the Indiamen; Stevenson and Bernard met with it in Arracan in 1825; MacNab in Mainpuri, and Spencer in Moradabad, in 1836; and a host of later observers in subsequent epidemics. Its frequency has been variable: Shirreff saw it in one-half of his cases; Farquhar speaks of it as constituting a principal feature of the disease; one-fourth of Bateson's cases were jaundiced, and nearly the same proportion (4 in 17) of the cases observed by Hugh Clark. Other observers met with it less frequently. Spencer says it was common; Inglis, not uncommon; and there were only a few cases in the Dera Ghazee Khan epidemic of 1855, described by Maxwell. It was evidently a rare symptom in the eruptive relapsing fever. Twining encountered apparently but two cases: in one of these there was subacute inflammation of the liver, with hæmorrhoids and slight jaundice; and the other is described as a "severe bilious remittent," which occurred on the ninth day from the commencement of the illness, and subsided after eleven days. Mouat noted two instances of "hepatitis," but has not mentioned jaundice. Edward Goodeve, in 1853, made the remarkable observation that simple jaundice, without much disturbance of the liver, attacked a large number of persons in the spring of that year, but he has not mentioned the co-existence of jaundice with the eruptive fever. In a case of the eruptive fever, in 1864, recorded by Chuckerbutty, in which dysentery supervened, the symptom

occurred, as I have already pointed out. The presence of jaundice in the coolie emigrant epidemic, which was attended by an eruption, is not mentioned by D. B. Smith. In some of the epidemics of the non-eruptive fever, likewise, the symptom was either totally wanting, or more probably was not noted in the accounts. McDonell, Lawrence, Eyre, and Eteson, do not allude to jaundice. Its absence in the Kimedy epidemic was probably due to the high estimation of calomel entertained by McDonell, which led him always to prescribe it. Eyre and Eteson speak of functional disorder of the liver; and it is not improbable that they included any instances of jaundice that might have occurred under this term.

The intensity of jaundice varies in different individuals from a faint tinge to a bright yellow. Bernard classified the Arracan fever of 1825–26, according to the depth of the colour, into two divisions. The yellowness is occasionally limited to the conjunctivæ; but more commonly it becomes general, though it is always first observed in the eyes. In the Indiamen the conjunctivæ were apparently the only parts discoloured. Bateson thus graphically describes two instances of intense jaundice, in the Umballa epidemic of 1866. "They were a sight not quickly to be forgotten. To outward appearance these poor men fell sick, and were all over yellowed at the same time—yellowed in the highest exaggeration of jaundice—scalp yellow, yellow ear cartilages, frothy yellow saliva about the mouth, and trickling out of it; and the tongue, yellow-stained and smooth, was bathed in the horrid yellow frothy fluid. Ghastly cases indeed!" Both died.

Some observers have remarked that jaundice did not occur in the beginning of an epidemic. Lyell observed this was the case in the Eusufzai epidemic, in which subsequently the symptom was sufficiently common. Nor has the symptom often occurred in the onset of the fever. About the fourth or fifth day has been the usual date of its appearance; Gray, however, met with it at Mooltan, on the second or third day. When it occurred as a prominent symptom on the first manifestation of the fever, the case invariably terminated fatally, according to Bateson's ex-

perience. When it came on as an ordinary symptom later in the disease, it was by no means a portent of danger. When the colour was very bright, the case was severe, and rarely recovered. Bernard found the bright yellow variety mortal. R. H. Hunter considered "bilious remittent" a more dangerous form than the eruptive fever, in the Poona and Bombay epidemic of 1836. Jaundice, though often present in fatal cases, is not always so, nor even in all severe cases. Shirreff specially directs attention to this fact, as observed by him in the Panniput and Rhotuck epidemic of 1837, in which jaundice was more common than in any epidemic before or after.

According to Bateson, jaundice is more frequent in the relapses than in the primary fever,and never occurs twice in the same individual.

11. The *urine* varies with the amount of the fluid ingested, but as a rule the quantity is equal to or exceeds the normal standard. After the termination of the paroxysms, the quantity is usually much increased. During the paroxysms the colour is dark, and the specific gravity usually high. Occasionally the quantity is reduced, or the secretion is altogether suppressed: this may occur at any period; but whenever it occurs, it is found to be accompanied by cerebral symptoms, such as delirium, stupor, coma, or convulsions. Whenever cerebral symptoms occur, there are grounds for believing that they are due to the retention in the blood of urea and other products of tissue metamorphosis. Copious deposits of lithates about the period of crisis are more common than in either typhus or enteric fever. Albumen has rarely been found in the urine. In the jaundiced cases bile pigment is found in greater or less quantity.

Observations on the urine are generally wanting in Indian accounts. In the majority of instances there was nothing remarkable observed: some writers speak of the urine as copious and pale, others as scanty and high-coloured. The tinging of the urine with bile has been noticed by several. A few state that it was scalding; and Shirreff observed that in some instances it was altogether suppressed. Edward Goodeve found albumen in one case of

the eruptive fever. Hugh Clark found no albumen in his seventeen cases, nor did Bateson in the experiments instituted by Farquhar, and followed up by him during the Umballa epidemic of 1866. Science is indebted to Farquhar and Bateson for the following facts regarding the urine in relapsing fever:—"Urine had acid reaction; sp. gr. 1007; contained no albumen. No very decided instances of bile presence were elicited." In two instances in which the urine was tinged with bile, I found the reaction to be alkaline, when freshly passed; and the alkalinity continued for many days, until the bile disappeared. There was no albumen. In both cases the specific gravity was higher during the intermission than after the relapse. A few drops placed on the back of a white plate were of a bright yellow colour. A drop of sulphuric acid being added, with or without syrup, produced a great play of colours—blue, purple, and finally brown red. Nitric acid, in addition to the above colours, which were brought out by it a little fainter than by sulphuric acid, elicited a bright green. Hydrochloric acid hardly changed the yellow colour of the urine. Solution of potash merely diluted the urine, and rendered the yellow colour paler. In a test tube, nitric acid changed the colour at first to a dark orange from orange yellow, and then to green, and, when boiled, to a blackish green.

12. *Headache* is almost invariably complained of. Hardly a single writer has omitted to make mention of it. It has varied in intensity in different epidemics as well as in individuals. The degree of pain is stated to have been intense, severe, or excruciating, sometimes without any qualifying expression. Generally it is most felt at the onset of the fever, and it might abate in a few days; but at times it is persistent, and forms the main complaint made by the patient, abating during the intermission and returning or not in the relapse, according to the severity of the latter. Gray and Bateson have noted the localisation of the symptom in the forehead. *Vertigo* also is very generally experienced, more especially at the beginning, but it is not limited to that period of the disease. Vertigo often occurs when there is no headache. By far the most remarkable

and distressing symptom complained of is *the great suffering from pains, more or less general, in the body and limbs.* Few writers have failed to record the symptom as having caused more or less annoyance. The eruptive relapsing fever appears to have been particularly marked by severe and almost universal muscular and arthritic pains. In Twining's epidemic this was a leading feature; besides intense headache, severe pains were felt in the loins and muscles of the limbs, especially of the lower extremities, and aching in the back of the neck, causing extreme anguish. In the Berhampore epidemic of 1825, Mouat observed severe pain in the head, loins, shoulders, arms, wrists, hips, thighs, and ankles, sometimes even in the fingers and toes. Edward Goodeve also speaks of the pain of the loins and limbs; but the symptom apparently was less prominent in the epidemic of 1853 than in the earlier epidemics. In the non-eruptive fever the pains are likewise of great severity, and they are generally present in individual cases of the disease. The earliest observer of the disease in the present century—Hunter—speaks of pains in the legs in the *Exeter* epidemic; of the knees, ankles, and elbows in the *Mornington;* and violent pains in the loins in the *Lucy Maria* and *Marian.* McDonell states that pain all over the body was generally complained of. MacNab speaks of the pains as unusual. Bateson has recorded pains in the muscles of the thighs and knees, in the loins, and in the knee and elbow joints. Gray remarks: "The pains were remarkable, and I think may be considered one of the diagnostic marks of the disease. Sometimes in the muscles, sometimes in the joints, sometimes in both; so keenly were they felt that the sufferer would shed many a tear of anguish over them; nor did they cease with the cessation of the febrile symptoms. They sometimes remained for several weeks after the patient was, in other respects, well." Other writers have also observed the persistence of the pains after the fever had terminated. In some cases, a sore stiffness of the joints, with pain on movement, is complained of. Twining refers to a report of an epidemic in H.M. 13th Regiment, at Rangoon, in 1825, in which the surgeon observed, as a common sequence of the fever, a weakness of the knees and

painful rigidity of the tendo Achillis. The occurrence of violent pains in the loins, limbs, and joints, has obtained for this disease the name of rheumatic fever from several of the early European pathologists, and it will be observed that Robinson has described the epidemic at Buxar and Ghazepore, in 1825, as fever of a rheumatic form. Copeland also has named the eruptive epidemic of Calcutta, described by Twining, *Scarlatina rheumatica.*

But although very generally present, muscular and arthritic pains are occasionally wanting in individual cases, and are seldom met with even in entire epidemics. In the epidemic in the 20th Punjab Infantry, this symptom was not prominent in some cases, and I have since met with a few instances in which merely a stiffness of the limbs, or soreness, was complained of. In Dr. John Murray's Meerut epidemic of 1839, the patients seldom complained of local pains. The describers of a few epidemics have failed to make any remark regarding pains, and it might fairly be inferred that in them the symptom was not universal or very remarkable.

13. Murchison states that *delirium* is an exceptional symptom in relapsing fever; and in most cases the mind remains clear throughout. Of 220 cases observed by Douglas, delirium occurred only in eighteen. About the period of crisis, the patients sometimes become stupid and confused, with a tendency to stupor; at other times they become suddenly and violently delirious. These cerebral symptoms persist, or they may speedily pass off. They are due to diminished excretion from the kidneys.

In this country, as might have been expected from the greater intensity of the disease, cerebral symptoms have been more frequently met with than in the European disease. Hunter has recorded delirium in the *Lucy Maria* and much delirium in the *Marian.* Spencer, in the Moradabad epidemic of 1836, observed cerebral affection, manifested by low delirium or stupor, in many cases; it was generally associated with jaundice. In the Bareilly epidemic, Guthrie met with cerebral affection, varying in intensity from slight frontal headache to deep coma. Shirreff found stupor and coma to be common enough in the

course of the disease, but these symptoms did not occur in any of the cases with well-marked biliary suffusion; these, on the contrary, were characterised by anxiety and restlessness to a degree. Inglis states that the most frequent complication in the Tatta epidemic of 1839 was "meningitis," marked by a wild staring appearance of the countenance, inability to answer questions correctly, and short outbreaks of outrageous delirium. In the Goomsur epidemic, Eyre met with ten cases which proved fatal from cerebral affection attended with mental aberration and coma. Lyell found delirium to be constant and general, and Farquhar states that it usually set in on the seventh day.

In the more recent epidemics, however, the mental faculties have only in exceptional cases suffered impairment. In the two epidemics at Dera Ghazee Khan, in 1854 and 1855, the mental faculties were clear, according to Maxwell. In the epidemic in the 20th Regiment, in 1864, I found that the intellect was clear and the eyes intelligent in the great majority of the cases, even in those in whom the prostration was great, and who could hardly articulate from the extreme dryness of the mouth and throat. In a few cases, however, I met with muttering delirium, and in one individual a condition of mind verging on idiocy was noticed for a day or two. Bateson met with only two cases of delirium in 424 cases; he remarks, "delirium is no feature of this special disease." The patients were listless, and even moribund cases were only confused in their ideas. Hugh Clark and Gray, likewise, rarely observed delirium. In the Roorkee epidemic of 1869, there were few head symptoms—a happy exemption, which Eteson attributed to his prompt attention and treatment.

In some of the earlier epidemics, also, impairment of the mental faculties was unusual. Twining never saw it; but Mellis observed, in the same epidemic, some cases of great delirium. In the Kimedy epidemic, with the exception of vertigo and headache, McDonell never saw any symptom of affection of the head in the primary fever. At the onset of the relapse, certain patients fell into a state of depression or stupor, almost amounting to insensibility; this condition, however, passed off after continuing for two or three hours.

Edward Goodeve observed, in the eruptive epidemic of 1853, that the cerebral functions were not sensibly disturbed, except in one case, which was fatal.

14. *Sleeplessness* is a common and distressing symptom, both in the paroxysms and in convalescence. *Stupor* and *coma* are rare in relapsing fever. They occur in connection with suppression of urine, and usually supervene at or after the period of crisis. When they come on before the cessation of the paroxysms, and do not speedily pass off, there is no well marked crisis, and all the phenomena of the typhoid state may be gradually developed.

In the Indian disease, wakefulness, restlessness, or jactitation have been generally observed; in many instances in an extreme degree. In the Goomsur epidemic, Eyre observed restlessness even in the intermittent fever. As already stated, cerebral symptoms have been more common in the Indian than in the European disease, especially in the earlier epidemics. They are indicative of danger, and often precede death. Shirreff speaks of coma as common in the Paniput and Rhotuck epidemic of 1837, and he appears to have been the only observer who met with complete suppression of the urine in relapsing fever. In some epidemics a condition of great drowsiness or semi-coma has been observed in some instances, generally passing off, or deepening into complete coma, and terminating in death. In Hugh Clark's fatal cases, delirium preceded coma. Occasionally, dangerous cerebral symptoms set in suddenly and unexpectedly in cases that appear to be doing well. Bateson observed this peculiarity among fleshy prisoners who suffered from relapsing fever in the Umballa epidemic of 1866.

15. *Prostration*, more or less, is present in all cases from the first, but less than in typhus; and it is rarely so complete as to prevent the patient getting out of bed, or helping himself, except in those cases where cerebral symptoms supervene.

This symptom has been generally observed in Indian epidemics, and in some of them it is described as extreme. The muscular weakness has been regarded as the more remarkable in connection with the short duration of the

fever, and the absence of cerebral affection. Lawrence thought extreme debility the most remarkable feature in the Mangalore epidemic; Twining noted extreme prostration of strength in the eruptive fever; and Edward Goodeve states that, in the epidemic of 1853, when profuse perspirations came on in the remissions, the depression was so extreme as to excite anxiety. The prostration is much less than in typhus, but far greater than is observed in many examples of typhoid fever. A person with relapsing fever is hardly physically capable of carrying on his avocations in ordinary circumstances, though he might under necessity or on compulsion be able to undergo some prolonged muscular exertion.

16. *General convulsions* very rarely occur in relapsing fever. Mouat mentions the case of a child, in whom large sloughing ulcers on the limbs had formed, who suffered from convulsions before death. R. H. Hunter met with another case in the Poona epidemic of 1836, which terminated fatally in convulsions. In the epidemic on board the *Lucy Maria* Indiaman, Hunter states that the extremities were affected with general spasms before death. No other observers appear to have met with convulsions. *Hiccup*, however, has more often occurred. Hunter noted it as a symptom which ended the scene in fatal cases in the epidemic on board the *Marian*. MacNab, in the Mainpuri epidemic of 1837, observed hiccup continue for several days consecutively in fatal cases. Guthrie met with hiccup frequently in the protracted stages of the disease. It has been also observed by Lyell, Hugh Clark, and Bateson. The latter gentleman thought that it was due to the use of strong solution of quinine. *Muscular paralysis*, as indicated by retention of urine and the involuntary passage of urine and fæces, is rare, except perhaps in cases in which cerebral symptoms are prominent. *Tremors*, *subsultus*, *carphology*, and *rigidity* of the muscles are also rare. I saw a case in the epidemic in the 20th Regiment, which terminated in fatal coma, in which the eyes were rolled upwards, the pupils dilated and insensible, the fingers spasmodically clenched, and a singular tremor agitated the body.

17. Murchison states that the "ferrety eye," or the *injected condition of the conjunctiva*, characteristic of typhus, is comparatively rare in relapsing fever. In this country, the eyes are somewhat commonly affected. Mr. Cavell observed stiffness, soreness, and heaviness of the eyes, so that opening them was painful, but without intolerance of light; and Twining and Edward Goodeve met with suffused and watery eyes, in the eruptive fever. Stevenson describes the eyes in the Arracan epidemic as red and fiery. Spencer found the eyes to be bloodshot in some cases. Guthrie describes the eyes as generally dull and muddy, now and then streaked with red vessels, and frequently yellow and saffron-coloured. In the Allahabad epidemic of 1842, Beattie found the eyes in all cases bloodshot; and Farquhar states that in the Eusufzai epidemic the eyes were bloodshot and suffused. Bateson describes the eyes in typical cases as watery and congested, even to marked pterygia-like appearance, and without photophobia, in some cases of a dusky, dull, unpolished brass colour.

Epistaxis, or bleeding from the nose, does not appear to have attracted attention from the earlier writers. It was noted by Mellis in the eruptive epidemic at Calcutta in 1824. I observed it in the epidemic in the 20th Regiment in 1864. In some cases it was profuse, and recurred several times. In one case, the hæmorrhage was even dangerously abundant, so that plugging of the anterior and posterior nares with lint steeped in tincture of steel was resorted to to stop further loss of blood. Bateson states that in the Umballa epidemic of 1866, epistaxis occurred in three per cent. of the patients, was apt to recur, and required plugging. Gray says that in the Mooltan epidemic, bleeding from the nose was not common. This symptom might be taken as a means of distinguishing between relapsing fever and typhus, as in the latter disease it rarely or never occurs. I have no recollection of having observed bleeding from the nose in the epidemics of typhus in the Rawul Pindee jail in the years 1867 and 1869. An epidemic in which epistaxis has not occurred in a single individual is not likely to be one of relapsing or of typhoid fever. Murchison, however, points out that

typhus, complicated with scurvy, is often attended with hæmorrhages from the nose and bowels. *Hyperæsthesia of the surface*, according to Murchison, has never been observed in relapsing fever. No Indian writer has yet recorded an instance. In the epidemic in the 20th Regiment, in 1864, one of the hospital dooly bearers, who had contracted the disease, became affected with œdema: his thighs and arms swelled considerably, and were tender, even on gentle pressure. This case was unique, as similar tenderness of the limbs was not observed in any of the other cases, and death was unusually rapid. The exact date of the commencement of his illness could not be ascertained, but he died on the night of his admission into hospital.

In the eruptive epidemic of 1824, at Calcutta, Mr. Cavell observed one symptom, namely, a disagreeable bitter taste in the mouth, which has not been noted by any other author.

Another rare symptom is *deafness*, of which Graham observed one or two instances in the Candeish epidemic of 1839.

In Lower Bengal, in many instances, with the onset of the fever, there is a sensation of pain and distension within the nose; and, at a later period, the Schneiderian membrane will be observed much swollen and inflamed. This complication has obtained for the disease the name of *nakra*, or *nasa*, amongst the Bengalees; and it apparently is confined to Lower Bengal. The affection never terminates in suppuration, or ulceration, or in any chronic disease resembling ozæna. *Twining's "Diseases of Bengal,"* pp. 701–4, ed. 1832.

18. Murchison states that the diminished impulse and impairment, or absence, of the first sound of the action of the *heart*, indicative of softening of the left ventricle, so common in typhus, are not observed in relapsing fever. Drs. Stokes, Lyons (of Dublin), and Heslop have drawn attention to the frequent occurrence of a systolic bellows-murmur, which is rarely or never produced in typhus. This murmur always ceased as the patient regained strength, and hence it was obviously independent of valvular disease.

Few Indian observers have remarked cardiac symptoms. McDonell, however, speaks of irritability of the heart, accompanied by a threatening of effusion into the chest. There can be no doubt, however, that the heart has been affected very seriously in some epidemics. In the epidemics which occurred on board the emigrant ships in 1864 and 1865, one of the medical officers spoke of the disease as pericarditis; while there can be no doubt that this affection occurred only as a complication of relapsing fever. In the epidemic which occurred in the 34th Madras N.I. at Mangalore, in 1845, Lawrence apparently made a similar mistake in some instances which he speaks of as examples of carditis. He describes the heart's action in these cases as a fluttering motion, or as forcible and confused. Exact observations on this subject are wanting.

19. Relapsing fever in Great Britain and Ireland is not characterized by an eruption. Exceptional instances, however, have occurred. Dr. Arnott, of Dundee, met with one instance where "an eruption resembling measles" was present. A second case occurred in the practice of Dr. Watson, of Leith, in which a measly eruption appeared, and lasted for three or four days. A third case was reported by Dr. W. Robertson, of Edinburgh; and a fourth case by Dr. Rose Cormack. In the relapsing fever of Silesia, in 1841, a copious eruption was far from uncommon. It is thus described by Murchison. The eruption differed from that of typhus in the following particulars: it appeared as early as the second or third day, and after one or two days disappeared. It was rosy or pale red, effaceable by pressure, followed by desquamation, and not obvious after death.

In India, an eruption has been observed in the following epidemics: in 1824, in Calcutta, described by Twining, Cavell, and Mellis; in Guzerat, described by R. H. Kennedy; and also in Burmah; in 1825, in Berhampore, described by Mouat; in 1836, at Poonah, described by R. H. Hunter; in 1824, at Calcutta, described by Henry Goodeve; in 1847, at Cawnpore, and in 1853, at Calcutta, described by Edward Goodeve; again in Calcutta, in 1864, described by Chuckerbutty; and also in 1864 and in 1865,

amongst the coolies in the emigrant ships, described by Partridge, and referred to by D. B. Smith. Twining and Edward Goodeve state that the eruption usually appeared on the second or third day, more frequently on an earlier than on a later date. Its duration varied from twenty-four hours to five or six days. It has been observed on every part of the body: on the palms of the hands and soles of the feet, on the upper and lower extremities, on the face, and even at the roots of the hair on the scalp, on the neck, chest, and abdomen. Edward Goodeve states that it only occasionally appeared on the lower extremities, and was there fainter than elsewhere; and both he and his brother Henry concur in stating that it was less distinct on the abdomen also than elsewhere, and rarely found in that situation. The latter gentleman had seen cases in which the entire surface of the body was covered, scarcely a spot of the size of a rupee remaining free. Henry Goodeve found that it first made its appearance on the palms of the hands and soles of the feet, and extended to the fingers and toes and back of the hands and feet, and then spread to the arms and legs. The face was next attacked, and became deeply tinged, even to the roots of the hair, and then the neck and chest, and very rarely the abdomen. Edward Goodeve found the eruption first on the face, and sometimes simultaneously on the hands and face. All concur in describing the eruption as of a scarlet or bright red colour. Edward Goodeve says that it varied from a bright red to the faintest rose tinge. The eruption was not elevated, except in a few instances, and the colour disappeared on pressure. The eruptions were sometimes confluent. Sometimes, while fading, the colour changed to a somewhat blueish tinge, but never became livid. Chuckerbutty, who probably observed only very grave instances of the disease, described the eruption in these words. "It was of a mulberry colour, macular in form, varying in size, sometimes appearing elevated to the eye, like the eruption of measles, sometimes no higher than the skin, always disappearing on pressure, and returning on its removal; observed between the third and seventh days, sometimes later; and fading away and vanishing after some five or

six days, sometimes sooner, sometimes later." Edward Goodeve found no difficulty in seeing the eruption in natives: this generally, but not always, required a little management of the light. Twining and Henry Goodeve state that the eruption was attended with an itching or tingling sensation. The eruption disappeared without desquamation, except in a few cases, when the cuticle came off in branny scales, and rarely in large flakes. After disappearing, the eruption would sometimes return transiently, during excitement. In the non-eruptive fever which occurred in the 20th Regiment in 1864, I observed, in one of the cases that was attended with diarrhœa, a peeling off of the skin in small flakes, all over the body. Desquamation of the cuticle is, however, of very rare occurrence. De Renzy, who witnessed an epidemic in the Mooltan jail, no complete account of which has been published, describes the skin as becoming "dry, hard, and leathery, and covered with a white scurf, which no amount of washing with soap and water could remove."

Besides the rash above described, eruptions variously described as urticaria, papular and vesicular, bullæ, and wheals, have occurred in some instances.

With the exception of the epidemics above noted, in no other has any characteristic eruption been observed. Petechiæ have been occasionally seen. Mouat mentions the occurrence of spots, like *purpura simplex*, not disappearing on pressure, as having been remarked by him in the Berhampore eruptive fever; and Chuckerbutty has noted the occurrence of petechiæ towards the end of one case (Ellen Freeman) which terminated fatally. Vibices have apparently very rarely occurred. Stevenson observed them in Arracan, in 1825. Chuckerbutty saw them, accompanied by petechiæ in the case above referred to. In the non-eruptive fever, I saw but one instance of rather extensive vibices in the lower extremities, and they seemed to have been due to the irritation caused by the application of solution of iodine.

The eruptive fever was in several instances accompanied with an eruption of large watery vesicles, attended with much swelling and redness of the skin. Mouat alludes to

the cases of four or five children in whom these occurred, and gave rise on bursting to ulcers and even sloughing, to such an extent as to have brought on fatal convulsions in one child. Edward Goodeve quotes some cases observed by Professor O'Shaughnessy, in which the red eruption was attended with considerable swelling of the face, so that the eyes were closed for three days; vesication and desquamation followed, as in cutaneous erysipelas, which, in fact, Professor O'Shaughnessy considered the disease to have been. It is doubtful whether the cellulitis or erysipelatous swelling of the face, observed by Udoy Chund Dutt, at Pooree, in the Orissa famine of 1866, was due to relapsing fever or to small-pox. Sudamina occur in both the eruptive and non-eruptive fever, but rarely, I should say, in the latter. Minas observed them rather abundant in the epidemic in the Bhutty territory, and he speaks of them as miliary vesicles. Bateson observed sudamina at the critical sweatings. I cannot recall a single instance in which I have observed sudamina. In the non-eruptive fever, large blebs, or watery vesicles, attended with swelling and redness of the skin, are occasionally met with; this affection, usually called pemphigus, was observed by Bateson in two instances in the Umballa epidemic of 1866.

Herpetic eruptions often break out on the lips in relapsing fever. In the eruption epidemic at Calcutta, of 1853, Edward Goodeve found the lips and interior of the mouth of a bright red or damask colour, in well-marked examples of the disease; and in many cases the follicles of the mucous membrane became prominent and enlarged. The Schneiderian membrane of the nose in some instances assumed a bright red hue.*

* The eruptive relapsing fever has been observed in other parts of Asia, besides India. In an account of the Medical Topography of Baghdad, by J. M. Hyslop, M.D., in no. x., for 1849 and 1850, of the *Transactions of the Medical and Physical Society of Bombay*, is the following description of an epidemic in that city. "In the autumn of 1843 a new epidemic appeared, resembling in many points the worst form of influenza. It came on with rigors and great difficulty of breathing; these symptoms were followed by very strong fever, extremely foul tongue, and, in many cases, delirium; and when the last did not exist, the patient was harassed by fears of impending dissolution. This

20. The temperature of the skin is, as a rule, higher than in typhus, according to Murchison. Christison observed it in the Edinburgh epidemic of 1817–19, to range from 102° to 105°, and at times it reached 107°. Observations regarding the temperature are generally wanting in Indian accounts. Farquhar appears to have been the only observer who took the temperature of patients. Bateson states that in the Umballa epidemic of 1866, the average reading of Farquhar's experiments was 100°. My observations in isolated instances indicated a higher temperature than this. Lyell and Farquhar, in the Eusufzai epidemics found the temperature to be inconsiderable; and Edward Goodeve states that in some cases the pyrexia is not well marked.

In the epidemic of relapsing fever in the 20th Punjab Infantry at Rawul Pindee, in the year 1864, I observed two classes of cases with respect to the temperature of the surface of the body. In one set the temperature throughout the primary fever was persistently above the normal warmth of the skin; in the other, the temperature in the morning was natural, but in the afternoon febrile. I distinguished these cases by the terms remittent and intermittent, but in their general and essential characteristics they were the same disease, differing only in the degree or intensity of the symptoms. The remittent cases in all respects, excepting in the features of the constant increased heat and the greater severity of the disease, were identical with the intermittent cases. The difference was one merely of degree and not of essential nature. Numerous other observers in this country have noted the same remarkable fact. Twining states that some of his eruptive cases were mild, more resembling febricula, but characterized with

ended generally on the third day, in an efflorescence of the deepest scarlet all over the body, in diarrhœa, or in profuse perspiration. The mortality was not great, but relapses were frequent, and the recoveries tedious. Many people suffered for a few weeks after the attack from rheumatic pains, or from paralysis of one or more of the extremities. At least eight-tenths of the population were attacked. It extended all over the province, and had never been known in these countries before."

There is also a short account of a similar epidemic in a town in China, in a volume of the *Transactions of the Calcutta Med. and Phy. Society*. I regret that I did not make a note of it."

severe pains, such as are wanting in the latter disease. Stevenson subdivided the disease which he observed in Arracan, in 1825, and which, without doubt, was relapsing fever, into intermittent and remittent. McDonell classified the Kimedy epidemic of 1833 into intermittent and remittent, but he states distinctly that both forms were due to the same causes, and were in fact the same disease, so that any inadvertence in the arrangement of the two classes of cases was of no consequence. Remittent cases, he states, constituted one-third of the whole number. The Paniput and Rhotuck epidemic of 1837, was called bilious remittent fever by Shirreff; he says, however, that in mild cases the disease assumed the intermittent form, though it was generally remittent, and not unfrequently continued: when intermittent, quotidian and tertian types were common, and some cases were quartan. The Mercara epidemic of 1842 is described by Lawrence apparently as consisting entirely of intermittent fever; and the Mangalore epidemic of 1845, as continued and intermittent fever. The great epidemic of 1843 in Hydrabad in Scinde, consisted for the most part of intermittent fever. The Goomsur epidemic of 1847, described by Eyre, consisted at first of quotidian intermittent fever, with bilious symptoms, but subsequently became remittent, and some cases were continued fever. Maxwell speaks of the epidemics in 1854 and 1855 in the Dera Ghazee Khan jail, as consisting of intermittent, remittent, and continued fever, and preceded by a good deal of intermittent fever. Bateson is precise and decided on this subject; he observed distinct intermissions and remissions in the primary fever in the Umballa epidemic of 1866. He says, "I find from my notes that the most frequent time for the manifestation of the fever was the forenoon, generally after the morning meal. The remission would occur towards dawn next morning; exacerbation coming on again towards 10 a.m. same day. . . . During the earlier epidemic time, I took the fever to be intermittent, then it became, I thought, remittent, and some of the cases were even continued fever. I imagine it begins simulating an intermittent, goes through remittent, and culminates in some few cases in continued fever." The Roorkee epidemic of 1869

was considered by Eteson as one of ague, or intermittent fever. He says the symptoms were those of jungle or bilious remittent fever, in a supposed diluted form; but that the first few cases were not of the true type. "Later in the season, the bilious remittent faded into pure intermittent, as the poison seemed to be more diluted, and its vitality possibly weakened under the colder weather and dryer atmosphere." In the Saharunpore epidemic of 1869, Garden observed distinct intermissions in some cases during the primary fever; and the Peshawur epidemics of 1869 and 1870 are described by Bellew as consisting in their simplest and ordinary form of intermittent fever, acquiring often a remittent character, and sometimes appearing to lapse into continued fever.

The evidence above collected is very strong, that the primary fever may be intermittent, remittent, or continued. The range of temperature is thus seen to be unimportant as a character for classification, an error which the earlier Indian pathologists have uniformly made, and which unfortunately is still perpetuated. The intermittent form of relapsing fever is not uncommon, and preponderates in some epidemics; the remittent form is the most frequently met with, while the continued fever, in which the diurnal range of temperature is inconsiderable, is the least common of all. That these forms are not distinct diseases, but merely milder or graver examples of the same disease, is clearly the view enunciated by all the observers. In addition to the authors above alluded to, numerous others describe the fever as having a remittent character. The Poona epidemic of 1836 is said by R. H. Hunter to have been a catarrhal fever of remittent type, changing afterwards to tertian, and then becoming remittent again. Spencer speaks of the Moradabad epidemic of 1836 as a pure remittent, with one paroxysm in the twenty-four hours; in the earlier stages, however, a clear intermission. Guthrie says of the Bareilly epidemic of 1837, that most cases were remittent, the paroxysm, or exacerbation, taking place at dusk, and continuing all night. Inglis described the Tatta epidemic of 1839 as remittent fever. Edward Goodeve represents the Calcutta eruptive epidemic of 1853 to have been generally

paroxysmal, but continuous in a few cases. Farquhar observed partial remissions in the Eusufzai epidemic of 1853. The more modern writers, such as Walker, Gray, Chuckerbutty, De Renzy, Partridge, and others, as well as Beattie and MacNab in 1842 and 1836, appear to have regarded the disease as continued fever.

That the range of diurnal temperature, as expressed by the terms intermittent, remittent, and continued, indicates no essential difference between these forms of the disease, is deducible from the following circumstances. All three have been observed to occur together in almost all the epidemics; they have presented the same general characters —a primary fever of short duration, an interval of freedom from fever, and a relapse, with a corresponding identity of symptoms and complications; in the same epidemic one or other form has preponderated at one time and not at another; and finally, in individual patients, one form has often been observed to pass into the other. McDonell speaks of the difficulty experienced by him in discriminating the intermittent from the remittent variety in the Kimedy epidemic, in consequence of some particular stage being wanting, or the intermissions being imperfect in some instances. Eyre in the Goomsur epidemic observed intermittent cases pass into remittents, and *vice versâ*, and sometimes into continued fever. Eteson says that the majority of the remittent cases in the Roorke epidemic of 1869 were developed out of intermittent fever, apparently from the non-recurrence of the sweating stage, or from its arrest by cold or wet. The character of the relapses further contributes to the evidence of the identity of the three forms. When the primary fever has been remittent or continued, the relapses have been of the same form, but not unfrequently intermittent, as McDonell has pointed out; and this author, as well as Eyre and others, observed in several instances an intermittent primary fever to be followed by a remittent or continued relapse. Farquhar, who considered the Eusufzai epidemic of 1853 to have been typhus, says that in the primary fever the remissions were partial and imperfect, but in the relapses they were more or less distinctly marked.

The facts observed in connection with relapsing fever, and also with the other forms of fever, show conclusively that the elder Indian pathologists erred in taking the range of temperature as the basis for the classification of fevers. So far from the fevers named intermittent, remittent, and continued, being distinct diseases, the facts indicate that they should be regarded as varieties of the same disease manifesting itself in a more or less severe degree. I have observed that, as in the case of relapsing fever, the other forms of fever have also an intermittent and remittent variety. The specific distinctions between fevers established by European pathologists, apply to the fevers of this country, whether intermittent, remittent, or continued, which admit of being classified, according to the European method, into relapsing, typhus, typhoid, and simple fever. There, in fact, exist in this country intermittent, remittent, and continued varieties of the four forms of fever above-named. The explanation given by the various writers of the remarkable transformations into each other of intermittent, remittent, and of the continued forms of fever are merely speculative, and cannot be accepted. The view of the nature of these forms here presented is a legitimate deduction from the independent observations of numerous observers in the course of the present century.

21. A few other symptoms have been noted by Indian observers. A general flushing of the face has been frequently noticed from the epidemics recorded by Hunter to those of more recent times; Murchison points out that it differs from the flushing of the face seen in typhoid fever in the latter being circumscribed. A bloated and swelled countenance has been occasionally observed; Hunter, Twining, and Edward Goodeve have recorded this symptom, and I have met with one instance of it. In general, the expression is intelligent, and the eyes bright and lively, without the stupid and dull expression so common in typhus. I have been particularly struck with this peculiarity in the cases, with few exceptions, which came under my observation. When cerebral symptoms occur, the countenance loses its natural expression, and may assume the character observed in typhus. But though the countenance remains in general

intelligent and natural, it is expressive of distress and suffering. Bateson says that the expression indicated apathy or abandon, not stupor or anxiety. Gray, speaking of the Mooltan epidemic of 1868, writes: "The physiognomy of the sick was striking. It was a careworn, hopeless expression. This was remarked at once by a medical officer from cantonments, who paid a visit to one of the hospitals. He pointed out that they had just the appearance of the sick of the sufferers from the Orissa famine, many of whom he had treated while holding a civil charge in Lower Bengal." Twining states that "the face sometimes assumes a lurid, cadaverous colour" in the "remittent fever of the rains," which is relapsing fever.

Aphonia, or loss of voice, was observed by Twining in some cases in the Calcutta epidemic of 1833; and not unfrequently in the Umballa epidemic of 1866, by Bateson, who attributed it to "abnormal nervous action." I observed the symptom in one case in the epidemic of 1864 in the 20th Punjab Infantry; it appeared to be due to extreme dryness of the mouth and throat. In other cases, also, in which the dryness was considerable, the voice became low and husky. The reader will remember the inability to speak experienced by Mr. Holwell on emerging from the Black Hole, and how a drink of water to moisten his mouth and throat removed the symptom.

Hugh Clark met with one case attended with *dysphagia*, or difficulty of swallowing, in the epidemic at Buxar in 1868.

Udoy Chund Dutt found the persons who were suffering from "a low sort of fever" in the Orissa famine of 1866, emit "a peculiar heavy animal smell from their bodies."*

* Report of the Government Charitable Dispensaries of Bengal Proper, for the year 1866, p. 182.

SECTION VI.

Stages and Duration of Relapsing Fever.

In a well-marked example of relapsing fever, there are three distinct stages: namely, the primary fever, the intermission, and the relapse.

Most observers have recorded that the accession of the primary fever has been sudden, without previous warning of the coming on of illness. It is attended with shivering or rigors, more or less severe, or a feeling of chilliness, or a cold creeping sensation in the loins and back; preceded or followed by headache, giddiness or swimming in the head, nausea or vomiting of green bilious matter, and aching pains in the back and limbs, languor, and prostration of strength. Occasionally, vomiting occurs in association with purging; and at times these two symptoms, or the latter only, are very considerable, and the evacuations may even assume, as pointed out by Edward Goodeve and Bellew, the rice-water character generally supposed to appertain exclusively to cholera. When the accession comes on with these symptoms, the resemblance to cholera is great; and I cannot avoid thinking that some of these cases have been actually mistaken for this disease, the fever which followed having been regarded as "secondary fever."

But though the initiation of the fever has generally been sudden, several observers have noted some premonitory symptoms. Twining observed in 1824, that in the first period of the epidemic the fever came on suddenly and without premonitory symptoms; but latterly, anorexia, languor, restlessness, and a white tongue preceded the attack by a day. In the Kimedy epidemic of 1833, McDonell has recorded that many of the patients suffered for a few days prior to the attack from loss of appetite, irregular bowels, and debility, sense of restlessness, and often from pains in the limbs. In the Moradabad epidemic of 1836, Spencer observed the attack to be preceded by weariness and general pains. Edward Goodeve encountered a few cases in which colic and diarrhœa were the premoni-

tory symptoms. In general, however, there is little or no disturbance of the previous health.

The duration of the primary fever is short; and by this feature relapsing fever is distinguishable from typhus and typhoid. All observers are in accord on this point. Cavell states, the eruptive fever of 1824 was commonly known as "the three days' fever" amongst the warrant and non-commissioned officers attached to Fort William, resident at Cooly Bazaar, now called Hastings. Mouat observed the fever, in the Berhampore epidemic of 1825, to endure for three days, and seldom longer than six or eight days. In the form called *nakra*, or *nasa*, by the Bengalees, the duration is from three to five days. John Adams fixed the average duration of the fever in the Buxar and Ghazeepore epidemic of the same year at four days. Hunter says of the epidemic in the *Marian*, that the symptoms did not abate for four or five days; and, in the *Exeter*, also, four days was the shortest duration. Lawrence fixed the average duration of the fever in the Mangalore epidemic of 1845 at four or five days. Eyre found the intermittent fever in the Goomsur epidemic of 1847 to cease after four or five paroxysms. Hugh Clark and Gray also met with cases in which the fever lasted no longer than four days. Sutherland, in the Patna epidemic of 1857, and De Renzy, at Mooltan, found the fever to continue for five or six days; and this period was also the longest duration of the fever stated by Gray, as observed by him in the Mooltan epidemic of 1868. Bateson and Hugh Clark likewise found the average continuance of the primary fever to be six days. Longer periods than the above have been observed by others. Gray, Walker, Lyell, Hugh Clark, Maxwell, Shirreff, and some others, have met with cases in which the fever has continued for seven, eight, and nine days. Maxwell fixed the duration of the cases in the epidemic at Dera Ghazee Khan, in 1854, at ten days. The longest periods noted are thirteen, fourteen, and twenty days. Eyre observed only one case which lasted for thirteen days. Hunter states that the fever on board the *Exeter* lasted from five to twenty days; and Lyell found the fever in the Eusufzai epidemic of 1852–53, to endure from seven to fourteen days.

It is probable, however, that these epidemics were mixed, and that some of the cases were typhus. The Eusufzai epidemic of 1854, which immediately followed Lyell's epidemic, if it was not a continuation of it, was actually considered by Farquhar as typhus. This gentleman has unfortunately omitted to state, in his account, what the duration of his cases was.

In the Calcutta epidemic of 1828, described by John Adams, under the name of "Bronchitic Fever of Infants and Young Children," and which spread to other parts of the country, the shortest duration of the fever noted was twenty-four hours. I have already referred to the sweating fever of Europe, which was probably relapsing fever, and which Caius has defined as "a contagious, pestilential fever of one day."

In the Eusufzai epidemic of 1854, Farquhar observed that after the third day the symptoms became more severe. In the course of the primary fever occur the various symptoms already noted, and complications of various kinds are liable to arise. Sometimes in the course of the fever, symptoms of collapse resembling cholera, attended with vomiting and purging of rice-water stools, have been observed in some localities; and these symptoms, resembling an attack of cholera, occasionally occur at the crisis or termination of the primary fever. This mode of termination was not uncommon in the Peshawur epidemics of 1869 and 1870. Bellew says, "These violent symptoms sometimes succeed in entirely clearing out the fever poison from the body, thus freeing the patient from a return of the fever." More generally, however, the crisis is attended by profuse perspiration, and Bateson states that he has observed sudamina form at this period. On other occasions, copious diarrhœa occurs instead of perspiration, and this symptom, in some epidemics, is very common. Murchison states that a discharge of blood from the bowels, epistaxis, or copious menstruation, may take occasionally the place of the critical perspiration. Profuse hæmorrhage from the anus occasionally terminated the fever in the Hydrabad epidemic of 1843. Sometimes sudden furious delirium occurs at this period.

On the cessation of the primary fever, a period of con-

valescence, called the intermission, ensues. The more urgent symptoms abate, and with the exception of debility, stiffness of the joints, and muscular pains, there is hardly any other symptom existing. The pulse loses its febrile rapidity, in general becomes normal, or may even be slower than natural. Its fulness, however, does not always subside, and may continue throughout the intermission, as pointed out by McDonell, who regarded this symptom as a sure indication of the recurrence of the fever. If jaundice had occurred in the primary fever, it fades in the intermission; but in several instances it does not entirely disappear. Epistaxis, jaundice, or some one or other of the complications of relapsing fever might occur. In several cases, however, the convalescence steadily progresses, the appetite returns, and the strength is recovered so completely that many resume their work, and soldiers are often discharged to duty, before the relapse sets in.

The duration of the intermission varies from two to several days in individual cases and epidemics. In the Patna epidemic of 1857, according to Sutherland, the duration was constantly two days. It is generally, however, much longer than this period. In the Kimedy epidemic, McDonell found it sometimes to continue for upwards of fifteen or twenty days. Eyre fixed the average duration of the intermission in the Goomsur epidemic at ten days; Lyell states that in the Eusufzai epidemic of 1852–53, the intermission endured from two to ten days; and in the epidemic of 1853, Farquhar found the relapse to occur from the fourteenth to the sixteenth day from the commencement of the fever. In the Dera Ghazee Khan epidemics the duration was so variable that Maxwell could not strike an average. In the epidemic in the 20th Regiment, I found the range to be from four to eight or ten days. In the Buxar epidemic, observed by Hugh Clark, the average duration was 7·1 days; the longest being nine days, the shortest two days, and the next shortest five days. Gray found it to be, in the Mooltan epidemic of 1868, either three, four, or five days; and in an earlier epidemic, in the same station, De Renzy states that it lasted from five to twelve days. In the Roorkee epidemic of 1869, Eteson remarked that "the

interval before the system was to be re-prostrated" was about a fortnight. Garden found the intermission to vary from four days in the majority of cases, up to twenty-one days.

Murchison has pointed out that in some instances the intermission is not perfect, or there is merely a remission or considerable mitigation of the symptoms, without the complete abeyance of the fever. In such cases, the pulse does not fall to its natural frequency, the appetite does not return, lassitude, slight headache, and giddiness are experienced, with occasional chills and perspirations; and probably some local complication has occurred. When cerebral symptoms supervene towards the period of crisis of the primary fever, the intermission may not be well marked. In both these classes of cases, which, however, are unfrequent and exceptional, the primary fever has a more protracted character. There can be little doubt that instances of relapsing fever of prolonged duration have occurred in the numerous epidemics that have been recorded in this country, but the attention of observers has not been specially directed to them. The cases of lengthy duration, alluded to by McDonell, Eyre, Lyell, and others, probably were of this nature.

In numerous cases, the intermission is followed by permanent convalescence, not interrupted by a recurrence of the fever.

After a longer or shorter interval of freedom from fever, as above detailed, the fever returns abruptly, and in many cases with a rigor. None of the observers have met with any premonitory symptoms beyond a persistent frequency of the pulse, which indicated the return of the febrile condition; while several have noticed that the health seemed fairly established, and, in the case of soldiers, the patients were on the eve of returning to duty, when the relapse would come on quite unexpectedly. The second attack may be of the same character as the primary fever, but generally it is milder, though occasionally more severe. Twining states that he found the relapse to be milder, with less pain, and the cessation of fever was less abrupt. McDonell observed the relapse to be sometimes the same

as the primary fever; but at other times an intermittent primary fever would become remittent in the relapse; but generally the relapse was intermittent fever, ushered in with a rigor. This author met with some instances in which the return of the fever was attended with great oppression, amounting to apparent insensibility, which continued for two or three hours. At one period of the Goomsur epidemic of 1847, after it had been going on for several months, Eyre found that the relapses after intermittent primary fever, were frequently of the graver forms of remittent and continued fever; and even when the relapses were also intermittent, serious complaints, such as enlargement of the spleen, occurred in them. And in the Eusufzai epidemics of 1853, Lyell and Farquhar observed, that the relapses were attended with serious derangement of the bowels and rapid emaciation. As a broad rule, however, the relapses were of a milder nature, especially in the more recent epidemics recorded. Sometimes the second attack causes so little inconvenience to the patient, and is so faintly marked by objective symptoms, that it is apt to be entirely overlooked, unless the observer employs a thermometer. In the eruptive epidemic at Calcutta, in 1853, the relapse was evidently not well marked in the cases that came under the observation of Edward Goodeve, who wrote, "there was at times a degree of febrile excitement, as evidenced by warm perspiring skin and quick pulse, though the dry heat and more marked symptoms of pyrexia had subsided."

A relapse, however, is not invariable; and on the cessation of the primary fever, convalescence may become permanently established. By computation of the cases recorded by various authors, Murchison has ascertained that of 2425 cases, relapses occurred in 1701, or in upwards of seven-tenths; while in the remaining three-tenths, no febrile symptoms, even of the slightest nature, followed the subsidence of the primary attack. In the Umballa epidemic of 1866, out of 124 cases observed by Bateson, seventy-nine, or three-fifths, relapsed. Of the seventeen cases observed by Hugh Clark, in two no relapse occurred. In the Mainpuri epidemic, of 1836, according to McNab,

few or no relapses occurred; but it is probable that on this point, the observation of the narrator was defective. All the writers who were aware of the nature of the fever which they were observing have recorded that relapses, though frequent, have not occurred in every instance. In the Mooltan epidemic, of 1868, the non-occurrence of relapses was exceptionally unusual; and Gray remarks in his account of it, that "the rule was, that whoever had one attack had also a relapse."

The duration of the relapse in ordinary cases rarely exceeds four or five days, and sometimes it is not more than twenty-four hours, and occasionally not longer than a few hours. Twining found the average duration to be three or four days; and in ten cases which recovered under Hugh Clark's observation, the relapse averaged 4·2 days; the longest period having been five days, and the shortest three days. In addition to the above, however, Hugh Clark notes that in one case, which he regarded as non-relapsing, fever occurred on the fifteenth night, but it left in the morning. The duration of the relapse in the Mooltan epidemic, of 1868, according to Gray, was from two to five or six days. Twining alludes to one of his cases, in which the relapse was of the bilious remittent form, and continued for eleven days. It is not improbable, considering the general non-acquaintance with the disease in this country, that instances of prolonged duration of the relapse in many instances had not been noted. Dr. Lyons, of Dublin, states that he met with cases in the Crimea, in which the relapse was protracted to twenty-one days; and similar instances might be supposed to have occasionally occurred in this country, in which the specific fevers display some anomalous characters. I have not, however, observed in any of the cases that came under my notice since 1864, a single instance in which the relapse was of more prolonged duration than the primary fever.

Occasionally second relapses occur, of very much the same character as an ordinary first relapse. Indian observers have not made accurate observations regarding subsequent relapses. Of the seventy-nine relapses noted by Bateson in the Umballa epidemic of 1866, fifteen

relapsed a second time. In the Eusufzai epidemic of 1854, Farquhar states that second relapses occurred on the twenty-eighth or thirtieth day of the illness. Many observers have recorded more than two relapses. McDonell notes the fact that relapses occurred to the sixth time in the Kimedy epidemic. In the Poona epidemic of 1836, R. H. Hunter states that the relapses were very frequently repeated. Maxwell, in the Dera Ghazee Khan epidemics, observed relapses for the third time, and many of them in the intermittent cases. De Renzy has observed even a fifth relapse. In 1866, the sub-assistant surgeon of Midnapore, whose name Dr. D. B. Smith has omitted to mention in his Sanitary Report for 1868, observed three cases of relapsing fever, in which a third, fourth, fifth, and even a seventh relapse occurred at intervals of a fortnight.

In some of the epidemics recorded by Indian writers, relapses have apparently not occurred, or rather, no statement regarding them is to be found in the accounts. In all such epidemics, I have, on reasonable grounds, attributed the omission of mention of relapses merely to want of observation. The eruptive epidemic which occurred in Calcutta in 1828, was described by three writers: viz., by Twining, Mellis, and Cavell. The two latter make no mention of relapses, while Twining does. In the same way, some symptoms which are well known as usual in relapsing fever are not recorded by Twining, but the other two writers have supplied the omission. Thus, the short duration of the fever, constipation, and epistaxis, are characters of relapsing fever noted by Cavell and Mellis, but not by Twining. In the Mercara epidemic of 1842, which apparently was entirely intermittent in character, though of unusually severe nature, and the complications of which were set down by Lawrence as primary diseases, he remarks quite casually, there was a remarkable tendency to relapse in cases of fever, as well as of rheumatism, anasarca, and partial paralysis. In the description of the epidemic in the Bareilly jail, in 1837, Guthrie has altogether omitted to speak of the occurrence of relapses. But in his account of the measures adopted by him for the suppression of the disease, he fully supplied the omission. He says,

that on patients becoming convalescent in the prison-hospital, they were removed to a large bungalow outside the jail, where they remained for some days. The jemadar in charge of them was cautioned to send them back to the jail hospital the instant the fever relapsed. From the above convalescents a second selection was daily made, and the men selected were removed to a second bungalow; and, says Mr. Guthrie, if these did not in five or six days suffer a relapse, they were considered cured. The tendency to relapse was so great and frequent, that Guthrie was obliged to take practical measures regarding them; and yet it is remarkable that he omitted to notice this peculiarity in his description of the disease. In the description of the Tatta epidemic of 1839, Inglis omits altogether to mention the recurrence of the fever; but in his account of the medical history of his regiment, he relates that on its departure from Tatta, he yielded to the entreaties of many of the men, who were convalescent from fever, to be allowed to accompany the regiment; and that he regretted having done this, as a number of them suffered relapses, and a few of these died. It would appear that some of the old writers regarded the relapse as a distinct and separate attack of illness, and not, as we now regard it, as a part of the same illness as the primary fever; and for this reason, probably, those writers considered it unnecessary to connect the relapse, or second attack, with the first illness.

Others apparently regarded the primary fever and relapse as the same illness, and the intermediate interval of freedom from fever was attributed to good therapeutic treatment. The short duration of the primary fever, the want of uniformity in the duration of the intermission, or in the period of the relapse, the not uncommon non-recurrence of the fever, and its milder character when it did return, were circumstances which naturally gave support to this view. Mercurialisation, for instance, was considered a certain mode of subduing fever; and the natural cessation of the fever, which is of short duration, was attributed to its beneficial action. The return of the fever after a few days, a week, or a fortnight, of exemption, was naturally laid to the account of the influence of mercury passing off.

Thus McDonell states, "while the system was under the influence of mercury, the paroxysm of fever was arrested; but no sooner did its effects wear away, than the fever returned with its former virulence." R. H. Hunter was under a similar impression. He says, "when the mouth was made sore by mercury, then an apyrexial period occurred; and if quinine was then administered, convalescence ensued rapidly; but if not, they were almost certain to relapse as the mercurial action wore off."

Others appear to have regarded the relapse as due to ordinary causes, such as excessive indulgence in food, exposure, or the presence of inflammatory diseases, as dysentery, or to old age, to which Beattie attributed it in some of his cases; and the describers of the Mauritius epidemic of 1866 considered the relapses to have been caused by a fall of temperature.

The remarkable liability to recurrence of this disease manifestly struck some minds more forcibly than others. McDonell has drawn a striking comparison between the fever which broke out amongst the troops in Kimedy and the ordinary fever of the population of Chicacole; and, to him, the tendency to relapse appeared to be peculiarly distinctive of the former, and he accordingly directed special attention to it. Others have alluded to it more or less prominently, while some have overlooked it altogether. Amongst the latter appear many of the systematic writers, in whose descriptions one of the most remarkable features of a disease that has been more common and destructive in this country than any other, is only casually mentioned. A recent author, Dr. Peet, of Bombay, has noted the liability of the intermittent variety to relapse. He says: "Persons who have suffered from intermittent fever, and have been, to all appearance, cured, are liable to recurrence, in the form of a few paroxysms, or, it may be, of a single paroxysm. These attacks sometimes observe regular periods."* Twining, in his work on the Diseases of Bengal, does not allude to relapses, although his remittent

* "Principles and Practice of Medicine," by John Peet, M.D. Bombay, 1864.

fever of the rains was undoubtedly relapsing fever. In his paper, called "Some Account of the Fevers of 1833," published in the seventh volume (1835) of the *Transactions of the Medical and Physical Society of Calcutta*, the following remark occurs:—"On the treatment of the intermittent fevers of this season, I have only to observe, that the cases have been tedious and relapses frequent." In speaking of the improper practice of captains of ships, who removed their sailors too soon from hospital, he says, "the consequence was, that many of those poor people had repeated relapses of fever; some of them returned to hospital three or four times." He has thus quite accidentally recorded the actual occurrence of a remarkable feature of his remittent fever of the rains, which he failed to mention in his systematic work. As I have already pointed out, Twining likewise mentions the occurrence of relapses in his account of the eruptive epidemic of 1824.

The termination of the relapse is sometimes marked by perspiration or other evacuation, but not generally of so abundant a character as to have attracted special notice. Hugh Clark observed second crises by perspiration in the Buxar epidemic of 1868, but other writers are silent on this subject. On the cessation of the relapse, permanent convalescence generally sets in. All the writers concur in describing the convalescence as slow and tedious, attended with pains and aching in the joints, and other distressing symptoms. It is sometimes interrupted by secondary relapses, or protracted by the occurrence of various complications.

In ordinary circumstances, when there has been only one relapse, Murchison fixes the total duration of relapsing fever at about three weeks. Twining states that in about a month the patient was able to say that he was quite well. Farquhar found the convalescence in the Eusufzai epidemic of 1854 to have been unusually slow, and health not fully restored till after six weeks. In the seventeen cases observed by Hugh Clark, the average duration of the entire illness was 18½ days, the longest being 20 days, and the shortest 16 days.

SECTION VII.

Complications and Sequelæ of Relapsing Fever.

Indian writers in general have not fully entered into the complications and sequelæ of relapsing fever, although it is probable that the great mortality which has attended the disease was due to the occurrence of serious secondary disorders in its naturally mild course. A fair amount of information on this subject can, however, be gathered from the accounts, although much more precision is desirable. Care has been taken in this section also to point out the special complications which are rare or have not been observed in the course of the disease as it occurs in Europe, but which have been observed in this country, more or less frequently, in the various epidemics which have been recorded.

The respiratory organs are often implicated in the course of relapsing fever, the bronchi being the parts most commonly affected. Sometimes the bronchial symptoms are so prominent, that a few writers have named the disease after this complication. Thus John Adams called the Calcutta epidemic of 1828, "bronchitic fever of young children and infants"; and R. H. Hunter named some of the cases in the Poona epidemic of 1836, "catarrhal fever." In addition to the above, bronchitis has been more or less observed in other epidemics, especially in the following. Mellis met with it in the eruptive epidemic at Calcutta, in 1824; Mouat, in the Berhampore epidemic of 1825; Mac Nab, in the Mainpuri epidemic of 1836; Guthrie, in the Bareilly epidemic of 1837; Shirreff, in the Paniput and Rhotuck epidemics of the same year; Inglis, in the Tatta epidemic of 1839; Graham, in the Candeish epidemic of 1839; Eyre, in the Goomsur epidemic of 1847; Edward Goodeve, in the eruptive epidemic of 1853; and Gray, in the Mooltan epidemic of 1868. In the epidemic in the 20th Regiment, in 1864, it was the chief and most frequent complication. Usually the affection is slight, and causes no more inconvenience than a cough. Not unfrequently,

however, it assumes formidable proportions, and may be the chief cause of the mortality, as in the epidemic described by John Adams. The source of danger is the copious secretion, which the patient is unable to cough up; and the constant and violent efforts to do so exhaust his strength. In several cases which occurred in the epidemic in the 20th Regiment, the secretion was so considerable as to threaten suffocation; and the complication was one of a very serious nature. The bronchial affection was of a most intense character in the Candeish epidemic of 1839, described by Graham. The air-cells were ruptured from the violence of the cough, and air escaped into the cellular tissue of the thorax, forming emphysema of the face, neck, and upper part of the thorax.

The season of the year appears to have much influence in the causation of bronchitis as well as of pneumonia. The catarrhal symptoms in the Poona epidemic of 1836 preponderated during the continuance of the monsoon, and abated on the return of dry weather.

Pneumonia apparently occurs less frequently than bronchitis, and is a rare complication. It is seldom alluded to; but this might be due to its having been overlooked, or cursorily spoken of as cough, pain of the chest, or difficulty of breathing. Murchison states that, according to Jenner, it is the next most common complication after enlargement of the liver and spleen. This does not appear to be the case in this country. R. H. Hunter met with one case; MacNab and Gray and a few others also observed some cases. I have rarely seen this affection in connection with relapsing fever. This complication was frequently met with in the epidemic of 1870 in the Punjab.

Pleurisy, likewise, is a rare complication. Mouat and Eyre met with it.

Murchison states that *laryngitis* was observed by Smith in nine (of 1000) cases about the period of crisis. It is usually slight, but may require the performance of tracheotomy. Indian writers are silent regarding this complication.

Complications referrible to the organs of circulation appear to have been less frequently observed than affec-

tions of the pulmonary organs, in the Indian disease. Murchison states that sudden syncope comes on in some cases, and may prove rapidly fatal. The most extraordinary circumstance is, that it may happen quite unexpectedly in cases previously mild, and may terminate in death within a few hours after the patient has been looked upon as in no danger. It may occur in the primary fever, in the intermission, or in the relapse. Occasionally the syncope is due to hæmorrhage; but in the majority of cases there is nothing to account for it, except, perhaps, protracted starvation before and during the fever.

Indian writers have not alluded to the occurrence of this accident, except Hunter, who mentions the case of one man, in a weak state, who died suddenly after a drink of water. In the Moradabad epidemic of 1836, Spencer speaks of collapse having been rather frequent, attended with cold and clammy skin, low delirium, and sanguineous evacuation.

Palpitations are sometimes complained of during convalescence, according to Murchison. Some of the Indian writers speak of increased action and irritability of the heart, and attribute it to pericarditis or carditis. McDonell states that in his severest cases there was great irritability or throbbing of the heart, with effusion, or threatening of effusion, into the chest, a symptom which appeared generally after the fever had left, but sometimes suddenly during the course of it. Most of the fatal cases were caused by effusion into the chest. In the Mercara epidemic of 1842, Lawrence says that in the cases that proved rapidly fatal there was effusion into the pericardium. In the Mangalore epidemic of 1845, the same author again found effusion into the pericardium; and in his medical history of the 34th Regiment, or C.L.I., he speaks of carditis as a separate disease, occurring in the course of the epidemic; but it is probable that it was a complication of the fever. He describes the heart's action in these cases as a forcible and confused or fluttering motion. Hunter, likewise, speaks of difficulty of breathing, with and without swelling of the chest, having been observed in some of the epidemics on board the Indiamen. It will be remembered that one of the medical officers of the emigrant ships was inclined to

regard the disease which appeared amongst the coolies in 1864 and subsequent years, as an epidemic of pericarditis, although there is no doubt that the disease was relapsing fever. The subject requires some attention and accurate observation in epidemics that might hereafter occur.

A common symptom is hæmorrhage from various parts, epistaxis being the most common of all. In the cases observed by Stevenson in Arracan, in 1825, hæmorrhage took place, not only from the nose, but from the ears and mouth; and it is probable that the black vomit which he speaks of was due to hæmorrhage from the stomach. Spencer met with collapse, apparently due to sanguineous evacuation, probably from the bowels. In the Candeish epidemic of 1839, Graham has recorded hæmorrhage from the nose and throat. In the Eusufzai epidemic of 1852–53, Lyell observed a tendency to bleeding from the gums, which were swollen and spongy; and often hæmorrhage from the bowels and nostrils. Bateson met with two cases of hæmorrhage from the bowels in the Umballa epidemic of 1866; and it is probable that the cases of hæmorrhagic flux recorded by Udoy Chund Dutt, as observed by him during the Orissa famine of 1866, occurred in the course of relapsing fever, as already pointed out in page 81. Other writers have recorded the appearance of hæmorrhage from various parts; but not one, apparently, has observed the occurrence of hæmorrhage from the uterus. A soft spongy state of the gums, with tendency to bleed, has been observed by Gray in the Mooltan epidemic of 1868; and in a few of the cases which occurred in the 20th Regiment, in 1864, the same symptom was present. In the Hydrabad epidemic of 1843, H. J. Carter states that the fever frequently commenced with vomiting of blood, and sometimes terminated with a discharge of blood from the anus.

Complications referrible to the nervous system appear to be not uncommon in the Indian disease, though, according to Murchison, only rarely observed in the European disease. In the Kimedy epidemic of 1833, McDonell met with two cases in which paralysis supervened, and in one of these there was also anæsthesia or numbness; in both the paralysis occurred during convalescence. In the Mercara

epidemic of 1842, Lawrence says that several patients experienced loss of power and sensation in the lower limbs, and walked with a tottering gait, these symptoms being sometimes preceded, and sometimes followed, by œdema of the feet and hands. In the Mangalore epidemic of 1845, the same author found paralysis to be a frequent complication; and he further states that convalescence from paralysis was protracted and retarded by a temporary recurrence of the earlier symptoms; whether these were increase of circulation, œdema, or febrile heat, the paralytic symptoms were always increased at the same time. Eyre met with three cases of palsy, which were mistaken for beri-beri; all three proved fatal. In one case the paralysis occurred in the primary fever, in another during the intermission, and in the third case in the relapse. In the Umballa epidemic of 1866, Bateson found one of his two cases of hæmorrhage from the bowels, affected with facial paralysis. Gray likewise met with a few cases of partial paralysis in the epidemic in the Lahore jail, in 1864. Hugh Clark observed one case of dysphagia. In the *Indian Medical Gazette* for April, 1867, Garden describes eighteen cases of paralysis in children after fever. I consider the disease, from Garden's description, to have been relapsing fever, for the following reasons: the duration of the fever, from two to eight or ten days, is more consonant with the character of relapsing fever than of typhus or typhoid, the former moreover being rare in India and the latter rare in Upper India, where Dr. Garden's cases occurred. In his account of the Saharunpore epidemics of 1869–70, he states that the disease was of annual and constant occurrence in his district. It is probable that it was occasionally prevalent in 1866, in which year Garden made these observations. In the eighteen cases, paraplegia occurred in ten, paralysis of the left leg in one, of the right wrist in two, of the left arm in one, of the right arm in one, of the pharynx in one, and hemiplegia in two. All these cases occurred during convalescence. There was a natural tendency to recovery after an indefinite duration, but the more protracted cases became permanent.

The *muscular* and *arthritic pains* which are felt during

the continuance of the fever, continue on its departure, and often cause much suffering, but they cease on the strength being recovered.

One of the most remarkable features of relapsing fever, Murchison remarks, is the frequent occurrence during convalescence of a peculiar disease of the eyes, which is never met with after typhus or pythogenic fever. The disease, he continues, presents two distinct stages, the *amaurotic* and the *inflammatory*. In the first stage, the patient complains of dizziness of vision, of *muscæ volitantes*, and luminous stars. This stage is of variable duration; in some cases it commences with convalescence, or even before the cessation of the febrile paroxysms, and the inflammatory stage does not supervene for weeks or months; but still oftener the dulness of vision does not commence for several days, weeks, or even months, after the febrile attack, and is then almost immediately followed by the symptoms of inflammation. The amaurotic stage invariably precedes the inflammation, but occasionally slight amaurosis is all that is met with, no subsequent signs of inflammation manifesting themselves externally. As a rule, the inflammation commences from three weeks to three months after the cessation of the fever; occasionally its advent is protracted to four, five, or eight months after the fever; while Douglas mentions two cases where it happened as early as the second day of the relapse. The inflammation appears to commence in the retina, and from this to spread to the iris and sclerotic, the capsule of the lens, the choroid, and the lining membrane of the cornea; the conjunctivæ in general are but slightly affected. The inflammation is attended by considerable lachrymation, and by intense pain in and around the eye, aggravated during the night, and preventing sleep. The pulse varies from 84 to 120; rigors are frequent; the tongue is usually clean and moist. Recovery is tedious; in most cases two months have been necessary to effect a cure, and, unless carefully treated, the disease may terminate in permanent loss of sight. After the inflammation has subsided, the amaurotic symptoms continue for a longer or shorter period. The disease rarely attacks both eyes, and the right eye suffers more frequently than the left. Jacob

never met with a case in which both eyes were affected. Out of 105 cases recorded by various observers, the disease was limited to the right eye in 69, to the left in 23, and attacked both in 13. It occurs at all ages but most frequently between 10 and 30. Occasionally, the patient seems to have recovered from the effects of the febrile attack, before the ophthalmia commences, but far oftener a considerable degree of debility remains. Jacob and Mackenzie both state that the ophthalmia is most common in the poor, who had insufficient nourishment during convalescence; and the latter observes, that many of his patients were worn and extremely weak at the time of the attack. These observations point to insufficient nourishment as one of the main causes of the ophthalmia; and if this be so, the circumstance explains why the affection in question succeeds no other fever than relapsing fever. In many instances, exposure to cold seems to be the immediate exciting cause.

Indian observers have not made accurate observations regarding the ophthalmia that follows relapsing fever. In most of the accounts no mention is made of this sequela; and the reason is evident: viz., the writers either did not connect the ophthalmia, assuming that it did occur, with the fever, or the patient had gone away from observation long before the affection of the eyes set in. In all the accounts in which allusion is made to ophthalmia, it occurred in the course of the fever, or shortly after. Cavell has recorded a stiffness, soreness, and heaviness of the eyes, which rendered opening them painful, as a complication of the epidemic at Calcutta, of 1824, but there was no intolerance of light. Mouat likewise observed ophthalmia in the Berhampore epidemic of 1825. In the terrible epidemic of 1837, in the Bareilly jail, Guthrie states that sometimes the eyes became disorganized in the course of one night, the cornea protruding as in the eyes of a boiled fish. In the Umballa epidemic of 1866, Bateson met with ophthalmia in many cases. He says that it was of a peculiar nature; a little of the cornea-tissue proper disappeared, and the conjunctivæ over that place was seen loose and flaccid. It occurred during convalescence; and whenever the eye at

this period was found to be watery, an examination detected the incipient affection; in a day or two the resulting leucoma was very distinct. "The epidemic," Bateson states, "left its mark on many a prisoner by this ophthalmic leucoma." Gray found ophthalmia to be a common complication and sequela in the Mooltan epidemic of 1868, and in the Lahore epidemic of 1864 few escaped it; he attributed it to defective nutrition. Two of the seventeen cases observed by Hugh Clark suffered from ophthalmia, which apparently came on during the intermission. In the epidemic in the 20th Regiment, in 1864, a few of the sick suffered from simple conjunctivitis of a very mild nature. H. J. Carter mentions the occurrence of amaurotic affections during the great epidemic of 1843, at Hydrabad, in Scinde.

Affection of the eyes is not limited to relapsing fever, but has likewise been observed in typhus. In the epidemic of typhus in 1869, in the Rawul Pindee jail, sloughing of both cornea occurred in one case, slight ulceration in another, and circumscribed opacities formed in a few. The prisoners were well fed, and received every reasonable indulgence in food during sickness, but they were stinted of air. One of the cases, in which slight ulceration of the cornea occurred, was that of the sub-assistant surgeon, who contracted typhus from attendance on the sick. I have not observed amaurosis or retinitis in typhus; nor am I aware that ophthalmia in any form has been observed in this country in typhoid fever.

Macnamara attributes the following affections of the eye to "malarious fever," which, after comparing Indian with European observations, might safely be regarded as relapsing fever. The repeated attacks of such fevers, he states, produces a permanent "dyscrasia of the blood," which condition, though it might also arise from disease of the kidneys, appears to be an essential element in the history of all retinal cases. Hyperæmia of the retina is frequently met with among persons "who have imbibed a large dose of miasmatic poison." In these cases the retina almost invariably becomes œdematous, and is liable to be detached by the effusion from the choroid; there is hardly any continuous pain, the patient only complaining from

time to time of slight aching pain in the eye, and the gradually increasing loss of sight is the only constant symptom present. When the healthy eye of the native is examined with the ophthalmoscope, the retina appears of a uniformly bright slate or grey colour; but in this affection the retina appears of a crimson hue. With the exception of traumatic cases, inflammation of the retina or retinitis almost always depends upon "constitutional dyscrasia, induced by malaria, or some such poisonous influence." This disease generally commences with a throbbing, aching pain in the eyeball and temple: after a few days the pain increases, and is often very severe indeed. The patient also suffers from intolerance of light, and the appearance of flashes of light in the field of vision, and from lachrymation. From the commencement of the attack, there is more or less dimness of vision. If the inflammation be confined to the peripheral portion of the retina, the impairment of vision will be far less than if the region of the yellow spot be implicated. The tension of the eye-ball is generally slightly increased. In cases which are protracted and become chronic, or when the inflammation extends to the choroid, the lens and vitreous body are liable to become hazy. The vessels of the sclerotic and conjunctivæ generally become congested. Extravasation of blood is the most common accident in retinitis, and although the blood may be re-absorbed, the delicate nervous tissue is generally more or less deranged. "Neo-plastic formations" are also common, and if they become organized, the functions of the retina are destroyed in the situation of the newly-formed tissue, a scotoma or dark spot in the field of vision remaining. Lastly suppuration may occur as a consequence of inflammation; but this accident is very rare. The disease generally terminates in resolution, and ultimately the patient regains his vision, which may in time become almost as perfect as it was before the attack.

Macnamara further describes a class of cases in which impairment and even almost complete loss of vision after remittent fever, was due, not to hyperæmia or inflammation of the retina, but to mechanical interruption to the circulation of the blood through the retinal vessels. "On ex-

amining the patient's eyes with the ophthalmoscope," he says, "I discovered the optic discs to be of normal size and colour. The vessels of the retina were much contracted, and at the outer part of it a number of elongated black spots were noticed;" of which he gives a representation in his work. "Some of the black lines appeared to be the smaller branches of the arteries, which had been plugged with pigmentary matter. In many places, however, it was impossible to trace the atrophied vessels up to the point at which they had become occluded; whereas in other branches, small deposits of pigment could be detected actually filling up the vessels. . . . In some cases, in addition to the appearances above described, numerous small clots of blood were found scattered over the surface of the retina." This affection, which Macnamara styles melanæmia of the retina, was unattended with pain, or photophobia, or any external indication of disease of the eyes. A number of such cases came under his observation during the rainy months of 1864, at the Calcutta Ophthalmic Hospital, probably during an epidemic of relapsing fever, or Twining's remittent fever of the rains. He says, "these cases coming one after another, and each of them having a similar story to tell, of blindness supervening on repeated attacks of remittent fever, led me to think that the changes noticed in the eye must have arisen from the same cause, and one closely connected, in some way or other, with malarial influences."

A peculiar form of retinitis, producing fatty degeneration of the retina, called neuro-retinitis, and opacity of the vitreous body, are considered by Macnamara to be in some cases sequelæ of "malarious fever."*

It is also probable that night-blindness is sometimes a sequela of relapsing fever.

Affections of the organs of digestion are very frequently found to occur in relapsing fever.

In the epidemic at Edinburgh of 1817–19, Welsh states "in 181 of 743 cases, the fauces were more or less inflamed;

* "A Manual of the Diseases of the Eye," by C. Macnamara, Surgeon to the Calcutta Ophthalmic Hospital, and Professor of Ophthalmic Medicine and Surgery in the Calcutta Medical College: 1868.

but in most cases the affection was slight." Murchison has not recorded any further observation of this complication in the European disease. In this country pharyngitis has been met with not unfrequently, and has been noted by several observers. In the Bareilly epidemic of 1837, Guthrie states that sometimes severe pain in the throat was complained of. In the Paniput and Rhotuck epidemic of 1837, Shirreff found sore throat, with swelling of the lymphatic glands, a common complication in some villages, in the early days of the epidemic. It would appear that pharyngitis is more frequently met with in the eruptive fever: affection of the fauces has been noted by Kennedy, in the Guzerat eruptive epidemic of 1824, in which, in many cases, deglutition was painful; by Twining, in the epidemic of 1833, at Calcutta, who says that affections of the mucous membrane of the throat were severe, occasioning much hoarseness, and in some cases suppression of the voice: eruptions were observed in this epidemic. Edward Goodeve likewise states that the mucous follicles of the fauces became enlarged in the eruptive epidemic of 1853, and refers to a case observed by Dr. Shircore, in which the tonsils were ulcerated.

Dysentery and diarrhœa are common complications or sequelæ of relapsing fever, in both the European and Indian disease, and are among the chief causes of death. They have occurred, more or less, in all the epidemics, and in a few have been universal and prominent features. The eruptive form, though generally milder, is not exempted from the presence of these diseases, for they were observed by Twining, Mouat, and Edward Goodeve, in the epidemics recorded by them. The latter gentleman also observed one case in which vomiting and purging of rice-water stools occurred. Diarrhœa is much more common in the non-eruptive fever, and this is often the cause of a fatal termination. It may occur in the course of the primary fever, as in the Dera Ghazee Khan epidemic of 1855, in which Maxwell found it to supervene on the fourth or fifth day, earlier in bad cases, and accompanied by gurgling on pressure. Sometimes diarrhœa occurs on the termination of the fever, as a critical discharge, as observed by Gray

in the Mooltan epidemic of 1868. Generally, however, it occurs in the relapse, or during convalescence. It is of all degrees of severity, and no age is exempt from it; but probably those who were previously in a debilitated condition of health are more liable to it than the robust. Dysentery is a far more serious complication than diarrhœa, and, like it, generally occurs during or after the relapse; though it is liable to occur during the primary fever, as well as in the intermission. It is often of a very intractable nature, becoming chronic, wearing the patient down to a skeleton, and ultimately destroying him. Anatomical lesions of the large intestines of considerable extent are found after death. In some of the epidemics, the majority of the fatal cases appear to have been due to the occurrence of diarrhœa or dysentery.

Murchison states that peritonitis is a rare complication, and is always fatal. Of 2846 cases of relapsing fever treated in the Glasgow Infirmary, seven died of this affection. It has been known to occur as early as the sixth, and as late as the thirty-eighth day. In this country this complication has not been observed, but it was probably, in some cases at least, overlooked; as an insidious form of peritonitis, unattended with symptoms, and causing no prostration whatever, but proving fatal in two or three days, has been stated to be occasionally met with in India: the existence of the disease during life being ascertained at the *post mortem* examination of the body.

Lumbrici, or round worms, are not unfrequently found associated with relapsing fever, but in all probability they had previously existed in the intestines.

Complications referrible to the integuments are the following. Erysipelas is an occasional sequela of relapsing fever, and sometimes proves fatal. The cases observed by Professor O'Shaughnessy, and referred to by Edward Goodeve, of erysipelas of this form in the eruptive fever, are the only recorded instances of erysipelas in the Indian disease.

Œdema of the lower extremities is not an uncommon sequela, although several epidemics were apparently quite exempt from it. It sometimes sets in early in the disease,

after a few days of fever, but more commonly after repeated relapses. It appears to depend on debility of the organs of circulation, perhaps on fatty degeneration, or an impoverished state of the blood; and is chiefly met with amongst persons who had been starving, and subjected to exposure before or during the attack. It is usually slight, but might be considerable. Œdema is sometimes found in the hands, and occasionally the whole body may become anasarcous. General dropsy was apparently a rather common and prominent symptom in the epidemics which occurred on board the Indiamen, but it has been rarely observed in the later epidemics. The face in these cases becomes puffy. Effusions of fluid likewise occasionally occur into the joints, chiefly the knees and ankles, and also into the pleura and pericardium; and in the latter cases death rapidly ensues. The slighter forms of œdema disappear on the recovery of the strength; and the more extensive effusions, when not fatal, seldom last longer than two or three weeks. Sometimes the œdema disappears, and returns with the relapse.

Gangrene, from pressure or bed-sores, is of very rare occurrence in relapsing fever, in consequence of the short duration of the disease. Spontaneous gangrene, independent of pressure, has been occasionally observed, but it is perhaps restricted to persons whose general health had been previously indifferent, or broken by protracted privation. In such persons, rapid disorganization of the eyes, sloughing of blistered surfaces, and of various parts of the body, have at times been observed. Bateson, in the Umballa epidemic of 1866, met with two cases of spontaneous sloughing of the back of the leg.

Cutaneous eruptions, which may be regarded as accidental, and not peculiar to the disease, are met with. Murchison mentions the following. The frequent occurrence of herpetic eruptions around the mouth and nose was noted by Perry at Glasgow and Arnott at Dundee, especially about the period of relapse. In a few cases Cormack observed a pustular eruption around the mouth, immediately after, or simultaneously with, the crisis. Wardel mentions an instance where several bullæ, containing a

sanguineous fluid, appeared over the body. The patient died of uræmic symptoms, and urea was found in the blood. Another case is mentioned by Douglas, where the fever was followed by an abundant eruption of lichen.

Indian observers have not in general paid much attention to cutaneous symptoms, though their occurrence might be supposed in a warm and variable climate, prolific of anomalous eruptions, to be not uncommon. The formation of large watery vesicles on various parts, forming ulcers on bursting, and even giving rise to serious sloughing, was observed by Mouat in the Berhampore epidemic of 1825. Edward Goodeve met with vesicles on the face, an unusual locality; and Minas saw miliary vesicles break out all over the body, in the Bhutty epidemic of 1855. The affection called pemphigus is also occasionally seen in relapsing fever, and Mouat's cases were probably of this nature.

Boils sometimes break out over the body during convalescence, and may cause considerable annoyance, and even retard recovery. The reader will be reminded of the remarkable eruption of boils which broke out on the bodies of Mr. Holwell and his fellow-sufferers on the subsidence of fever, after the Black Hole catastrophe. Abscesses, also, of greater or less extent, occasionally form in the cellular tissue in various parts of the body, but chiefly in the perinæum.

Inflammatory swellings or buboes, according to Murchison, are only occasionally met with in the European disease. In this country, however, they appear to have occurred not unfrequently, and have been recorded by several observers. The glands chiefly affected were the salivary glands, the parotid, sublingual, and submaxillary, and occasionally the femoral and inguinal glands; and other lymphatic glands, such as those in the axilla and in the neck, were occasionally implicated. Swelling, followed by suppuration of the lymphatic glands generally, was common in the Eusufzai epidemic, recorded by Lyell and Farquhar. Mellis observed an instance in which one testicle swelled; and this author likewise met with instances of salivation consequent on swelling of the salivary glands,

although no mercury had been given. In the Mooltan epidemic of 1868, Gray met with numerous cases of abscess of the parotid or sublingual gland. These cases generally turned out badly. There was rapid inflammation, followed by sloughing, even though early incisions were made, debility increased, and death took place in a few days. Such untoward consequences of affection of glands are probably consequent on protracted privation. In general, these complications do not give rise to much constitutional disturbance. In all the cases of relapsing fever that came under my own observation, I have never seen the salivary or lymphatic glands in any way implicated; except, perhaps, the suppression of the function of the former, inferred from the dry state of the mouth.

The complications referrible to the uterine system are the following, according to Murchison. Menstruation may occur at any stage of relapsing fever; at the termination, it is sometimes profuse and apparently critical; and occasionally on the invasion of the fever, severe menstrual discharge has been observed to take place by Jackson. The almost invariable occurrence of abortion, no matter at what period of pregnancy, is a very remarkable feature of relapsing fever. Of thirty-six pregnant females who took the fever, under the care of Smith and Jackson, all miscarried but one. According to Cormack, abortion occurs most frequently in the relapse; but Jackson in one group of cases, observed it to be a more frequent accident in the primary fever. Occasionally abortion takes place as early as the second day of the fever. Delivery is sometimes followed by copious hæmorrhage, or by rapid sinking and death; but as a rule, the mother recovers, but the child, even when pregnancy is far advanced, is always still-born, or only survives a few hours. Murchison points out that the almost invariable occurrence of this accident distinguishes relapsing fever as a separate disease from typhus, of which it has been supposed by some, to be a mild variety. In the latter disease, abortion is the exception, and when it occurs, the child, if near the full time, usually lives.

Indian observers have apparently not had much oppor-

tunity of witnessing the influence of the disease on the uterine system. Duncan Stewart states the re-establishment of menstruation was the first sign of recovery from the fever in females. With regard to the occurrence of abortion, this accident would appear to be unusual in the eruptive disease. Twining found an absolute absence of the tendency to abort in any stage of pregnancy, in women who suffered from even severe attacks of the disease. Regarding the occurrence of abortion in the non-eruptive fever, Indian writers are silent.

There are no observations regarding the influence of the disease on the male organs of generation, except the fact recorded by Mellis, that in one instance the testicle became swollen and painful. I have heard the statement made that in the villages bordering on irrigation canals in Northern India, the men become impotent after suffering from repeated attacks of fever. I consider it highly probable that the form of the fever prevalent in these villages is relapsing fever, mainly of the intermittent variety. The subject has not been investigated, and there are no facts upon which definite conclusions might be grounded. The relation between the food supply and increase of population is well known to political economists; and naturalists are aware of the fact that ill-fed animals are feebly prolific; but the subject has not been studied by pathologists in connection with the influence on procreation of relapsing fever, a disease due to defective nutrition. The women in irrigation districts are not sterile.

SECTION VIII.

Varieties of Relapsing Fever.

There are many varieties of relapsing fever according to its degree of severity, or the presence of certain symptoms or complications. The most formidable is the variety which terminates suddenly by syncope, of which, however, there is only one instance on record, casually mentioned by

Hunter. The next most formidable variety is characterized by delirium, stupor, subsultus, coma, or convulsions, or "the typhoid state." A third very distinct variety is marked by jaundice, and of this two forms occur: in one the yellow discolouration is slight, probably only observable in the conjunctivæ, or slightly over the skin, causing in Europeans, or fair natives, in some instances a muddy or bronze tint; in the other form, the colour of the skin is a bright yellow, perceptible in every part of the surface of the body, and sometimes even approaching in hue to a blackness, and the fluids, secretions and excretions, such as the saliva, the urine, and serous effusions under the cuticle, likewise become discoloured yellow. The cases in which the duration of the primary fever is unusually short, or of moderate length, or exceptionally protracted; in which the intermission is short or long; in which no relapse occurs; in which one relapse, or in which several relapses occur,—might also be regarded as varieties. Another, but small group, in which the intermission is not well marked, and the primary fever is unusually protracted, might be looked upon as a distinct variety. The class of cases, occurring epidemically in this country, in which a copious scarlet eruption appears, forms a neat and well-marked variety of relapsing fever, of which additional peculiarities may be stated to be the rarity of the co-existence of jaundice and of the accident of abortion in females. Some epidemics have been characterized by diarrhœa and dysentery, and these complications may thus be looked upon as forming the peculiarities of another variety. In other epidemics, again, such as the Calcutta epidemic of 1824, described by John Adams, and that which occurred in the 20th Regiment in 1864, bronchitis was a very prominent affection; this complication may therefore be taken as the basis of a distinct variety. The occurrence of paralysis, in like manner, distinguishes some cases of relapsing fever, and of them a special form of the disease might be made.

The Bengalees have distinguished a form of relapsing fever, which appears to be geographically limited to Lower Bengal, to which they have assigned the name of *nakra*, or *nasa*, which literally means the nose disease. The

following account of it is condensed from Twining's work on the Diseases of Bengal. "It usually commences with a sensation of pain and distension within the nose, attended by extreme pain in the back of the neck, a hot forehead, and excessive weariness and pain in the loins, and in all the joints. In a few hours, the pains are much augmented in the frontal and superior maxillary sinuses, and in the nose; but the headache and pains in the back and limbs are not at that time moderated. The eyes soon become red, a strong light is irksome; and much prostration of strength takes place. The thirst is usually very distressing; and the sufferings of the patient in the majority of cases so severe, that he is soon obliged to relinquish his usual occupations, and lie down. The pulse is in general rapid, but seldom very full or hard. It has been observed, as frequent as 128, in a slight-made elderly Hindoo, within three hours after the first sensation of uneasiness had commenced in the back of the neck and interior of the nose. The respiration is hurried, but not laborious; and there is much anxiety, especially when the patient stands in the erect posture. If we look within the nostrils, the Schneiderian membrane will be observed much swollen and inflamed. In a few rare instances, the complaint begins with a bilious vomiting. A burning heat of all parts of the body continues for two or three days, and seldom terminates by a critical perspiration. The ordinary duration of the disease is from three to five days. It attacks both Hindoos and Mahommedans; and slight-made persons do not seem more exempt from it than those of a robust habit. Women suffer from this disease more rarely than men, and it is very seldom observed in children below ten years of age or in men much above forty-five. Some Asiatics are never attacked during their whole lives; while others have had this fever severely once a fortnight for three or four months, and then were free from the disease for many years. More commonly those who have had the disease twice, are seldom exempt from its return annually for several years; but these attacks do not observe any regular periods. The nakra occurs at all seasons of the year; but it is more common at the latter

end of the hot weather, and during the rains, than at any other time." Twining perceived the similarity between this form of relapsing fever and the eruptive fever which occurred epidemically at Calcutta, in 1824. He never knew a case to terminate fatally, except when cerebral symptoms supervened: a form of the disease to which the Bengalees apply the name of *biggar*. I have met with only a single case of nakra, which occurred in the person of my bearer, a native of Oude. He was attacked at Calcutta, in the month of July, 1870, with continued fever, which endured for seven days, and was attended with slight pain in the upper portion of the nose and forehead, a copious discharge of mucus from the nostrils, considerable debility, some wasting, and excruciating pain in the back of the neck, in the loins and lower limbs, especially the ankles. There was then a complete intermission of the febrile symptoms, but the pains were felt, gradually decreasing in severity, for about eight days longer. A fortnight after, the relapse took place, and all the symptoms of the original attack returned. After five or six days the fever left, but the pains were felt for a few days longer. He recovered, and continued in fair health for nearly a full month, when he was again seized with severe pain in the back of the neck and in the loins, and a copious discharge from the nose, unattended with pain in that organ, but there was no fever. These unpleasant symptoms endured for four days, and the bearer has never since been troubled with nakra: quinine was given in this case, *secundem artem*, but was of no use.

The thermometrical phenomena of relapsing fever supply at least three definite varieties, namely, the intermittent, remittent, and continued. In the first two, the primary fever exhibits the peculiarity of a periodical complete intermission of the febrile heat, or of a remission or marked duration of it. The intermittent form may have the intermissions daily, in which case it may be styled quotidian; or on every second, or even third day, which sub-varieties may be styled tertian or quartan. In the two latter the primary fever might be protracted. The three primary thermometric varieties intermix and run into each other in

numerous instances. The primary fever may begin as intermittent and become remittent or continued, or *vice versâ*. The relapses also exhibit the phenomena of a varying range of temperature, and might be intermittent, remittent, or continued. In general the relapse is of the same form as the primary fever, but not always. An intermittent relapse might follow a remittent or continued primary fever; and a remittent or continued relapse has also been observed to succeed a primary intermittent fever. The range of daily temperature is an index of the degree of intensity or severity of the disease, the intermittent form being the mildest, and in ordinary circumstances rarely fatal. The frequent recurrence of relapses, however, to which this form is prone, might greatly reduce the strength, and render the supervention of complications a serious accident; so that in a poor population, as pointed out by Bellew, this mild form of the disease, actually in the long run fills as many graves as the more severe remittent and continued forms. In the Hydrabad epidemic of 1843, the frequency of relapses proved very destructive amongst the native troops of Sir Charles Napier.

SECTION IX.

Diagnosis of Relapsing Fever.

It is necessary in this country to discriminate relapsing fever generally from typhus, typhoid, and simple fever, and rheumatism; and some forms of it from icterus, or simple jaundice, from measles, scarlatina, and small-pox.

Typhus and relapsing fever generally prevail together in European epidemics, and it is probable that in some epidemics in this country, such as the Eusufzai epidemic of 1853, described by Farquhar, and the Calcutta epidemics of 1864, described by Partridge and Chuckerbutty, there were many cases of typhus interspersed. Considering the amount of crowding in Indian prisons, I cannot divest myself of the belief that the epidemics that occurred in

them consisted of a mixture of typhus and relapsing fever. The two diseases are very different, and the characters that distinguish relapsing fever from typhus are mainly the following :—

(*a.*) As a broad rule, the fever is of short duration, generally from five to seven days; while typhus, on the average, endures for fourteen days. Exceptionally short duration of typhus, from seven to ten days, was not unfrequently observed in the epidemic in the Rawul Pindee jail, in 1869. Relapsing fever can be discriminated from such short cases of typhus fever, by the following additional features.

(*b.*) The frequency of jaundice, of vomiting, and of tenderness and enlargement of the liver and spleen.

(*c.*) The presence of epistaxis and other hæmorrhages. It should be borne in mind, however, that hæmorrhages occur in typhus when scurvy is present.

(*d.*) The severe muscular and arthritic pains.

(*e.*) The rarity of delirium and other cerebral symptoms.

(*f.*) The occurrence of retinitis as a sequela.

(*g.*) The subsidence of the fever is not in every case followed by permanent convalescence, but generally, after an intermission of varying duration, a relapse takes place; while in typhus a relapse of the same kind is rarely or never seen.

(*h.*) The absence of that heaviness or stupidity of countenance, so characteristic of typhus. The much greater frequency of the pulse, as early as the second day of the disease.

In addition to the above distinctive features, which are taken from Murchison's work, this author likewise mentions the following, regarding which, however, it should be remembered, that observations bearing upon some of them are wanting, and that the others are of doubtful applicability to the graver forms of relapsing fever and to typhus, as both these diseases have been observed in this country.

(*i.*) The suddenness and severity of the primary rigors.

(*j.*) The frequent occurrence of an anæmic cardiac murmur, and the absence of the cardiac phenomena indicative of the softening of the left ventricle.

(*k.*) The greater heat of skin, and the absence of the typhus eruption. A degree of heat exceeding that in typhus has not been recorded in this country. It should also be remembered, that the typhus eruption is rarely met with in this country. In the typhus epidemic of 1869, in the Rawul Pindee jail, I saw the eruption in a very few instances of the disease, and late in the epidemic; in the preceding and minor epidemic of 1867, a larger proportion of the patients had the characteristic eruption. I have not seen an eruption in the few instances of typhus that I have met with in Calcutta. The eruption of relapsing fever might be distinguished from the typhus eruption by its scarlet colour, its disappearance under pressure at every stage of its persistence, its transient duration, and its abundance on all parts of the body. From the recorded evidence, it would appear that an eruption in relapsing fever has been a more frequent occurrence than an eruption in typhus.

(*l.*) The invariable occurrence of abortion in pregnant females. As I have already pointed out, abortion is a rare accident in the eruptive fever, and there are no observations regarding its occurrence or non-occurrence in the non-eruptive fever.

(*m.*) The remarkable difference in the rate of mortality, which in typhus is in proportion of one out of every five persons attacked, and in the Irish epidemics it even exceeded one in three; whereas in relapsing fever, the proportion is one in twenty-one attacked, and in some epidemics even less. I shall hereafter show that the rate of mortality in this country, hardly affords a means of distinguishing relapsing fever from typhus.

As a rule, the characters of the two diseases are so distinct that there is no difficulty in discriminating the one from the other. But, as Murchison has pointed out, cases occasionally occur in which the resemblance to typhus, when the patient is first seen, is so great, that even those who are familiar with the two diseases are liable to be deceived. Such cases are those in which cerebral symptoms, and especially the typhoid state, are present; and should they terminate fatally, the diagnosis might remain

doubtful. In judging of the nature of these cases, the physician must be guided by general considerations, such as the past history and the character of the epidemic prevailing, or of other cases which might have occurred in the same village, regiment, prison, ship, house, or family; and the probable cause, if inquiry can be made into it, regarding which an opinion can be formed from a review of the general circumstances surrounding the patient.

I believe that there can never be any permanent difficulty in distinguishing relapsing from typhoid fever, even in instances in which cerebral symptoms and the typhoid state are present when the patient first comes under observation; for, if he should survive, a few days will remove any doubt at first entertained, and in case of early death, the examination of the body will afford a satisfactory means of distinction. It should be remembered that tumidity of the abdomen, or meteorism, has occasionally been observed in relapsing fever, and that diarrhœa has been frequently met with. Whenever a doubt is felt, it would be well to delay coming to a conclusion for a few days, when the diagnosis between the two diseases can be accurately made, without probability or even possibility of mistake. As far as I can judge, from the ill-recorded evidence, the two diseases have occurred together epidemically; but more frequently relapsing fever has broken out epidemically in a locality in which typhoid fever is endemic and always present; and though, as far as I am aware, the one has not been mistaken for the other, both have been regarded as forms of the same hypothetical disease, that is, remittent fever caused by malaria. This, I think, was the mistake made by the writers of the descriptions published in the official Annual Reports, and in the *Indian Medical Gazette*, of the "Epidemic Fever" of Lower Bengal.

Cases of typhoid fever followed by a relapse are sometimes called relapsing fever. Employed in a colloquial sense, the designation is appropriate; but the technical sense in which pathologists use the term should prevent its being loosely applied to such cases. The short duration of the fever, the frequency of jaundice, the muscular and arthritic pains, the greater degree of suffering, and, in most

cases, the general circumstances of the patient, will suffice to distinguish relapsing from typhoid fever.

The distinction between relapsing and simple fever is sometimes attended with considerable difficulty, especially in what are called sporadic cases. Individuals in good and robust health, and who are naturally impatient under suffering, complain loudly of the headache and general soreness of the body in a simple fever, contracted from exposure to the sun or rain, or from other ordinary causes. A mild attack of relapsing fever, on the other hand, unattended with jaundice or a relapse, and in which the general characters of relapsing fever are not well marked, cannot be distinguished from simple fever. The occurrence of jaundice, however slight, and even if limited to the conjunctiva, and of repeated relapses, has not been observed in simple fever. In an ill-ventilated hospital, especially when crowded with a large number of sick, every case of fever, without exception, should be isolated, from the difficulty of distinguishing simple fever from the contagious fevers, especially at their commencement, and sometimes throughout their course when of a mild nature. This rule has been inculcated for many years by Dr. Dallas, the Inspector-General of Prisons in the Punjab, a province remarkable for the awful epidemics of relapsing fever and typhus which have occurred within recent years in its prisons. And it is certain that the careful observance of this precaution by prison medical officers, as well as the practice of isolating prisoners newly sent to jail and gangs transferred from one prison to another, has materially helped to prevent or mitigate the consequences of the importation of fever into prisons from the free population and from other prisons.

The difficulty of discriminating the intermittent forms of the various fevers from each other is not considerable; and as these forms, though frequently preponderating, never occur entirely unaccompanied by the non-intermittent forms, the diagnosis made of the latter will apply to the intermittent forms. Jaundice, according to my experience in Northern India, is of rare occurrence in any form of intermittent fevers. It is probably more commonly met with in Lower Bengal, as it is in Algeria, according to

Boudin, who found it in as many as seven-tenths of the cases of intermittent fever. The intermittent form of relapsing fever is prone to periodical relapses; and the primary attack rarely includes more than four or five daily paroxysms, as observed by Eyre in the Goomsur epidemic. The typhoid and typhus intermittent fevers are of the same duration as the non-intermittent fevers.

The pain felt in the right hypochondrium and the enlargement of the liver, which in many cases is very manifest, might lead to a case of relapsing fever being mistaken for hepatitis, especially when occurring singly or in the beginning of an epidemic; and the short duration of the fever contributes to support the error. Bateson states that he diagnosed one of his cases on admission, in the beginning of the Umballa jail epidemic of 1866, as remittent fever: but he was "thrown off his guard" by the non-occurrence of contemporary cases, and was induced by that circumstance to change the original diagnosis which he had made to hepatitis. The history of a case and its subsequent course will indicate its true nature; and material assistance will of course be obtained on the occurrence of similar cases in the same neighbourhood. It should be remembered that jaundice is rarely or never a symptom of hepatitis; nor are muscular and arthritic pains in the limbs, high fever, nor early prostration, present in that disease.

It is probable that relapsing fever has been at times mistaken for simple jaundice. This symptom, as has been pointed out, does not always immediately subside, but sometimes remains after the primary fever has passed off. A case of this nature, coming under observation during the intermission, is liable to be mistaken for simple jaundice. The history of a case of jaundice should always be inquired into. The occurrence of jaundice, apart from relapsing fever, according to my experience, is as rare in Northern India as at Calcutta. The presence of fever in a case of jaundice should always attract attention; for this symptom, when due to ordinary causes, is unaccompanied by much fever. The converse mistake should be also guarded against; for, strange as it may appear, epidemics of simple

jaundice have occasionally been met with in Europe, and one occurred in this country in the army of Afghanistan, at Quetta and Candahar, in 1838 and 1839, and another in the 1st Bombay Fusiliers, at Peshawur, in 1849.*

Partridge states that the cases of relapsing fever accompanied with scarlet eruption, which occurred amongst the Calcutta cooly emigrants, were sometimes mistaken for measles. As the reporters of the various epidemics of the eruptive fever have not considered it necessary to point out the differences between this form of relapsing fever and measles, the distinction between the two diseases is clearly self-evident. The absence of the coryza or the catarrhal symptoms of measles, the peculiarity of the eruption, and, according to Morehead, the absence of lesions of the small intestines, are the most prominent differences between the two diseases. Copeland has mistaken the eruptive fever for scarlatina complicated with rheumatism, or *scarlatina rheumatica*, as he has designated this form in his "Dictionary of Practical Medicine." Murchison remarks: "The severe rigors and pain in the back, coupled with headache, vomiting, and quick pulse, may, at the onset, lead to the suspicion of *small-pox*. Although the lumber pain and vomiting are rarely so severe as in the early stage of small-pox, a diagnosis during the first two days may be difficult, especially if there is any possibility of the patient having been exposed to the poisons of both diseases."

Murchison has considered it necessary to distinguish relapsing from remittent fever caused by malaria. He points out that Craigie, Mackenzie, and other observers of the Scotch epidemic of 1843, regarded relapsing fever as a variety of the remittent fever of tropical countries. It will be remarked that the observations made by these gentlemen on the thermometric phenomena exhibited by the European fever are fully applicable to the disease in this country, as illustrated in this work. It would appear, in fact, that Murchison has drawn a distinction where there is no difference. It is to be hoped that sufficient evidence has been collected together in the sections on the history and symp-

* *Transactions of Medical and Physical Society of Bombay*, no. iv. for 1841, and no. x. for 1851.

toms of relapsing fever in India to show the error of Murchison's remark, that "no form of tropical remittent fever was ever observed where the febrile paroxysm lasted almost continuously for five or seven days, was then followed by a complete intermission of a week, and afterwards, with tolerable regularity on a certain day, by a return of the fever for three or five days." With regard to his statement that malarious remittent fever has a tendency to relapse, I have to remark that it is a singular fact that neither Twining, Morehead, nor Peet have mentioned such a tendency in remittent fever in their systematic works, although all of them have alluded to it in their fugitive writings. And I might further direct attention to another remarkable circumstance, that all these authors have omitted to state the duration of the forms of fever which they have described. In my own experience, not unfrequently, in the earlier years of my service, I met with a form of disease which I considered, in common with my contemporaries, to have been malarious remittent fever. Since, however, Murchison's "Treatise on the Continued Fevers of Great Britain" fell into my hands some years ago, I have failed to meet with this disease in the Punjab. On coming to Calcutta about three years ago, I naturally expected to see malarious fevers in profusion in a region which has been alleged to be the home of marsh miasm or malaria. But malarious remittent fever seems to be extinct in the present day, for I have not yet succeeded in meeting with it in Calcutta. The impression seems to be tolerably general in the profession that the specific fevers, so elaborately described by Murchison, have been heretofore mistaken for malarious remittent fever. I have myself no doubt that the fevers of this country, arrayed though they are with some peculiarities, which are probably due to climate and the circumstances of the people, are essentially the same as the fevers of Europe.

With regard to the distinction between relapsing and yellow fever, I am unable to speak with precision, from want of personal observation of the latter disease. It will be seen, on reference to the section on the History of Relapsing Fever, that Young met with cases of fever in Aurun-

gabad in 1826, which, he says, were "so similar to the descriptions given by our transatlantic brethren of the yellow fever, as to leave no doubt of their identity." In the previous year, Stevenson met with six cases of fever in Arracan, the only differences between which and the Bulam or yellow fever were the occurrence of remissions and relapses, and their apparent non-contagiousness. Writing in 1832, Twining says: "The yellow fever, so justly dreaded in the western hemisphere, is hardly to be accounted an epidemic of Bengal; although we every year meet with some patients in whom an intense yellowness of the skin occurs in fevers of considerable severity." From all the information that I have been able to gather regarding yellow fever, this disease appears to me to be relapsing fever of intense severity. The American writers who have described the disease have probably committed the same error as the Indian writers on fevers; that is, they have failed to observe and record all the phenomena exhibited by it. The perusal of a "Report on the Epidemic Fever at Trinidad, West Indies, 1869," by Staff-Surgeon J. Crosse Johnston, M.D., published in the "Army Medical Department Blue Book for 1869," has confirmed my impressions. The Trinidad epidemic, in which several cases of yellow fever, with black vomit and albuminous urine, were diagnosed by medical officers who were familiar with that disease, presented all the peculiarities of the Indian epidemics of relapsing fever, the coalition of the three thermometrical forms, and even "the occasional appearance of an eruption (which, however, resembled lichen tropicus rather than miliary vesicles, accredited to relapsing fever), and the tendency to relapse." In one of the cases of "yellow fever" the skin "was covered with a whealoid rash on yellow ground." The relation of yellow fever to relapsing fever is probably the same as that between the plague, "black death," or mahamarree, and typhus. I have already alluded to my belief that the malarious remittent fever of authors is some one or other of the specific fevers. One form of remittent fever attended with jaundice so closely resembles yellow fever, that Parkes has endeavoured to point out the distinction between them. He has fixed upon

the presence of albumen in the urine of patients suffering from yellow fever, as a means of distinguishing between the two diseases. Parkes has prematurely made this distinction, since observations on the urine of remittent fever with jaundice, *i.e.*, as I believe, of relapsing fever, have not yet been made on a sufficiently extensive scale as to justify a positive conclusion. There can be little doubt that in the more severe forms of relapsing fever, in which the typhoid state is fully developed, albumen will be found in the urine, although the fact has not yet been actually demonstrated by experiment, except by Edward Goodeve in one case of the eruptive fever. W. J. Moore states that when fever is of frequent recurrence, albuminous urine is quite as often present as absent.* On this subject, Murchison makes the following apposite remarks: "In 1853, I found no albumen in the urine of persons suffering from remittent fever in Burmah. My observations, which, for the most part, were made early in the disease, before the supervention of typhoid symptoms, have been quoted as establishing a distinction between malarious remittents and true yellow fever. The comparative frequency, however, of albuminuria in yellow fever is probably due to the fact that the typhoid state is much more common in this disease than in malarious remittents. When the typhoid state is developed in remittent fever, it would indeed be extraordinary if it differed from the typhoid state of all other diseases in the absence of albuminuria." † The yellow fever and dengue of tropical America are manifestly the analogues of the two forms of relapsing fever, attended with jaundice and a scarlet eruption, met with in tropical Asia; and all four are probably pathologically identical, as the two latter undoubtedly are. I observe that Dr. Aitken, of Netley, considers dengue and Twining's eruptive fever to be the same disease.

As a broad proposition in the diagnosis of relapsing fever, the main points to be borne in mind are, the short duration of the fever, the frequency of relapses, the severe

* *Indian Annals of Medical Science*, vol. xxii., p. 281.

† Murchison's "Diseases of the Liver, Jaundice, and Abdominal Dropsy, 1868," p. 380.

muscular and arthritic pains, and the occurrence of jaundice. In making inquiries of the people of a district regarding the nature of an epidemic of fever, a statement regarding jaundice should always raise the suspicion that the disease is relapsing fever. This symptom has never, to my knowledge, been observed in India in connection with typhus, typhoid, or simple fever. In England, however, it has on rare occasions been met with in typhus and typhoid fever; and in France it is not unfrequently seen in the latter disease, as Trousseau describes a bilious form of it attended with jaundice. Bateson, in making inquiries as to the existence of relapsing fever in the Umballa district, in the Punjab, in connection with his investigation of the cause of the jail epidemic, in 1866, did not hesitate in the conclusion which he adopted, when tah-sildars, or native subordinate magistrates, informed him that several people who died of fever in the villages had yellow eyes. Cookson, in like manner, traced the origin of the case of relapsing fever which occurred in the Shahpore jail, in 1867, to the village of Gerowt, from which the prisoner came. These gentlemen felt certain, from their knowledge of the features of the prevalent fevers of the Punjab, that fever, with jaundice, in a Punjab village was relapsing fever. It should not, however, be forgotten that the absence or rarity of jaundice in a fever epidemic is not a proof of the non-existence of relapsing fever.

SECTION X.

Prognosis and Mortality.

As in all diseases, the prognosis in relapsing fever is based on the statistics of the mortality from the disease, the circumstances which appear to influence that rate, the presence and severity of certain symptoms and complications in individual cases, and the mode of fatal termination.

(a.) *Rate of Mortality.*

Murchison states that relapsing fever is far from being a fatal disease; its rate of mortality, compared with typhus or typhoid fever, is very small. At the London Fever Hospital,

between the years 1848 to 1857, out of 441 cases admitted, only eleven proved fatal, making $2\frac{1}{2}$ per cent., or about one in forty, or deducting two cases fatal within two hours after admission, the mortality was only two per cent., or one in fifty. In the Scotch epidemic of 1843, the average mortality, according to different observers, was 4·12 per cent., or one in 24·23 cases. In the Scotch and Irish epidemics, which occurred since 1843, the mortality per cent. was 5·43, or one death in 18·4 cases. Adding all these results together, the average mortality in Great Britain from relapsing fever is found to be 4·75 per cent., or one in 21.

On this subject I have been able to collect the following statistics from various sources :—

Year.	Locality.	Authority.	Cases.	Deaths	Mortality per Cent.
1852–53	Village of Dowlutghai in Eusufzai . .	Lyell	410	216	52·68
,,	Village of Dowlutghai-Ka-kote in Eusufzai	Lyell	82	38	46·41
1864	Camp followers of 20th Punjab Infy., at Rawul Pindee .	Lyons	12	4	33·33
1868	Buxar	Hugh Clark. . .	17	4	23·52
1836–37	Bareilly Jail . . .	Guthrie	810 ?	119	14·69
1860	Agra Jail	Walker	1340	299	14·77
1864	Agra Jail . . .	D. B. Smith, in *Ind. Med. Gazette* for May, 1867. . .	1340	250	18·64
1866	Umballa Jail . . .	Bateson	424	46	10·81
1839	Recruits marching through the jungles between Malwa and Candeish. . . .	Graham . . .	60	7	11·66
1847	18th Regt. Madras N. Infy. in Goomsur	Eyre	2367	37	1·56
1864	20th Punjab Infy. at Rawul Pindee . .	Lyons	50 ?	2	4·00
1869	Bengal Sappers and Miners at Roorkee.	Eteson	239	1	0.42

The above scanty statistics of the mortality furnish conclusions which correspond with those formed by various observers, who have expressed, in general terms, the rate of mortality from the disease among different classes of the community. The poorer classes have been the greatest sufferers; these, in the table, are represented by the people of Buxar and Eusufzai, and the regimental camp-followers at Rawul Pindee, whose means of subsistence were a monthly pittance rarely exceeding four or five rupees, and generally below that sum. The destruction amongst these classes has, in the various epidemics, amounted to tens and hundreds of thousands; and it is probable that the rate of mortality amongst them equals, if it does not exceed, 39 per cent. of those attacked. In the town of Moradabad, in 1836, Spencer states that not one out of six recovered, and that the natives considered it "the height of good luck" to escape death. In the Paniput and Rhotuck epidemic of 1837, the mortality was still greater, according to Shirreff; three-fourths of those attacked died. At Faridpore, out of a population of 500 families, 200 individuals died within six weeks; at Pakism, out of a population of 1000, 230 died within twenty-seven days; in one division of this village almost every one died who was attacked. At Bhow, in a family of sixteen members, seven died within the month; and in the same village entire families were exterminated. In the epidemic of 1860, in Central India, every third person attacked died, according to Walker, and whole villages were depopulated. The mortality in these epidemics was so considerable that it forms a reason for the suspicion that many of the cases were typhus, although the descriptions do not apply to that disease. It is probable that this rate of mortality is not unusual even in more recent epidemics; but it is not a little remarkable that although fever is still very wide-spread and destructive, there are no official or other authentic accounts from which the disease may be identified with accuracy. From the scanty data available, it is not improbable that mainly of this form of fever were the destructive epidemics which occurred within the last decade in Lower Bengal, whereby the country in some parts has been denuded of its human

inhabitants, and reverted to jungle, and to the occupancy of wild beasts, whose tenure is free, and which do not contribute to the resources of the State.

The rate of mortality amongst prisoners in the jails has been less than amongst the free population; it might be set down at an average of 15 per cent. of those attacked. It might, however, be affirmed with certainty that in future epidemics, which, I believe, are only possible, under present circumstances, from importation of the disease into prisons from the free population, the mortality will be much less than it has been in past years.

Amongst the ordinary comfortable classes, whose means of subsistence bear some proportion to the wants of nature, the rate of mortality from the disease is on a par with that which obtains in Europe, or rather less. The native troops might be taken as the representatives of this class; amongst them the rate of mortality might be set down generally at 2 per cent. of those attacked. In exceptional circumstances, native troops have suffered very severely, as in the jungles of Candeish, as related by Graham, and in Sir Charles Napier's army of Scinde.

The disease is rare amongst the upper classes of society, and is only occasionally met with amongst European troops. There are a few instances on record of death from this disease amongst Europeans. Amongst European children, however, the epidemic of 1828, described by Adams, was very fatal, owing to the cases being complicated with bronchitis, an affection of great danger in early infancy.

The average mortality from relapsing fever occurring amongst all classes of the community might be stated to be 10 per cent., a ratio which approximates to the mortality from typhus and typhoid fever in Europe. The extremes of the mortality from the disease are wide, being a small and almost inappreciable fraction amongst Europeans, and 39 per cent. amongst the villages, or poorer classes of the natives, or one in 2·8 of those attacked.* Twining justly

* On the not unreasonable assumption that the "epidemic fever" of Lower Bengal is relapsing fever, the rate of mortality given in the text is probably not beyond the fact. The following astounding passage

ranked the remittent fever of the Bengal rainy season among the most formidable diseases of India.

(b.) *Circumstances influencing the Rate of Mortality.*

1. *Times and Seasons.* The data for estimating the influence of season on the rate of mortality are scanty, and those that exist are vitiated by imperfection in the tables, as well as by the circumstance that no distinction was made between typhus and relapsing fever in epidemics that were probably mixed, as those which occurred in the jails of Northern India. The data, such as they are, which I have been able to collect regarding this subject, are the following:—

The 4522 deaths from fever, chiefly relapsing fever, which occurred in the jails of Northern India, from the more important epidemics between the years 1859 and 1867, were thus distributed over the months of the year, as shown in the following table, according to Bryden. The monthly mortality, given by H. J. Carter, which occurred in the great Hydrabad epidemic of 1843, which extended over the nine latter months of that year, in some points corresponds with Bryden's tables:—

occurs in an article by Mr. W. J. Moore on "Sanitary Reform," in no. c. of the *Calcutta Review*, p. 21:—

"At length, in 1869, the natives themselves, like the cartman calling on Jupiter, submitted a memorial to the Bengal Government. The mortuary returns of 181 villages were attached to the memorial, and it was stated that in the village of Dwarbasini, mentioned as an example, out of a population of 2700 souls, 1900 had perished during the last five years; and that among 820 living men, there were not 200 able-bodied. The picture drawn by the natives was a sufficiently gloomy one; but the testimony of Dr. Smith, the recently-appointed Sanitary Commissioner for Bengal, fully confirms the statements which the memorial contained."

According to Tanner, during the epidemic of relapsing fever which occurred in St. Petersburg, in the winter of 1864–5, the cases admitted into the civil and military hospitals numbered 7625, of which 836 died—*i.e.*, 10·9 per cent.

Months.	Jails of Northern India	Native Troops at Hydrabad.
January	454	...
February	485	...
March	710	...
April	782	3
May	419	9
June	157	25
July	87	13
August	116	10
September	215	11
October	320	34
November	342	99
December	435	115
Total	4522	319

From these figures it would appear that the mortality is least in the middle of the year, during the hot season. This conclusion is supported by the monthly mortality which occurred in the Goomsur epidemic of 1847, complete statistics of which are given by Eyre, so that the rate of mortality per cent. of admissions can be calculated.

Months.	Admissions.	Deaths.	Mortality per Cent.	Months.	Admissions.	Deaths.	Mortality per Cent.
January.	...	...	...	July	166	1	0·60
February	...	...	...	August	203	1	0·49
March	157	4	2·54	September	205	5	2·43
April				October	289	2	0·69
May	298	4	1·67	November	414	8	1·93
June	165	6	3·63	December	470	6	1·27

It would seem that warmth reduces the mortality from the disease, a fact which has been remarked in all the epidemics, more or less, from the days of Hunter, who noticed that the disease abated in severity, or disappeared,

on warm latitudes being entered, and returned in cold latitudes.

In districts in which the warm months of the year are also the rainy months, the mortality is apparently increased during those months. In Lower Bengal the disease, according to Twining, is most frequently met with, and most fatal, during the rains, and hence he named it remittent fever of the rains. Some of the epidemics of Lower Bengal, such as the Ghazepore epidemic of 1825, the Calcutta epidemics of 1828 and 1833, which occurred during the rainy months, were very fatal. The eruptive fever, however, seems not to be aggravated by the rains, as the great Calcutta epidemic of 1825, which extended over the rainy months, was unattended with any mortality, except in the single case of an aged Hindoo.

Murchison states that the mortality is probably greatest at the commencement of an epidemic. This is probably the case in this country also, in the great epidemics which occur amongst the general population, of which, however, little detailed information is available. In the minor epidemics which have occurred in jails, the mortality has invariably augmented from the beginning to the middle of an epidemic, in which period the absolute mortality has been the greatest, but there are no means of estimating the relative proportions between the deaths and the numbers attacked.

2. There are no Indian observations of the influence of *sex* on the mortality of relapsing fever. According to Murchison, the mortality among males suffering from the disease is slightly greater than that among females.

3. Regarding the influence of *age*, likewise, there are no Indian observations. According to a table given by Murchison, the ratio of mortality is seen to increase as life advances. Relapsing fever is more fatal at an age exceeding 30 than at a younger age. Above the age of 45, it appears to be fully as fatal as typhus. Of 153 cases under 30 admitted into the Edinburgh Infirmary in 1848–9, only 3 died, or 2 per cent.; but of 50 cases above 30, 5 died, or 10 per cent.; and of 9 cases above 50, 3 died, or 33·3 per cent. In the Paniput and Rhotuck epidemic of 1837, Shirreff observed that the young suffered the most.

4. *Station in life.* It appears clearly from the evidence, that in Europe very few of the rich or comfortable classes suffer from relapsing fever, so that the disease cannot be regarded as fatal among the rich. In this country, likewise, it is rarely that the well-to-do members of the community contract the disease. Writing in 1836, Stuart remarked the fact that people in fairly easy circumstances, such as gentlemen's domestic servants, sepoys, and Europeans, generally escaped the fever during the Moradabad epidemic; nor did any of the wealthier natives who caught the disease die of it. The classes among whom the fever makes its appearance, and commits most havoc, are the poorest, or those who temporarily are in the condition of the poor, that is, are deprived or stinted of the necessaries of life: as, for instance, troops on a campaign, people of a conquered country, who are turned out or fly from their homes indifferently provided, seamen after a shipwreck, and others in similar distressed circumstances.

5. *Recent residence in a locality* has little or no influence on the rate of mortality of relapsing fever. From all the evidence, the disease appears to be as fatal or the reverse to new comers as to old residents, in the proportion of their liability to contract it, and their general circumstances with respect to the means of subsistence.

6. There is hardly any evidence regarding the influence of the *previous habits* of the patients in the progress and result of the disease. Social vices, and dissipation of all sorts, impair the strength, and might therefore be supposed to be as unfavourable antecedents in relapsing fever as in other diseases.

7. *Humidity* of the soil appears to have an unfavourable influence by inducing splenic enlargement, and consequent anæmia. This subject will be reverted to more fully in the section on predisposing causes.

8. As a broad rule, persons in good health and of robust constitution, resist relapsing fever more readily than the sickly and feeble. This fact was well shown in the Umballa epidemic of 1866, which prevailed in the main jail, as well as in the branch jail at Ghugger. The number of deaths in proportion to those attacked was less at the branch jail.

Bateson explains the difference in the rate of mortality in the two jails, by the circumstance that the Ghugger prisoners were men of good stamina, having been selected for youth and vigour of body, as the work they were engaged in was of an arduous nature. In this manner also might be explained the lower mortality from the disease among troops, native or European, and the better classes of society. Bateson points out, however, that fleshy or "good-conditioned" men were more liable to succumb in a sudden and unexpected manner than spare men. Shirreff also observed that the young and previously healthy suffered the most, though he does not state that the greatest mortality occurred among them. I believe that scurvy, or the scorbutic condition manifested by soft and readily bleeding gums, enhances the danger of an attack of relapsing fever. This subject appears to have escaped the attention of writers.

9. There is not much information regarding the influence of previous diseases. Beattie attributed relapses to old age and previous disease: if frequent relapses should occur amongst persons already suffering from chronic disease, the probability is great that the powers of life will yield at some period more or less remote.

10. The remarks on the effect of station in life on the rate of mortality, are applicable to the influence of privation in augmenting mortality. As will be shown in a subsequent section on the etiology of relapsing fever, the cause of the disease is connected with a diminished food supply; and it will be readily understood that a continuance of privation after the disease is developed is fatal to recovery.

11. The influence of fatigue on the mortality is probably great, but there are no positive details to show its action. The same remark is applicable to the influence of mental depression. It is usual to attribute to this cause a share in producing the great mortality in prisons from relapsing fever and other diseases. But I have very great doubts on the subject, or at any rate as to whether mental depression is so universally and strongly felt by prisoners as to reduce their chances of recovery. I believe if wholesome sanitary conditions are rigidly maintained in prisons, the influence of

mental depression might be left out of account altogether, and it will not appreciably affect the state of health or the rate of mortality among prisoners. I have formed this conclusion after some years of observation made on prisoners derived from all ranks of native society. A certain amount of civilization or individual refinement appears to be necessary before mental emotions become capable of exercising an appreciable influence over the physical nature.

12. Neglect of medical treatment, of sanitation, and generally of care of the sick, have had the most potent influence of any causes in augmenting the mortality of the disease after it has been set up. To over-crowding and destitution are, perhaps, to be chiefly attributed the high mortality of the disease amongst prisoners and the village population.

(c.) *Prognosis from the Presence of certain Symptoms or Complications.*

In judging of the probable termination of an attack of relapsing fever, the following points, which are chiefly those specially indicated by Murchison, deserve attention.

1. A very rapid pulse, on the first or second day of the disease, is not, as in typhus, a cause of alarm.

2. Profuse perspiration, accompanied by a rapid pulse, is not, as in typhus, a dangerous symptom.

3. Jaundice and minute petechiæ do not, in themselves, indicate danger, unless they be accompanied by cerebral symptoms. Some observers, as Bernard and Bateson, regard very intense jaundice as a sign of danger, especially, according to the latter, when the symptom is prominent directly on the manifestation of the fever, when, he states, the termination was invariably fatal. Generally speaking, an epidemic in which jaundice is common, is more severe and attended with greater mortality than when this symptom is rare or not common.

4. Purpura, spots, and vibices, are only met with in severe cases.

5. Copious hæmorrhages, particularly from the stomach and bowels, are dangerous symptoms.

6. Cerebral symptoms, such as stupor, delirium, coma, and convulsions, tremors, and subsultus, are only observed in the most severe cases, and often terminate in death; even convulsions, however, are not necessarily fatal.

7. It must be borne in mind that in cases that appear to be progressing favourably, fatal syncope, or dangerous cerebral symptoms, occasionally supervene suddenly and unexpectedly.

8. Suppression or great diminution of the quantity of urine, is usually followed by cerebral symptoms of a dangerous character.

9. The presence of complications, and especially of peritonitis, pneumonia, bronchitis, diarrhœa, dysentery, abortion, or erysipelas, always increases the danger.

10. The interval between the primary fever and the relapse, and even after the first relapse, in many instances, must not be mistaken for permanent convalescence.

11. After the first relapse, the liability to certain sequelæ, and particularly to severe muscular and arthritic pains, dysentery, and ophthalmia, must be kept in view. Dysentery or diarrhœa supervening during convalescence often terminates fatally.

12. The liability to the occurrence at the crisis of profuse diarrhœa, or of choleraic symptoms, and the latter occasionally in the course or at the commencement of the primary fever, should be held in mind.

13. A copious flow of urine is a favourable symptom.

(d.) *Mode of fatal Termination.*

According to Indian experience, sudden death from syncope is rare in relapsing fever. Twining remarked of the remittent fever of the rains, that sometimes after one or two paroxysms, a change for the worse suddenly took place, without any apparent cause, and death occurred within an hour. More frequently death is caused by cerebral symptoms, as coma, due to uræmic poisoning; or by some complication, such as dysentery, diarrhœa, bronchitis, pneumonia, profuse hæmorrhage, etc., and probably also pericarditis. Dysentery and diarrhœa, occurring as complications, are pre-eminently the most common cause of

death in relapsing fever in natives of India; and next to these, cerebral symptoms.

Death may take place in the primary fever, in the intermission, in the relapse, or during convalescence. There is great variety in the day on which death happens. In the Bareilly epidemic of 1837, Guthrie states that many died in the first paroxysm or day of attack of the fever, completely overpowered. Hunter recorded that death, attended with difficulty of breathing, generally took place on the second day on board the *Exeter* and *Mornington*. Farquhar, in the Eusufzai epidemic of 1853, observed some cases which terminated fatally on the third day. Generally, however, death, in fatal cases, occurs from the sixth to the twelfth day. The average duration of Hugh Clark's four fatal cases was nine and a half days. Perhaps the greatest mortality in epidemics amongst the general population is during convalescence, at a late period, due to the dangerous sequelæ which occur after relapsing fever.

SECTION XI.

Anatomical Lesions.

Relapsing fever has been a very fatal disease in this country, and opportunities for examining the dead have been numerous. There are, however, few detailed records of autopsies; medical officers having been precluded from the prosecution of anatomical researches on the dead, from the multitude of the living who required their attention and services during the more awful visitations of the disease. The natives of India have, further, a prejudice against post-mortem examinations, and put difficulties in the way. But a sufficient number of examinations have been made to show that the disease is unattended with any special lesion. The gentlemen who have recorded the results of their anatomical examinations of the bodies of persons who have died of relapsing fever are few in number. Hunter gives the post-mortem appearances found in one body inspected in the beginning of this

century. In 1836, R. H. Hunter, at Poona, examined two bodies, and Spencer several bodies of prisoners who died of the disease in the Moradabad jail. In 1837, Guthrie examined several bodies in the Bareilly jail; and he and Spencer have placed on record a general account of the appearances observed by them. In 1860, Walker examined 104 bodies of prisoners who died in the Agra jail. In 1864, Chuckerbutty inspected four bodies at Calcutta; and, in 1868, Hugh Clark examined one body at Buxar; and Gray, three or four, at Mooltan. The observations of these gentlemen embraced the appearances met with in the more important viscera, and they correspond on the whole with those made by European observers, related by Murchison, as follows:—

There is usually considerable emaciation of the body, due rather to the previous want undergone by the sufferer than to the disease itself. When persons in easy circumstances die of the disease, contracted by contagion, emaciation is less marked; and, in some instances, even accumulations of fat are found, as recorded by Chuckerbutty.

Large patches of livid discolouration are observed on various parts of the body, particularly on the back, the scrotum, and the pinnæ of the ears. In some instances Guthrie found the integument so exsiccated as to crackle somewhat like parchment. In the jaundice cases, the yellow tint is often more marked after death than during life. The petechiæ, purpura-spots, and vibices, observed during life, persist after death; but, in the eruptive fever, the scarlet eruption disappears. In cases in which œdema had occurred, the cellular tissue is found infiltrated with serum, occasionally tinted yellow even when jaundice was not marked during life. There are no Indian observations regarding the colour of the muscles; but it is stated by Murchison, that the dark colour observed in typhus is absent in relapsing fever; and in one case, recorded by Jenner, the colour was of a brighter red than natural. The bones and white tissues of the body generally are tinged yellow in the jaundiced cases. In the bodies of children who died of sloughing sores due to pemphigus, these cutaneous lesions are found on the body.

Organs of Digestion.—Ulceration of the tonsils and redness of the epiglottis and pharynx might be found in cases, especially of the eruptive fever, in which these organs had been affected during life, but these lesions have apparently not been often observed in the dead body. The stomach is usually perfectly normal, or only slightly injected; but when death had been preceded by violent vomiting, and more especially when the symptom of black vomit had been present, the lining membrane is much injected, and here and there exhibits patches of ecchymosis and submucous extravasations of blood, and over these patches it is softened and lacerable. In rare cases, the stomach contains black blood; more commonly, however, only a little yellowish bilious fluid. Guthrie describes the stomach in those who died in the Bareilly jail epidemic of 1837, as flabby, enlarged, and much inflamed or reddened, particularly towards the pylorus, containing much black fluid, to all appearance consisting of atra-bilious morbid matters and grumous blood. The other Indian observers are silent regarding this organ.

In most cases the small intestines are healthy; when diarrhœa had been a prominent symptom or complication during life, the mucous membrane is found more or less congested, or ecchymosed in spots or large patches, especially at the lower part of the ileum. Guthrie describes the condition of the small intestines in the language of the pathologists of his day, as "involved in inflammation from a rosy blush to spots, some the size of a crown piece," and the duodendum thickened and much discoloured by bile. It seems not improbable that Guthrie confounded in one general description the anatomical lesions of two or three distinct diseases, namely, typhoid and relapsing fevers, and enteritis; for he speaks of having met with gangrene of the small intestines. He further alludes to intus-susception, both upwards and downwards, being very frequent in the jejunum and ileum; the calibre of these bowels being most irregular, either much contracted or much enlarged, from giving way of their inner coats. Guthrie is the only writer who met with such appearances, and further observation is neces-

sary before these statements can be accepted as applicable to relapsing fever. Lumbrici are often found inhabiting the small intestines, and even the stomach.

In uncomplicated cases, the large intestines are found healthy; in those complicated with diarrhœa, the mucous membrane is studded with punctiform or arborescent injection, or covered irregularly with large ecchymotic patches, situated in the neighbourhood of healthy membrane; these appearances may be limited to the large intestines, but more generally are found associated with similar lesions in the small intestines, especially the lower part of the ileum. When complicated with dysentery, the lesions of that disease are met with, varying from slight ulceration in some parts, to more or less disorganization, even amounting, in some instances, to gangrene, of the rectum, colon, and cœcum; in some of these cases of extensive destruction of the cœcum and colon, the inflammation is seen to have extended to the lower part of the ileum, which is of a purple or deep red colour. In some protracted cases, the mucous membrane of the colon and rectum was found by Guthrie to be changed into a red granular mass, easily scraped off by the knife. Walker found the mucous membrane of the colon congested in thirty-seven bodies, ulcerated in some parts in twenty-eight, and healthy in thirty-nine.

The mesenteric glands are not enlarged, and present no abnormal appearance. Guthrie, however, speaking generally, states that he found these glands changed into a caseous fawn-coloured matter, probably, however, only in cases of typhoid fever, of which some instances doubtless occurred in the Bareilly jail. The liver is usually found enlarged, distended with black blood, and hard. The colour, according to Twining, may sometimes be pale, and Hutchinson, in some fatal cases of fever in the old jails of Lower Bengal, found the liver white and very white. In the 104 bodies examined by Walker, the liver was healthy in three cases; in sixty-three, dark, and engorged with blood, being at the same time much enlarged; in thirty-seven, soft, and of some shade of a yellow colour, and in one only small and hard. The organ does not exhibit any alteration of structure, even in the jaundiced cases. In

one body, R. H. Hunter discovered an hepatic abscess. Guthrie, in another instance, found in the substance of the liver a lumbricus, which had crawled into the bile ducts from the intestines. He thus explains the phenomenon: "The worms of course were annoyed by the medicines and by the morbid contents of the bowels, and were famished, as we only allowed the patients a little congée—they made every effort to escape from the alimentary canal of the unfortunate patients, no longer alimentary to them."

Walker found the gall bladder empty in thirty-two bodies, full in seventy, and engorged in only two. The bile varies in tint from light yellow to black, and is often thick and viscid. It has been thought that its inspissated condition might obstruct the ducts, and account for the jaundice, as well as for the pale or white colour of the stools in some cases. The bile ducts, however, are always pervious, even in the jaundiced cases, and abundance of bile is generally found in the duodenum; the stools are only occasionally clay-coloured; and in some cases the bile is even thinner than natural.

Twining attributed the occurrence, in some instances, of simple jaundice, unconnected with fever, to the swelling of the absorbent glands situated on the cystic duct and the ductus communis choledochus, causing temporary occlusion. Morehead investigated the condition of the same glands in several subjects who had died of remittent fever complicated with jaundice, that is of relapsing fever, but found that they did not interfere with the flow of bile through the ducts.

The pancreas is normal. Indian observers are silent regarding this viscus. It might be yellow in the jaundiced cases.

The spleen appears to be less generally affected in this country than in Europe in relapsing fever. Many cases of enlarged spleen are improperly referred to fever, being simply splenitis accompanied, at the onset, with inflammatory fever, tending to great enlargement of the organ. In 104 bodies examined by Walker, the spleen was healthy in sixty-six, enlarged and engorged in twenty-eight, small and hard in ten. The increase of size is moderate; the

consistence often hard, and occasionally softened, and the colour sky-blue, or lighter than natural. Murchison states that occasionally pale red fibrinous deposits are found in its substance, and near the surface. These deposits are easily broken down, have a finely granular fracture, and are considerably firmer than the surrounding splenic tissue, from which they are separated by a distinct line of demarcation. Indian observations on these or similar deposits are wanting.

Guthrie describes the omentum as being generally deeply striped and reticulated with red vessels. Spencer found the following appearances in connection with the abdominal viscera. "The membranous tissue about the duodenum, the lobus Spigelii and gall-bladder, exhibited some disorganization—it was highly vascular, had lost its natural arrangement, and adhesions were formed of it to the surrounding parts; in one instance, the gall-bladder was so thickly and deeply imbedded in it, that it was difficult to separate them." Probably these lesions were the result of peritonitis, which Murchison states is sometimes found, but independent of any perforation of the bowel. Some fluid might occasionally be found in the peritoneal cavity.

In the remittent fever of the Bengal rainy season, or relapsing fever, Twining speaks of interstitial effusion in the cellular tissue, about the duodenum and the root of the meso-colon, more especially where it passes across the spine. *Op. cit.*, vol. ii. (1835) p. 295.

Organs of Circulation.—Indian observers have not generally noted any morbid appearances in the heart. Hugh Clark, however, found effusion in the pericardium in the single body which he examined; and it is probable that in the cases, stated by several authors, in which death took place rapidly, with cardiac symptoms, a similar effusion existed. Of European observers, Cormack found considerable effusion of blood beneath the endocardium of the left ventricle in one case.

Murchison states that decolourized fibrinous coagula, or "chicken-fat clots," as they are called by the American authors, are found in the heart more frequently than in typhus. Blood drawn during the febrile paroxysms has

been observed to be buffed and cupped by Twining and others, and the serum that separated to be yellow in the jaundiced cases. In other cases, especially those in which hæmorrhages were a prominent symptom, the blood coagulates imperfectly, and after death is found dark and fluid as in typhus.

In several cases urea has been detected in the blood.

The proportion of white corpuscles is increased, and in some cases the red corpuscles are seen under the microscope to be much serrated and notched. This condition of the corpuscles of the blood was observed in twelve cases by Cormack and Professor Allen Thompson in the Edinburgh epidemic of 1843. Dr. Hand has stated the condition of the blood in thirty cases of relapsing fever examined in 1870, in the Philadelphia Hospital. The red corpuscles had a granular appearance, as if the colouring matter was unevenly distributed, or collected in patches. The granulation was most marked round the circumference, giving the corpuscles the appearance of crenation. Crenation was also observed in non-granulated corpuscles in various degrees, from mere waviness of edge to complete deformity. In three only of the thirty cases were the white corpuscles found increased. The alteration of the corpuscles above described occurs early, and in one case Dr. Hand found the granular degeneration had set in within three or four hours of the first seizure.* In a case, not fatal, examined shortly after the relapse, I found the usual proportion of white to red corpuscles.

It should, however, be borne in mind that a granular condition of the red corpuscles, crenated edges, and other alteration of shape, and increase of the white corpuscles, are likewise found in other diseases marked by anæmia and great debility.

Macnamara has observed similar appearances in the blood corpuscles of persons suffering from intermittent and remittent fevers, probably relapsing fever, in this country. Cells, which, at first sight, appeared to be white corpuscles, on closer examination were found to have black granular

* *New York Medical Journal*, Aug., 1870, quoted in Stone's Half-Yearly Abstract of the Medical Sciences, July, December, 1870.

contents, and their irregular shape and size precluded the idea of their being simply white blood-corpuscles. He considered them to be pigment cells, and the presence of free pigmentary matter in the blood, points most conclusively, in his opinion, to their real nature. The white corpuscles, in these cases, were not increased in number, but there was a diminution of red ones, the majority of these, presenting numerous spine-like projections, looked like small stars. A number of dots were observed on their surface, which represented the projections as seen from above.

Macnamara regards these pigment cells as altered blood globules, which, from some cause or other, have been rendered unfit for further work, and are about to be changed into excrementitious material. The colouring matter which they contain is apparently of a more lasting nature than the rest of the globules, and, collecting in small masses, it forms the above-noticed lumps of pigment. Some of these small masses of pigment were the $\frac{1}{100}$ of a line in breadth, and $\frac{1}{20}$ of a line in length, and hence instances have been observed in which the capillaries have been plugged by them, especially in the liver, the brain, and the retina, as already spoken of.

Organs of Respiration.—The larynx and trachea present nothing abnormal beyond a redness of the mucous membrane in some cases. The bronchi are usually healthy, but where catarrhal or bronchitic symptoms have been present during life, they might contain viscid, mucous, or frothy serum, and the lining membrane be more or less injected. No adventitious membrane has been observed in either the trachea or the bronchi. The lungs occasionally present deviations from health. The most common morbid appearances are those of bronchitis, the minute bronchi being loaded with frothy serum. Emphysema is occasionally met with; and in rare instances, as in the body of recruits who contracted relapsing fever in the jungle between Malwa and Candeish, in 1839, as recorded by Graham, air has likewise found its way into the cellular tissue of the thorax, around the clavicles, and of the neck and face. Pneumonia is more commonly met in the European than in the Indian disease. Hypostatic congestion of the lungs is occasionally

met with. Walker found the lungs healthy in five cases; in sixty-one congested; in thirty-two much engorged; and in six, part, or the whole, of one lung was found hepatized.

Nervous System.—The cerebral membranes generally exhibit increased injection. An excess of serum is sometimes found in the lateral ventricles; in the jaundiced cases the serum might be tinged yellow; the dura mater, in such cases, is also yellow. In one case, in which suppression of urine, followed by cerebral symptoms, occurred during life, Dr. Maclagan found the serum in the lateral ventricles to contain urea. The brain and cerebellum show no signs of recent disease. Their substance is of normal consistence, and the vascular points, observed on a section, may or may not be increased in number. When there is much serum in the lateral ventricles, the substance of the brain may be slightly softened. Of fifty-eight bodies in which the head was examined, Walker found the brain healthy in twelve, much congested in thirty-two, serous effusions in six, apoplectic effusion, or blood under the pia mater, in eight.

Urinary System.—The kidneys are frequently more or less loaded with blood, but not generally otherwise diseased. In one body, I found them light yellow in colour. Guthrie says the urinary bladder is generally found collapsed. Walker, in 104 bodies, found the kidneys normal in 53, highly congested in 31, and otherwise diseased and degenerated in 20.

The *post-mortem* appearances of relapsing fever may be summed as follows.

1. There is no specific or constant lesion.
2. The most common lesions are enlargement of the liver and spleen, jaundice, dysentery, diarrhœa, and dysentery.

SECTION XII.

Etiology of Relapsing Fever.

A. *Predisposing Causes.*

1. *Sex.*—There is no evidence that sex confers any predisposition or exemption from relapsing fever. In the accounts of epidemics amongst the general population, the writers have not noted any peculiarities dependent upon sex, with regard to the greater or less liability of contracting the disease. Men and women are equally susceptible to the fever when exposed to the causes of it. In the Black Hole epidemic, Mrs. Carey, the only woman amongst the victims, did not escape the fever; and the subsequent eruption of boils, which Mr. Holwell considered a happy circumstance, attended every one who came out of the Black Hole. Twining speaks of women having undergone the fever in its severest forms in the Calcutta epidemic of 1824. In the Berhampore epidemic of 1825, the number of women who required hospital treatment exceeded the men. Spencer says of the Moradabad epidemic of 1836, that, when the fever once entered a house or family, every one in succession became affected. In the Goomsur epidemic of 1847, Eyre remarked that the sepoys' families resident at Russelcondah kept free from the fever which inflicted the men at the outposts; but they contracted it eventually after some of them had visited Chakapad, one of the outposts. In the Mauritius epidemic of 1866, no woman of the 2nd Battalion 13th Light Infantry, escaped the fever. Indian and European experience of relapsing fever corresponds on the subject of the equal liability of both sexes. Murchison states that it is impossible that sex, in itself, predisposes to relapsing fever.

2. *Age.*—Relapsing fever has been met with in persons of all ages, from infants in arms to aged and decrepit people. In the Berhampore epidemic of 1825, and the Calcutta epidemic of 1828, infants and young children suffered severely. Spencer and other observers remarked that the young and robust suffered the most. In the epidemic in the 20th Punjab Infantry in 1864, the hospital-havildar, the oldest soldier in the regiment, contracted the fever

from coming in contact with the sick in hospital. Twining mentions the case of an aged Hindoo who died of the eruptive fever in the Calcutta epidemic of 1824. The ages of Hugh Clark's cases varied from nine to fifty.

It appears from the statistics of the London Fever Hospital, collected by Murchison, that although persons of all ages, from two to seventy-four, suffer from relapsing fever, the proportion of young to the aged is greater than in typhus. Nearly one half of the cases of typhus at the London Fever Hospital were found to be upwards of 30, and nearly one-eighth upwards of 50; whereas, only one-third of the relapsing cases were above 20, and one-fifteenth above 50. Again, of typhus, less than 1 in 6, but of relapsing fever, more than 1 in $4\frac{1}{2}$, were under 15 years of age. Females of an advanced age seem to be more liable to be affected than males.

3. *Months and Seasons of the Year.*—The following table shows the prevalence of relapsing fever in each month of the year. It should be borne in mind, however, that Carter's figures are vitiated by the circumstance that in the aggregate of each month is included all the cases that remained in the previous month. It is to be regretted that fuller statistics on this important point are not available.

	Goomsur Epidemic of 1847.	Hydrabad Epidemic of 1863.	Sattara Epidemic of 1859.
January	...	...	34
February	...	...	42
March	157	177	37
April			15
May	298	797	...
June	165	1535	...
July	166	717	...
August	203	599	...
September	205	1415	...
October	289	4264	10
November	414	6263	16
December	470	4793	24

From Bryden's table, also, of the mortality from relapsing fever, given in a previous page, it will be seen that the disease has prevailed in all months of the year. Murchison justly says, "Relapsing fever is truly an epidemic disease, and the season of the year seems to have little influence on its prevalence. In one epidemic, the largest number of cases occurs during one season; in another epidemic, during a different season." Epidemics have commenced and prevailed in every month and season of the year. In the lower provinces of Bengal, epidemics have occurred chiefly in the rainy season. The Calcutta epidemics of 1824, 1828, 1833, 1853, and 1864, prevailed in the months of June, July and August, the rainy season; the Howrah epidemic of 1834, also occurred in the same period of the year. The remarkable prevalence of the disease during the rains, obtained for it the name of remittent fever of the Bengal rainy season, from Twining. That the rains of themselves have no influence in the generation of the fever is proved by the fact that the latter has been known to occur in the dry season. Thus, the Berhampore epidemic of 1825 began in the end of March, and terminated in June, at the beginning of the rainy season; and the epidemic amongst the cooly emigrants at Calcutta, began in September, on the cessation of the rains, and prevailed to the same month in the following year. The epidemic of 1825, in Arracan, the climate of which is of the same character as that of Lower Bengal, began in April, and terminated in January of the following year. In the upper provinces, epidemics have commenced chiefly in the cold season; thus, out of forty-five epidemics in the jails, the mortality from which has been tabulated by Bryden, the disease commenced in the cold season in thirty-two; but that cold in itself has no influence in starting the disease, is proved by the fact that thirteen of these epidemics began in the hot season. In these regions, likewise, epidemics have broken out in the rainy months. Thus, the great and destructive epidemic of 1825, which covered the territory about Ghazeepore, Chunarghur, and Benares, commenced and prevailed during the rains. On the other hand, the Patna epidemic

of 1857, which began in December of the previous year, ceased on the occurrence of the rains after a duration of about six months. In the Bombay Presidency the same fact appears. The epidemic in the 2nd Queen's Regiment, which commenced at Poona in the cold weather of 1835–36, abated, or was apparently arrested by a few days of hot weather; but it returned in force in April during some stormy weather. On the removal of the regiment to Bombay, the epidemic took on the more serious remittent form during the monsoon months. On the other hand, the Hydrabad epidemic of 1843, which commenced in April, distinctively abated in July and August, monsoon months, while it increased in intensity, and became more widespread in the cold weather, after the cessation of the rains. In the Madras Presidency likewise have epidemics occurred during the rainy as well as in the dry season. The fearful epidemic in the southern division of the Madras Presidency which occurred in the beginning of the century, prevailed through two entire years, and ceased in the middle of the year 1812. The Goomsur epidemic of 1847, which commenced in March, was not much influenced one way or the other by the rains. From these facts, the conclusion may be drawn that the seasons, *i.e.*, heat, cold, dryness, or rains, do not of themselves possess any predisposing influence on the disease, although the course and character of epidemics, and, indeed, their origin, are, in many instances, indirectly connected with these powerful agencies.

European and Indian experience of the disease coincides on this point. Murchison thus sums up the facts bearing on the subject:—"Epidemics of relapsing fever appear to commence, progress, and decline, quite irrespectively of the season of the year."

4. *Occupation.*—There is no evidence that occupation, in itself, predisposes to relapsing fever. In the jails, where prisoners are employed in a great diversity of occupations, the disease has affected all classes, however employed. The classes of the general community who have suffered most were those engaged in the lowest agricultural labour, or the small trades which fall to the lot of the poor; and the

disease was dependent, not on the nature of their work, but on the insufficiency or precariousness of their means of subsistence. The comparative exemption of the better classes, whose resources at all times are ample to prevent want, depends on this circumstance, whatever might be the nature of their employment. Military duties, in themselves, in like manner, have no influence in predisposing to the disease when troops do not suffer from bad and insufficient supplies of food, or when the people of the district are free from the disease. The great epidemic of Hydrabad, in 1843, amongst Sir Charles Napier's troops, cannot be attributed to the nature of military duties in themselves, for the labours of the troops were concluded; but rather to the contingencies incidental to warfare from the devastation of the country, the destitution of the conquered people, and to the disease having arisen amongst them, and spread to the troops, or to deficient accommodation and the breakdown of the commissariat. Carter attributed the disease to irrigation, an error that has been perpetuated to the present day. The epidemics that arose amongst the native troops in Kimedy and Goomsur had no connection whatever with the nature of their military duties in themselves, but were clearly due to the deficiency in the supplies. These duties do not appear to have been specially arduous, and were not more so than those undergone by troops in other expeditions. The force under Sir Neville Chamberlain and Sir John Garvock, which was shut up for three months in the Umbeyla hills in 1863, and incessantly attacked and harassed by night and day by a far more warlike hill-people than the Kimedy and Goomsur tribes, was kept free from relapsing fever by the successful exertions of an intelligent and active commissariat officer, who was rewarded with the honourable distinction of the Bath for his services. Even the so-called malarious fevers were reduced to a minimum in the Umbeyla force, though according to prevalent notions, the narrow valleys and low hills, such as those which were occupied by it, abound in malaria.

5. *Recent Residence in an Infected Locality.*—From the records of the London Fever Hospital, Murchison ascertained that of 380 cases of relapsing fever, about four-fifths

had resided in London not more than one year; of these, one-eleventh had not resided more than three months, and more than one-seventh had not resided more than six months, and many only a few days. He points out that although these statistics might seem to indicate that recent residence in London does predispose strongly to relapsing fever, this result could not have been due to any local cause in constant operation, for during seven years, prior to the publication of his treatise, in 1862, not a case of relapsing fever had occurred in London. He explains further that a large number of the persons who were affected were vagrants or out of employment, who, after wandering over the country, arrived destitute in London. Not a few of these persons were actually ill on arrival; and the majority of them had recently emigrated from Ireland, where they had probably contracted the disease, and brought it over with them.

That the circumstances of a locality, in themselves, or endemic peculiarities, do not develop the disease or predispose to it, is clearly deducible from the fact that the disease has become extinct in localities where before it prevailed extensively. It is quite clear, from the writings of Twining and others, that the disease was common in former days in Calcutta. It is now rarely met with, and may be regarded as practically extinct in the metropolis. Epidemics were common, prior to the year 1864, in the jails of the Punjab, but the disease has occurred only exceptionally, and been always introduced in every instance since recorded. The same remark is probably applicable to the jails of the North-Western provinces and of the whole Bengal Presidency.

The attention of Indian writers has not been generally directed to the greater susceptibility to the disease of new comers. The prisoners of the Mainpuri jail, who, being employed in road-making, were sent into the neighbourhood of Eta in the year 1836, contracted the disease a month after it had appeared epidemically in that city and its vicinity. Though it is clear that they caught the disease from the inhabitants, it is very probable that the causes of the disease were in operation at the time amongst them, and even prior to the outbreak. In the epidemic in the

19th Bombay N.I. at Kholapore, in 1852, the recruits suffered, in proportion to their numbers, much more than the sepoys. But Wyllie attributed the fact to their being in debt and poor on joining the regiment, and therefore unable to provide themselves with suitable food and clothing. He further points out the remarkable circumstance that, while the 18th Regiment suffered from the disease, the local corps at Bhowrah, a distance of only three miles, continued healthy. In the Tatta epidemic of 1839, most of the cases were young men, who had recently joined, and had never been before in Guzerat. In the epidemic in the Sattara jail in 1858–59, the authorities thought infection from old cases was readily received by newly-convicted prisoners. Six of twenty-four fatal cases were under two months' residence. Of the susceptibility of new-arrivals to contract the eruptive fever, an example is given by Mouat in the description of the Berhampore epidemic of 1825. The left wing of H.M.'s 31st Regiment, recently from England, readily took the disease a few days after arrival at the station. But it is probable that the wing would have contracted the disease all the same if the men had been old residents.

6. *Temperature and Moisture.*—From what has been already said regarding the influence of season, it is clear that variations of temperature in themselves have little or no influence over the origination of the disease; for epidemics have been kindled and have progressed during every month of the year, irrespective of the temperature. The indirect influence of a high temperature in abating the severity, reducing the mortality, and limiting the spread of the disease, is sufficiently apparent from the tables of the prevalence of the disease, and the mortality from it during the several months of the year. But the extinction of the disease cannot be attributed to a high temperature in the face of the fact of the origination of epidemics in the height of the hot weather, as in thirteen out of forty-five epidemics in the jails of Upper India, of the persistence of others during the hot months, and their decline, in many instances, in the cold weather. Corresponding facts preclude the idea that cold has any direct influence on the prevalence

of the disease; but its indirect effect on the spread, severity, and mortality of the disease is very marked. The influence of climatic temperature over the diffusion and mortality of the disease might be explained from incidental circumstances connected with ventilation, and the exposure of the sick to the fresh air. In the hot weather, the doors and windows of houses are thrown open night and day; and the healthy lead an out-door life, and even the sick may be brought out, as they generally are, into the shade of trees and verandahs, and freely exposed. The wholesome and powerful disinfecting influence of fresh air has thus full play. In the cold weather, on the other hand, houses are shut up; and to the evil effects of impeded ventilation are to be attributed the spread and intensity of the disease in cold weather. To this circumstance should be added the depressing influence of cold operating, even in health, and in every disease, and not confined to the subjects of relapsing fever, in the absence of clothing and artificial means of procuring warmth.

A few writers have attributed the disease to a sudden wetting, or to exposure to rain, or to the prevalence of wet weather. The epidemic which occurred amongst the troops in Burmah in, 1824, was thought, by Mellis's medical correspondent, to be due to prolonged exposure to incessant and heavy rain for twenty-four hours. It is plain, however, from Twining's account, that the disease was amongst the troops prior to their proceeding to Burmah; the 89th Regiment, for instance, had the disease in Madras and on the passage to Burmah. It would seem that exposure to wet and its attendant cold has a depressing influence favourable to the development of the disease, in those in whom the cause is already operating. To this circumstance, in part, might be attributed the great prevalence of the disease during the rains in Twining's days in Lower Bengal. In the epidemic of typhus in 1869, in the Rawul Pindee jail, I observed the remarkable influence of rain or wet in developing the disease in those who had undoubtedly already contracted it;* and it would appear that a similar

* See Appendix to "A Sketch of the Medical History of the Native

influence is exercised by wet in the case of relapsing fever. Humidity of the atmosphere or of the soil, in themselves, have no predisposing influence, for the disease has originated in regions and in seasons remarkable for dryness. Numerous epidemics are recorded as having occurred in Northern India, even in parts remarkable for extreme dryness of the soil and of the air. Few regions equal in dryness the elevated district of Rawul Pindee, in the Punjab, in which, for the greater part of the year, the natural streams dry up, or, rather, the waters run off rapidly to the Indus. In the greater part of it, the subsoil is almost absolutely wanting in moisture, and even the wells become dry in the hot months of the year. The want of water is a crying evil in the district, and numerous villages with difficulty obtain a scanty supply. The same remarks are applicable to the station and district of Umballa. In both these districts epidemics of relapsing fever have occurred repeatedly. Probably few regions in India are so hot and dry as the station and district of Mooltan, in which the disease has prevailed, not only amongst the muleteers, on their return from Abyssinia in 1869, but amongst old residents, the prisoners in the jail, as officially recorded by De Renzy.

Fever epidemics which occur in irrigated districts are often attributed to excessive moisture in the subsoil, and the consequent generation of malaria as a cause of fever. Recent observations of a comprehensive character throw much doubt upon this view. For instance, Cornish, in the Sanitary Report of the Madras Presidency for 1869, in speaking of the fever mortality (12 per mille of the population) in the Godavery district, the greater portion of which is under canal irrigation, remarks: "If a similar mortality had occurred in the adjoining irrigated district (Kistna), or in the delta of the Cauvery (Trichinopoly and Tanjore), where irrigation has been practised for many years, it would have become a question whether some connection might not have been traced between the acces-

Army of Bengal, for the Year 1869," by Surgeon-Major I. T. C. Ross, F.R.C.S., Secretary to the Inspector-General, Medical Department.

sion of fever and the influence of canal irrigation; but, as a matter of fact, fever has been more prevalent and fatal in the districts of Bellary, Kurnool, and Cuddapah, for the past four years, where there were no irrigation works to speak of, than in the Godavery district for the same time; while the irrigated districts of Kistna, Tanjore, and Trichinopoly have had a fever mortality of *fifty per cent.* below that of the dry districts just mentioned." The value of these observations is somewhat lessened by the want of information regarding the nature of the fever in the Godavery and the other districts; but the conjecture that it was relapsing fever is not improbable.

The irrigated district of Saharunpore, in the North-Western Provinces, suffered from epidemics of relapsing fever in two successive years, 1869 and 1870, and it would appear from Garden's account, that fever of the same nature prevailed, though less extensively, in the two preceding years, 1867 and 1868. For some years prior to 1867, however, the district had been remarkably free from fever, although irrigation was as much in operation during those years as subsequently. The early history of the same district furnishes some facts which materially weaken the view which connects the origination of the epidemics with canal irrigation. Authentic information has been collected by the editor of the *Indian Medical Gazette* (March, 1871) of the occurrence of fever epidemics in the district before canals had been constructed. The records of the Medical Department contain accounts of a fever epidemic in 1817, and another in 1814, in the last quarter of those years. In 1817, a body of prisoners collected together at Saharunpore, for some public works, sustained a loss of 34 in three months, out of a strength of 489, and it was alleged that the convicts merely participated in a sickness common to the locality, which had affected the troops, and depopulated villages. In 1814, a body of 225 prisoners lost 34 in three months. The nature of these epidemics might be inferred from the circumstance of their having appeared amongst prisoners who in Northern India suffered much from relapsing fever in former days. But although it is utterly impossible that canal irrigation and the conse-

quent moisture of the subsoil have any influence in producing relapsing fever, it is not improbable that when fever does break out in an irrigated district, the humidity aggravates the disease, and assists in its dispersion. It is well known that districts irrigated by canals or natural streams are remarkably prolific of enlargement of the spleen, a very serious complication, when it occurs, of relapsing fever. By aiding in developing this lesion, as it appears to do, a humid district would materially increase the danger, and thus add to the mortality, immediate or ultimate, resulting during or subsequent to an epidemic. Enlargement of the spleen has not been met with to any considerable extent in the epidemics which have occurred in districts which possess a dry soil, such as those of the Punjab, excepting perhaps Peshawur; while it appears to have been common in the epidemics at Saharunpore, and in the remittent fever of Lower Bengal of Twining. I have already alluded to the fact, that splenic complication has been less common in India than in the relapsing fever of Great Britain and Ireland, the soil of which countries, under the best of circumstances, contains much moisture, even more, perhaps, than that of the irrigated districts of this country.

It would appear, therefore, from the evidence, that while humidity has little or no influence on the prevalence of the disease, it markedly predisposes to the dangerous lesion of enlargement of the spleen. It would likewise appear that paralytic symptoms are not uncommon in humid countries, such as Saharunpore and Mangalore, as a complication of relapsing fever.

7. *Bodily Fatigue* appears to have an influence favourable to the reception and spread of the fever. Partly to this cause might be attributed the wide diffusion of the disease amongst troops in arduous campaigns, such as those of Burmah in 1824–25, Sir Charles Napier's Scinde campaign, and the Kimedy and Goomsur expeditions. Amongst prisoners also, under the old system of employing them in working on public works, at a distance from their prisons, it is probable that excessive fatigue had an influence in predisposing to the disease.

8. Other circumstances being favourable to the development of the disease, *Mental Depression* might be supposed to come into play in individual instances, as a predisposing condition. I decline, however, to admit that depressing passions have any appreciable influence on the epidemic manifestation of the disease. I cannot ascertain the facts on which such a statement can be based, and surmise that the opinion might have been advanced to excuse or cover a culpable neglect of the plainest principles of physiology. Depressing passions were alleged to be one cause which predisposed prisoners in Indian jails to attacks of fever, and augmented the mortality; but my experience of prisoners has afforded no proof of it, nor have I been able to gather from the recorded experience of others any facts which justify such a view. On the contrary, I have found that if the truths of physiology and the precepts of sanitation receive due attention, and are not suppressed from considerations erroneously supposed to be legal or judicial, because they have been affirmed on occasions by judicial officers, prisoners in jails can be maintained in as good health as native troops or the better classes of the civil population. In all accounts of epidemics, medical officers have laid no stress on the influence of depressing passions as predisposing to the manifestation of the disease.

9. *Excessive Vegetation*, generally alleged to be favourable to the manifestation of fever in this country, cannot be supposed to have any influence on the prevalence of relapsing fever, which has appeared epidemically in districts which are almost destitute of natural vegetation, and only partially cultivated, such as many of those in the Punjab, and which has alternately prevailed and become almost extinct in districts remarkable for luxuriant vegetation. The name *jungle* fever, applied to the *bilious remittent fever* of the old authors, or the relapsing fever of modern pathologists, essentially carried with it no deeper significance than the names Kurnaul fever or Bombay fever applied to the same disease. These were designations employed by those who did not understand the nature of the disease, and really implied only that the disease was observed in certain localities. The theory propounded

by the old pathologists associated a luxuriant wild vegetation with the causation of jungle-fever. Instances of detachments of troops becoming affected with the fever, while traversing or residing temporarily in jungles, are undoubtedly on record, but all such outbreaks can be traced to causes apart from vegetation, which have been found to be antecedent and necessary to the development of the disease epidemically, in every situation and locality, in jungles as well as in bare regions devoid of jungles, in cities, in jails, and even on board ship.

10. Previous illnesses predispose to relapsing fever. Patients in hospital, suffering from other diseases, are specially apt to contract the fever, when cases of it are treated in the same wards. It is probable that through the hospital many epidemics in regiments and jails have been lighted up. Although the subject has not been mentioned by writers,' it would appear that scurvy is a powerful predisposing cause. Prisoners in jails and native troops, who have suffered much from epidemics, are often affected with scurvy, or soft and readily bleeding gums. The debility and loss of vigour induced by intemperance, the use of bhang or opium, and by debauchery, are favourable to the development of the disease; but it should never be forgotten that the most robust health is not proof against the reception of contagion.

11. Relapsing fever being contagious, overcrowding, of course, favours its propagation. To this cause is attributable its wide diffusion when it makes its appearance in jails, regiments, crowded houses, villages, and cities. Overcrowding, associated with filth and destitution, appears to be the most favourable condition for the reception and spread of the disease. I have alluded to the great mortality sustained by the villagers of Pakism during the Paniput and Rhotuck epidemic of 1837. Shirreff thus describes the state of the people: "I counted in the interior of one house of the ordinary size, twelve buffaloes, besides some calves and a pony, all but pressing on individuals labouring under different stages of the epidemic. Four of these sufferers were lying in two beds, and a fifth after some time was detected breathing his last in a place like a baker's oven. The pent up putrid vapour (for it

was not air) of this place, nearly suffocated me, no attention having been paid to the commonest cleanliness. Seven individuals had already died out of this house from the epidemic. Many other houses in the same village were similarly circumstanced." It is not surprising that this village suffered severely, and that one division of it was depopulated to a man. Shirreff elsewhere observed, on the other hand, that wherever the ventilation and other conditions were good, the disease was rendered innocuous. The reader will remember Hunter's account of the stockings of one of the native crew of the Indiamen.

B. *Exciting Causes.*

1. *Contagion.*

Murchison states that amongst European observers, all have believed relapsing fever to be contagious, except Craigie and Virchow. Craigie considered that the belief that it was contagious was a "presumption rather than a well-founded inference." It would appear, however, that this opinion was expressed while the Edinburgh epidemic of 1843 was going on: when the disease was, for the first time, beginning to be regarded as distinct from typhus, and before sufficient evidence had been collected as to its contagious character. Virchow's entire experience of the disease was acquired during a fortnight's visit to Silesia, during the epidemic of 1847, a period hardly sufficient for a thorough observation of the peculiarities of an unfamiliar disease. All the medical men practising in Silesia, however, believed the disease to be contagious.

Amongst Indian observers, not a few have denied or disbelieved in the contagiousness of relapsing fever, or, as it was formerly known, of jungle fever, remittent fever, or bilious remittent fever. Annesley probably did not meet with relapsing fever in any amount in Madras, the endemic disease of which metropolis was obviously typhoid fever. Hence his remark, that he had not himself observed the property of contagiousness in tropical fevers that came under his observation, was probably correct. He, however, expressed surprise at that peculiarity, and endeavoured to account for it, while he admitted that the fevers prevalent

amongst natives were contagious. Twining, in his systematic work on the more important diseases of Bengal, is silent on the subject of contagiousness. He probably met with no instance in which the disease had been propagated by contagion in the wards of the Presidency General Hospital, which are remarkably well ventilated. In his account of the eruptive fever of 1824, he expresses a positive opinion that the disease was not contagious, for three reasons: namely, many escaped, although exposed to the fever; it arose at the same time in remote parts of Calcutta; and it affected persons who had not had any communication with the sick. The same apparent anomalies have been also observed in the case of small-pox and measles, whose contagiousness is universally admitted, which have been known to occur in places and under certain circumstances in an inexplicable manner, and not to be contracted by some persons, even when fully exposed to the poison. Morehead, like Annesley, did not observe the contagiousness of tropical fever, and he states that it is a subject of which he had no personal knowledge: a deficiency of observation probably due solely to the excellent ventilation maintained in the Jamsetjee Jejeebhoy Hospital and the European General Hospital in Bombay. Morehead, however, refers to the belief of Clark and Lind, that "Bengal remittent fever," which was doubtless the same disease as Twining's "remittent fever of the Bengal rainy season," was infectious; and remarks, "we shall do well to bear this old doctrine in recollection, because, though with our present greater attention to cleanliness and ventilation remittent fever is not infectious, it does not follow that it may not become so from overcrowding and neglect." The manner in which this author, writing so late as 1860, has ignored the observations and proofs brought forward by others regarding the contagiousness of tropical fever, in contributions to the Transactions of the Calcutta and Bombay Medical and Physical Societies, and to the medical journals, is very remarkable. He has, however, admitted the contagiousness of the Pali plague, and is, apparently, of opinion that the fever epidemic of 1856, amongst the coolies at Aden, was contagious, although Hormusjee had

not noticed the question of infection in his account. The following observers have recorded their conviction of the contagiousness of relapsing fever, and have afforded proofs for their belief: in 1836, MacNab, Spencer, and Stuart; in 1837, Guthrie and Shirreff; in 1839, John Murray; in 1842, Beattie; in 1852, Lyell; in 1853, Farquhar; and in 1860, Walker. During the last decade, numerous observers have recognised the contagious quality of the disease; and of these, the following may be mentioned: Chuckerbutty, Partridge, De Renzy, Gray, Dallas, Bateson, D. B. Smith, Cookson, C. M. Smith, Ross, Hugh Clark, Sutherland, Bryden, Green, and the Sanitary Commissioner with the Government of India.

The contagiousness of relapsing fever in this country is proved by similar evidence to that which has been brought forward by Murchison with regard to the disease in Europe.

(*a.*) *When relapsing fever commences in a house or district, it often spreads with great rapidity.*—No fact is more patent in the history of relapsing fever in this country than that the disease, when once set up amongst a body of men, often becomes rapidly diffused. In the Calcutta epidemic of 1824, the first cases were observed on the 23rd and 24th May. In ten days, says Twining, great numbers were ill; and before the end of July, nearly half of the vast population of Calcutta were affected; and within the short space of three months, only from two to five per cent. of the inhabitants escaped the fever. In the Berhampore epidemic of 1825, within two months 112 severe cases occurred amongst the troops. The rapidity of the spread of the fever amongst the sepoys of the Goomah outpost, in the Kimedy expedition of 1833, was equally remarkable. On the 8th July, twenty-six men were attacked; on the 9th, a similar number; and the sickness speedily became so general, that the officer commanding was unable to retain the post. Out of 240 men, only 120 were fit for duty, and these also were shortly after disabled to a man. Of the rearguard of the Goomah detachment, consisting of 250 men posted at Gibah, only five escaped the fever. The escorts of supplies to Goomah, although they went

there only for a day or two and returned, were attacked. In fact, it would appear that very few persons escaped the disease. In the epidemic in the Moradabad jail, in 1836, Spencer records that in the middle of April an increase of fever was observed amongst the prisoners, but the cases were mild. On the 20th April, instances of jaundice and cerebral affection occurred; and early in May, the hospital became crowded to excess. During the Paniput and Rhotuck epidemic of 1837, out of a population of 500 families in the village of Faridpore, 200 individuals were reported by the police to have died within six weeks. At the village of Pakism, containing a population of 1000 souls, 230 died within twenty-seven days. At Bhow, one family of sixteen members lost seven within a month. In the Goomsur expedition of 1847, the fever began on the 20th March, and became at once epidemic. In the Peshawur epidemic of 1849, in the 1st Bombay Fusiliers, 798 cases occurred in the short space of two months. In the Central India epidemic of 1859, within the space of a month many villages lost half their inhabitants. The epidemics which occurred in the jails of Northern India were remarkable for the rapidity of the spread of the fever. In the Saharunpore epidemic in the fall of the year 1870, in the month of October, the number of deaths was over 5000 in a population of 900,000.

(*b.*) *The prevalence of relapsing fever in single houses or in limited districts is in direct proportion to the degree of intercourse between the healthy and the sick.*—According to Duncan Stewart's account, the Professors of Bishop's College, their families, the students, and all the servants, were attacked in turns, in the Howrah epidemic of 1834. A very remarkable instance of the prevalence of the disease being in some instances, perhaps, entirely dependent on the facility of communication, was afforded in the Buxar and Ghazepore epidemics of 1825. The fever commenced at Buxar, and gradually went up to all the stations on the river. It appeared to be confined almost entirely to the course of the river, and inland villages did not suffer. The spread of the disease in densely populated cities and villages, is due in great measure to the unrestricted com-

munication between the sick and healthy. In the absence of the precaution of completely separating the affected, relapsing fever has invariably become general when it appeared in the jails of Northern India. Stuart has recorded the fact that when the jail at Moradabad was affected in 1836, and the hospital was crowded to excess, not one of the prisoners confined in the debtors' jail contracted the fever, although the latter building was situated within the walls of the criminal jail, and was not nearly so well ventilated. He justly attributed their exemption to the absence of communication with the criminal prisoners. While the civil prisoners, who were isolated in the very midst of the fever-afflicted jail, escaped, every hospital attendant was laid up in consequence, as Stuart explained, of their necessarily close intercourse with the sick. The remarkable liability of hospital attendants to contract the fever has been recorded by numerous observers. Carter says that no medical officer of Sir Charles Napier's force escaped in the Hydrabad epidemic of 1843: "those who were well acted for those who were sick; but as no one remained well long, there were sometimes very few at all left to act: not that there was a scarcity of medical officers in camp, but on account of the extreme prevalence of the disease, they, like the rest, were more or less unfitted for duty. For upwards of a fortnight, in the month of October, I was the only medical officer in charge of the 15th and 21st Regiments N.I., and of 500 camp-followers and prisoners. . . . Had our disease been a little more fatal, the living would no more have been able to bury their dead than they were in the time of Caius, who records this of the intermittent fever which prevailed in London in 1551. Indeed, to a crisis somewhat resembling that it had arrived in the hospital of the 21st Regiment N.I., between the 14th and 19th of November, when the whole of the subordinate medical establishment, with the exception of a few camp-followers, left the dispensary, to place themselves in the hospital among the patients to whom they had been giving their attendance." During the epidemic in the Bareilly jail, in 1837, Guthrie states that he himself suffered from pains in the shoulders,

loins, and groins; and that all the native doctors, with one exception, and almost every one of the attendants on the sick, every surgical patient in the hospital, as well as some of the guards, were attacked with the fever; so that he, as well as his predecessor, was forced to the conclusion that the epidemic was infectious within a certain limit or locality. In the epidemic in the 20th Punjab Infantry at Rawul Pindee, in 1864, the hospital establishment suffered more than the sepoys. One of the two native doctors, the hospital havildar, all of the four dooly bearers, both of the bhesties, both of the cooks, and both of the mehters, contracted the fever, as well as the mother and young brother of one of the latter, who resided on the premises, and helped in the work of the hospital; so that of the entire hospital establishment only two escaped,—a native doctor and myself. Of the twelve camp-followers in the hospital who were attacked, four died. In the epidemic in the Umballa jail, in 1866, the same remarkable liability of the attendants on the sick to contract the disease was observed. Bateson states that seventeen prisoner attendants and every free native attendant in the hospital were, at one time or another, seized with the fever; and, further, two burkindazes took it, and died jaundiced. The crews of the river-steamers and flats, which conveyed the Punjab muleteers to Mooltan, were infected by the latter. These men received liberal pay, were well fed and well clad, and always enjoyed good health. A single death was an exceedingly rare occurrence amongst them. Before the muleteers, says Gray, were received on board at Kotree, there was no sickness among the crew. After the embarkation of the muleteers, the crew began to sicken and die. The Indus Steam Flotilla Company's officials had seen no such fever before, and concluded that it must be a new disease imported by the muleteers from Abyssinia.

In jails the liability of the guards, and of the tradesmen dealing with the jail, who are constantly intermingling with the prisoners, to participate in an epidemic prevailing amongst the latter, has been remarked by several observers. The troops, however, cantoned in the same station, and often in the proximity of the jail, generally escape. Of this

fact, Maxwell gives a striking illustration, which was observed on the North-West Frontier. In the year 1855, relapsing fever occurred epidemically in the jails at Kohat, Bunnoo, Dera Ishmail Khan, and Dera Ghazee Khan. The result of Maxwell's inquiries was that the disease was limited to the jails, and little known elsewhere, and that the troops escaped. Two medical officers at Kohat and Dera Ishmail Khan took it; and a military officer at Asnee, a distant station, in which this was apparently the only instance of the disease. How this gentleman contracted his illness is not stated. The remarkable exemption of the troops from this disease, although resident in the neighbourhood of infected jails, is clearly due to the circumstance that there was little or no communication between them and the prisoners, and they were otherwise free from predisposing causes.

(*c.*) *Persons living in comfortable circumstances, and in localities where the disease is unknown, are attacked on visiting infected persons at a distance.*—Some of the facts already adduced in support of the two preceding propositions, illustrate this one also. Medical officers of Indian prisons invariably resided, in former days, at a distance from the prisons, generally in the military station; they contracted the disease from visiting the prisons, and coming thereby in communication with infected persons. McDonell has recorded that strangers from the plains, peons, and civil servants, who proceeded to the Goomah and Gibah outposts, and the escorts of supplies, contracted the fever from the infected sepoys. Eyre relates the circumstances under which the families of the sepoys at Russelcondah, in the Goomsur epidemic of 1847, caught the disease. The families kept free from the fever up to December, while the sepoys at the outposts suffered greatly. It was ascertained, on inquiry, that some of the families had been visiting an outpost where the fever prevailed in an aggravated form, and a few days after returning they became the subjects of the disease, and some of them died, and the disease then spread amongst the others.

(*d.*) *Relapsing fever has often been imported by infected persons into localities before exempt.*—In the illustration just

given, the women who became infected during their visit to the outpost, conveyed the disease to the families in Russelcondah, amongst whom it had not previously prevailed. Several others of the facts already stated support this proposition also. Some of the jail epidemics have been clearly proved to have been set up by the imprisonment of infected persons, or by transfer of infected prisoners from one jail to another. Bateson states that an epidemic of relapsing fever occurred in the Umballa jail, in the autumn of 1864; and he showed, in his official report, that the disease had been introduced into the jail by a gang of prisoners who were transferred from the Delhi jail. I have been unable to give the details of this epidemic, and of the important facts regarding its origination, because the official report of it has not been published. In the Umballa jail epidemic of 1866, the origin of the disease was very clearly and admirably traced to importation again; and from the officially published report of it I have taken the following valuable observations, besides many others referred to in this work. In December, 1865, a gang of thirty prisoners were transferred from the Kurnal to the Umballa jail. On arrival, on the 8th, they were put in quarantine, which extended over a period of fifteen days. Within four days after their arrival, two of the transferred prisoners fell ill with a "jaundice illness," and one of them died. A few cases of fever continued to occur in this gang; but they were mistaken for hepatitis, for remittent fever and intermittent fever, supposed, I fancy, to be due to malaria. On the termination of the period of quarantine, the whole, or the majority, of the gang was removed to barrack No. 28 in the jail. In this barrack a few cases of intermittent fever and "hepatitis" occurred in the months of December, 1865, and January and February, 1866. In the first week of March so many cases of remittent fever occurred in the same barrack, that Bateson's attention was directed to it. Taking at the time a wrong view of the cause and nature of the fever, as he ingenuously admits, he evacuated No. 28 barrack and fumigated it, and unfortunately spread its inmates among the other barracks. The epidemic then became general amongst the prisoners

who occupied the other barracks, and who had previously been exempt from the fever. Another untimely circumstance favoured the spread of the disease in March. A large number of dacoits were in the jail, and there was reason for believing that they were endeavouring to get up a combination for the purpose of breaking jail. Orders were, therefore, issued to the jailer so to lock up the individual dacoits at night, that no two of them should associate in the same dormitory or barrack for two successive nights. The contagion was thus spread, as there was a good deal of moving about, and prisoners, who had been infected, slept oftener in different barracks.

Before the dispersion of the inmates of No. 28 barrack, No. 18 barrack furnished a few cases of the fever. Bateson explains that the barrack became infected in this wise: A prisoner attendant on the sick in hospital, one Mamoo, slept every night in No. 18 barrack. On the 25th February, Mamoo fell sick, and in the first week in March two prisoners were admitted into hospital with the same illness from No. 18 barrack. Mamoo was the attendant on a prisoner who had died on the 17th December, on another who died on the 27th January, and on another who was admitted on the 24th February, besides several others who had the fever.

The length of time (a period of two months) which intervened between the introduction of infected persons into the jail and the epidemic outbreak of the fever, might, I think, be reasonably attributed to the absence of predisposing conditions in the jail. Since 1864, the prisoners of the Punjab jails have been well fed, well clothed, and their health carefuly attended to. The one great sanitary defect of crowding, still permitted, fortunately did not exist at the time; and thus the spread of a dangerous distemper was naturally slow and unobserved, in the absence of favourable conditions. It is hardly possible to believe that it would have been equally slow in any year prior to 1864, when the prisoners of the Punjab jails were maintained in a condition officially described by the late Mr. Macintire, Dep. Inspector-General of Hospitals of the Peshawur Circle, as a state of "chronic starvation," and by D. B. Smith as "modified starvation." That general good circumstances

and health do afford some protection against the reception and spread of the contagion of relapsing fever, is, I think, supported by the fact that of several European gentlemen who visited the Umballa jail, during the epidemic, of whom Bateson gives a list, not one contracted the disease.

The Kurnal jail, whose prisoners infected the Umballa jail, had itself been infected by a gang of seven thieves sent to it from Thana Rajound, in October, 1865. Cookson's account of the introduction of the disease into the Shahpore jail, in 1867, by a newly convicted prisoner, who had been infected in a village, will be found in the historical section. So well known is the fact that relapsing fever can be introduced amongst a body of men previously exempt, that it has been used in support of the assertion that, in all judicial epidemics, the disease had been introduced, and not generated within the jails.

A good example of the infection of the population of a locality by the visits of infected persons is given by Farquhar, who observed the spread of the fever in 1853 amongst the people of the Chuch, a richly-cultivated and densely-populated tract in the Rawul Pindee district, on the left bank of the Indus, after visits paid to friends by the villagers of Eusufzai, on the right bank of the river, where the epidemic first showed itself. In the Mauritius, an island moderately populated, and whose inhabitants are in comfortable circumstances, relapsing fever had been unknown epidemically prior to 1866, in which year a fearful epidemic took place. Whence and how the disease had been imported might be inferred from the popular name given to it of "Bombay fever," and from the circumstance that the cooly emigrants from Bombay were the first and chief sufferers. The Punjab Muleteers likewise hailed from Bombay, and probably also the coolies employed by the Public Works Department at Aden in 1856. Other examples of the importation of the disease from one locality to another will be found in the accounts of epidemics in the historical section.

The foregoing evidence is of the same character as the proofs adduced by Murchison to demonstrate the contagiousness of relapsing fever in Europe; and it is thus

clear that the disease is likewise contagious in this country. It should be remembered that the above proofs are general, and establish the contagiousness of every form or variety of relapsing fever, the eruptive as well as the non-eruptive disease, and all the thermometric varieties. These varieties are not only capable of propagating themselves by contagion, but there are proofs which form further evidence of their identity, that they are capable of producing each other. The circumstances under which the individual varieties are generated, and under which one variety might produce another, are not clearly apparent; but the instances of the intermingling in the same epidemic of more than one variety, are sufficiently numerous to justify the inference that they are identical in nature and can develop each other. Further observations in this direction, however, are necessary, as there cannot be a question that the non-recognition of the disease, in its protean forms, was the cause of many facts not having been observed, and thus allowed to lapse.

The eruptive fever can produce the non-eruptive variety. Twining states that H.M.'s 89th regiment left Madras for Rangoon in April, 1824, having the non-eruptive fever amongst them; the epidemic among the troops in Burmah, which was clearly introduced by the 89th regiment, was, however, a mixed one of the eruptive and non-eruptive fever. H.M.'s 13th regiment embarked at Calcutta at the end of April, 1824, and arrived at Rangoon early in May; a very mild non-eruptive fever prevailed amongst them. The date on which the regiment left Fort William was so shortly antecedent to the full development of the eruptive epidemic described by Cavell, that the presumption is very strong that the disease had been contracted in Fort William, and that, had the regiment remained in garrison, the eruption would have shown itself. Further proofs of the transmission, and contemporary existence in the same place, of the eruptive and non-eruptive varieties are to be found in Twining's fugitive writings. Amongst the anomalous cases in the eruptive epidemic of 1824, was one in which the eruptive fever was followed by an attack on the ninth day, or, as we should now say, by a relapse of

bilious remittent fever of great severity. The dogs of Twining's friend took the non-eruptive fever, with jaundice, during an eruptive epidemic. The Calcutta epidemic of 1833 was of the non-eruptive fever, but several of the patients had a red efflorescence over the whole skin on the second or third day of the fever. It is difficult to believe that the Berhampore epidemic of 1825, and the Buxar and Ghazepore epidemic of the same year, both which occurred during the same period, the rainy season, were of different diseases; and the presumption is strong that they were both parts of the same general epidemic, and set up in the same manner along the course of the Ganges. The former was eruptive and the latter non-eruptive.

Intermittent fever has never, to my knowledge, been publicly asserted to be contagious, though I have heard of this property of the disease being suspected by a few individuals. I trust that I have adduced convincing proofs of its identity with relapsing fever, or rather that the latter disease has an intermittent variety, for a similar variety of the other forms of fever likewise exists. Two forms of disease unquestionably identical cannot be regarded as not having in common an essential character. The proofs of the contagiousness of the intermittent variety of relapsing fever are sufficiently numerous. The fever amongst the troops in Kimedy and Goomsur was chiefly intermittent, and there can be no doubt that it was contagious, in common with the remittent fever, which was entirely absent in some months, and throughout the whole period of the prevalence of the epidemics formed but a small part of them. In all epidemics the intermittent variety has arisen side by side with the remittent and continued, and some epidemics have consisted entirely of intermittent fever. It is impossible to believe under these circumstances that the intermittent variety was wanting in a character conspicuous in the other two. The identity of the *bilious intermittent fever* of Carter, as observed by him in the fearful Hydrabad epidemic of 1843, with the *bilious remittent fever* of old authors, and the *relapsing fever* of modern pathologists, being obvious, the property of contagiousness cannot be denied to it; seeing, further, that the

rapidity of the spread and the persistence of the disease through the greater portion of the year, and throughout different seasons, the great mortality, and the liability of medical attendants to contract it, were circumstances consistent with the character of contagious distempers. The want of more complete proofs of contagion in this epidemic was evidently due to imperfect observation, and not to the absence of facts.

I have given, in some detail, the admirable researches of Bateson into the question of the origin of the Umballa jail epidemic of 1866. Some cases of the remittent or continued variety of relapsing were introduced into the jail in December, 1865; in the first week of March, 1866, an epidemic of the remittent fever broke out. The continuity between the imported cases and the epidemic was maintained during two months by cases of intermittent fever, and one case of remittent fever, mistaken for hepatitis. The continuity of the Goomsur epidemic was likewise kept up chiefly by intermittent fever, as is manifest from Eyre's monthly record.

I have recently met with an excellent proof of the contagiousness of the intermittent variety of relapsing fever in the Report on Hygiene, for 1870, by Professor E. A. Parkes, of Netley, published in the "Army Medical Department Blue Book," for 1870. Speaking of the Navy Medical Report, Dr. Parkes states: "An instance is given of the passage of malarious fever over half a mile of water.* The *Pylades*, with a healthy crew, anchored half a mile from the shore at Manzanilla, one of the most malarious places on the coast of Mexico. There was very little communication with the shore, except to get ten tons of cocoanuts as fuel. The ship, after remaining two days and seventeen hours, left on the 27th October. A case of intermittent fever was admitted on the 5th November, a second on the 7th; both these had been on shore. Then a man was admitted on the 8th, who had not been on shore. Then, from the 9th to the 15th November, thirty-

* Morehead, the great Indian authority on malaria, states, "Malaria is believed to lose its noxious properties by passing over a surface of water even of small extent."

two cases were admitted, twenty-eight of whom had not been out of the ship, and consequently must have either got the disease from the wind blowing off the shore (it had a marshy smell), or from the cocoanuts, which is unlikely. The longest incubative period was eighteen days. Yellowness of the skin and conjunctivæ was well marked in some cases." This was an epidemic of the intermittent variety of relapsing fever, introduced on board the *Pylades* in the same way as the disease was conveyed from the right to the left bank of the Indus in the Eusufzai epidemic of 1853. I have already pointed out that jaundice rarely and exceptionally occurs in other forms of fever, and never, I believe, in simple fever,

The evidence of the capability possessed by intermittent fever of reproducing itself, collaterally also proves that it is capable of producing the remittent and continued varieties under favourable circumstances, and of being itself produced by the graver varieties.

(*e.*) *The contagious nature of relapsing fever is indicated by the success attending the measures taken to prevent its propagation, by the early removal of the sick.*—An instance of the prevention of the spread of relapsing fever by the separation of sick and infected persons has been recorded by Cookson. The fever in the Umballa jail in 1866, was kept from spreading during the whole time that the Kurnal gang was in quarantine, nor did it spread to the other barracks, while the gang resided in No. 28 barrack. In 1868, a remarkable instance of success in preventing the spread of the disease, by the separation of the sick and infected occurred in my experience. A robust and healthy prisoner of the Rawul Pindee jail contracted relapsing fever, in an inexplicable manner, on the 25th October. The jail was much crowded at the time; but there was no other case. The sick prisoner was summarily removed, on the identification of the disease, to a quarantine barrack, where he was put aside and kept as much as was possible separate from the few residents of the barrack. In a few days two or three of the quarantine prisoners took the fever; and the entire gang, a small one, was then removed clear out of the jail to a tent outside.

No second case occurred amongst the old prisoners; and the epidemic which broke out in the jail, two months after, in January, 1869, was of typhus, without a single case of relapsing fever.

Some instances where the spread of the fever was arrested by the separation of the healthy from the sick and affected, without design, have already been alluded to. The exemption of the civil prisoners in the Moradabad jail in 1836, of the troops in the frontier stations in 1855, of the families of the sepoys at Russelcondah, were clearly due to their having been separate and apart from infected persons.

The importance of the early separation of the sick and infected from the healthy is now well understood, and has been recognised by the Government. The Punjab Muleteers were detained in camp at Mooltan, in 1868, by special order of the Punjab Government, and not permitted to return to their villages until the disease had disappeared. As there is no evidence of the occurrence of a general epidemic in the province in that year, the object of the order was fully attained.

The existence of an infectious principle in relapsing fever being obvious, the laws which govern its operation can be deduced from the results of observation.

1. *Mode of communication.*—The actual presence of a sick person, with the disease developed, appears to be necessary. In all instances in which the origination of the disease was traced to contagion, the ultimate point reached was a sick person. There is no evidence of the manner in which the poison has been conveyed, so that the only conclusion that can be formed is, that the air is the medium of communication. Probably the respiratory and cutaneous exhalations of the sick contain the poison, and perhaps also the alvine evacuations. The immediate associates and attendants of the patient, including the mehters, or scavengers, who have actually little communication with the sick in most cases, especially in regimental hospitals, beyond removing the excretions, are chiefly liable to contract the disease. These persons come within the area poisoned by the exhalations of the sick.

It might be that the actual manifestation of the disease

in a person is not absolutely essential to render him a centre of contagion, but that if the disease be latent or incubating in him he is liable to infect others. Bryden says, "the fever contagion spreads not after its development only, but in its latent stage, extending over many days before the outbreak in the individual." It is to be regretted that Bryden has not specified his facts, for facts on this subject are scarce, if not altogether wanting. Murchison, with his vast knowledge of the literature of fever, and his great opportunities of observation, has not stated a single fact which would indicate that relapsing fever is contagious in the latent stage. Bateson apparently accepts Bryden's opinion, and he adduces, in support of it, the infection of the inmates of No. 18 barrack by Mamoo, the hospital attendant, who slept every night in the barrack up to the date of his own attack, when he was permanently removed to the hospital. As the infection of No. 18 barrack admits of being explained otherwise, further facts bearing on this point in the natural history of the disease are necessary before the contagiousness of the latent period can be regarded as proved, though it is not improbable that it might be the case.

2. *The distance to which the poison will travel through the atmosphere.*—All the evidence indicates that close communication with a sick person is necessary for the reception of the poison, and that the latter becomes inert at a short distance. Some instances have already been given of the exemption of persons who were separated by a short interval of space from even large bodies of infected persons, as in the Punjab and other jails. There is no evidence of the infection of persons resident in the houses in the immediate vicinity of jails in which great epidemics had occurred. Whenever communication was prevented between infected persons and the healthy, the latter have remained free of the disease. On the other hand, persons resident in the same apartments as the sick, the attendants on the latter, and visitors, are specially liable to take the fever. With free ventilation, however, the disease almost ceases to be communicable. It is thus that an explanation can be afforded of the remarkable fact that neither Annesley,

Twining, nor Morehead observed any instance of the communicability of fever; and there cannot be a doubt that the two latter observers, at least, met with the disease commonly, for they have described it, and have recorded cases of it. It seems very probable, if not quite certain, that, as earth is a disinfectant of solid and liquid organic poisons, air is a sure disinfectant of gaseous animal poisons, especially of the contagious principle of the specific fevers.

Some writers have adduced instances of the non-communication of the fever to the healthy, although resident in the immediate neighbourhood of the sick, or even coming into communication with them. Hunter, who disbelieved in the contagiousness of bilious fevers, states that on board the *Mornington*, in which the native crew suffered terribly, losing fifty-six of their number, the Europeans and native Portuguese escaped altogether, although their berth was situated abreast and abaft of the natives' berth, and was equally badly ventilated. Twining likewise alludes to similar instances, from which he inferred that the disease was non-contagious. Taking into consideration the facts which demonstrate incontestably that the disease is contagious, the above instances are proofs of the facility with which the poison may be rendered inert, and its spread thereby prevented, even in difficult and unfavourable circumstances.

3. *Fomites.*—The poison of relapsing fever appears to be communicable by clothes. The evidence on which this statement is founded is scanty and somewhat feeble. Murchison brings forward the solitary fact mentioned by Cormack of the large number of laundrywomen who contracted the fever in the Edinburgh Infirmary during the epidemic of 1843. These women had no communication with the sick in the infirmary, except through their clothes and bedding, and their circumstances were tolerably comfortable, so as to negative the view of the spontaneous origin of the disease amongst them. In Indian experience, likewise, the facts which indicate the conveyance of contagion by clothes and bedding are few. The infection of the inmates of No. 18 barrack in the Umballa jail prior to the general outbreak of the epidemic of 1866, might be

attributed to the tainted clothes of the prisoner Mamoo, who was a hospital attendant. MacNab mentions the fact that two washerwomen, who were not prisoners, contracted the fever in the Mainpuri epidemic of 1836. All these instances of probable communication by means of clothes admit, however, of being otherwise explained. As a general epidemic was prevalent in Edinburgh and Mainpuri, the laundrywomen and the washerwomen might have contracted the disease during visits to sick friends not in the infirmary and jail; and the prisoners in No. 18 barrack might have sickened from occasional visits paid to the hospital or from communication with the inmates of No. 28 barrack.

There is no evidence that any other matters, such as the walls and floors of houses, the timber of doors and windows, etc., can receive the poison and communicate it.

4. *Length of exposure necessary in order to contract the disease.*—Murchison mentions a case of a medical gentleman who on visiting the Union Workhouse of the city of London, in 1845, while an epidemic of relapsing fever was going on, was attacked on the spot with nausea and headache, and took to bed at once with the fever. It appears, thus, that the disease might be contracted after even very short exposure. Commonly, however, a longer exposure appears to be necessary. The greater liability of the immediate attendants on the sick to contract the fever than medical officers indicates that short periods of exposure are in general innocuous, and that somewhat prolonged and continuous exposure is necessary. Prisoners in jails are sometimes one, two, or more days exposed to the contagion from a fellow-prisoner or patient sick with the fever; but on the latter being removed subsequently, the disease has not manifested itself among the others. The dilution of the poison effected by ventilation, or the concentration of it by deficiency of ventilation, obviously prevents or augments the danger of exposure. In a well ventilated hospital or building, as already stated, the poison is rendered inert, while a close room materially adds to the danger of even a transient exposure.

5. *The latent period.*—The effects of the poison of re-

lapsing fever may occasionally be almost instantaneous, as already pointed out. In general, however, the latent period extends over several days. Murchison states that the data are few for fixing its duration with accuracy, but those that exist make it from four to ten days. The Silesian physicians fixed the latent period at from a fortnight to three weeks, during the epidemic of 1847.

From Cookson's cases of relapsing fever in the Shahpore jail in 1867, the following facts are gathered. The first prisoner was attacked on the 11th January, and was removed out of the jail; two others in the same barrack were attacked on the 6th February, after twenty-five days; and another prisoner on the 11th, that is thirty-two days after the first prisoner, and eight days after the two following. All these cases were removed out of the jail into a tent; the prisoner who attended them was himself attacked on the 25th February, *i.e.*, fifty-three, twenty-two, and fifteen days respectively after the dates on which the cases under his care successively took ill.

Gray brings forward a few facts, collected from the log of one of the river steamers that conveyed the Punjab Muleteers to Mooltan, in 1868, from which he infers that the latent period "does not necessarily extend over more than fourteen days." The muleteers embarked on the 23rd July, and five of the crew who died, took the fever successively on the 6th, 7th, and 8th August. The extremes of the periods intervening between these dates and the date of embarkation, are fourteen and sixteen days.

From all the above data, the duration of the latent period of relapsing fever might be set down as extending from a few minutes up to twenty-five days, and probably longer, according to circumstances. In the case of the prisoner of the Rawul Pindee jail, already alluded to, the disease appeared amongst the others on the fourth or fifth day. McDonell thought that the latent period was from a fortnight to thirty days, before the effects of the poison, which he considered was malaria, were developed.

6. *Proportion of persons liable to be attacked on exposure to the poison of relapsing fever.*—Murchison found this to be smaller than in the case of typhus. During fourteen and

a half years, eighty cases of typhus originated in the London Fever Hospital, the number of admissions during the same period being 4787. One case of typhus, therefore, originated in the institution to every fifty-nine admissions. During the same period, only one case of relapsing fever originated in the hospital, although the number of cases amounted to 440. He drew the conclusion that this, and other circumstances, seem to indicate that the poison of relapsing fever is feebler in its operation than that of typhus.

There are few facts recorded in this country on this subject. From Cookson's cases, it is obvious that one individual suffering from relapsing fever, but immediately removed, infected another, and possibly two more. In the Rawul Pindee jail in 1868, one individual infected two or three others. In the typhus epidemic in this jail in 1869, some time after it had been fully established amongst the main body of the prisoners, the inmates of the two quarantine barracks, which are separate from each other as well as from the jail barracks, and the women, who also occupy a detached building, received the contagion from fomites, for they had no communication with the sick, and were not crowded. The disease manifested itself at various times in three of the prisoners under quarantine and two of the women; the others escaped altogether on the immediate removal of these five persons as they fell ill. It would appear from these facts, that the poison of typhus conveyed through fomites is of equal if not greater power than that of relapsing fever, emanating directly from a diseased person; while it is clear that both of the poisons are equally capable of being controlled.

7. *Stage at which relapsing fever is most infectious.*—There can be no doubt that during every period of the primary fever contagion is operative; but there are no facts from which any opinion can be based regarding the communicability of the fever during the intermission and the relapse. Bryden and Bateson believe that the latent period is infectious, but the evidence is too concise on this point, and there are some adverse facts. The probability is that relapsing fever is most infectious during the primary

fever. Whether the body of a person who has died of relapsing fever is capable of communicating the disease to the living is unknown, and very difficult to ascertain.

8. *Immunity from subsequent attacks.*—One attack of relapsing fever does not confer immunity from subsequent attacks. Twining tells us, that in the Calcutta epidemic of 1824, most people had a second attack, two or three months after the primary attack, and he takes care to discriminate between a second attack and a relapse. The variety of relapsing fever, called nakra, occurs often in the same person annually for several years. It would appear from Carter's account of relapsing fever amongst Sir Charles Napier's troops in Scinde, that the medical officers sustained repeated attacks of the fever. Bateson found six prisoners take the fever in 1866, who had been similarly seized in the epidemic of 1864, in the Umballa jail. Garden says, that it was the rule at Saharunpore for every member of a family to suffer once, twice, or oftener, during the months of August, September, and October, of the two epidemic years, 1869 and 1870.

9. *Relative contagiousness of the varieties of relapsing fever.*—There is hardly any precise information on this subject. It is probable, however, that the continued and remittent varieties are more contagious than the mild intermittent variety in ordinary circumstances; but there are instances, such as the Hydrabad epidemic, in which the intermittent fever spread rapidly through a large body of men. It would also seem, from the fact that the non-eruptive fever rarely spreads to the upper classes, and when it appears amongst them is seldom severe, that it is less contagious than the eruptive fever, which readily spreads to the better classes, and affects them as severely as the poor, though it is rarely fatal in the case of either.

2. *Spontaneous Generation.*

Although relapsing fever is highly contagious, and its appearance in some instances was clearly due to importation of the poison, yet on several occasions individual examples and epidemics of the disease have arisen which

are not traceable to contagion. In the Kimedy expedition of 1833, no exposure of the troops to the poison prior to the epidemic can be made out. On the contrary, it would seem, not only that the exposure was improbable, but that it was also not possible. The main body of the troops were free from the disease, while it appeared in an aggravated form in an advanced guard a fortnight after the latter had been stationed at a solitary outpost, deep in the midst of hills, from which all men had retreated, and all living things been driven away. Under these circumstances the reception of the poison from diseased living beings was not to be expected. Very few of the epidemics which have occurred in the jails of Upper India were traceable to contagion. The disease has appeared in jails, while the troops and the free population in their vicinity have been free from the disease; indeed, it would seem, for there is no evidence to the contrary, that in the numerical majority of these epidemics the disease was absolutely confined from beginning to end to these judicial institutions and their establishments. Few will be inclined to attribute the origin of the fever among the victims of the Black Hole Prison to contagion. Another strong argument in favour of a spontaneous generation of relapsing fever, is the fact, that after the disease has been entirely absent for some years, it again breaks out, without any traceable importation. Up to 1827 it was sufficiently common in Great Britain, but from 1828 to 1842 it disappeared. Its cessation was so complete, that when it reappeared in Scotland epidemically in 1843, it was regarded by many medical men as a new disease, and it could not be traced to importation. The eruptive relapsing fever has arisen in Calcutta at such long intervals that some writers, as for instance Henry Goodeve and Chuckerbutty, considered it a new disease not hitherto observed, and there is no evidence of its introduction. The Central India epidemic of 1859–60 was also regarded as a new disease. Unless the idea be entertained that relapsing fever existed from the beginning, the spontaneous generation of this, as of every other disease, must be admitted.

To arrive at a knowledge of the cause or causes of

relapsing fever, it is essential to investigate the conditions under which the disease has been generated on the occasions on which it could not be traced to contagion. On reference to the history of the Kimedy epidemic of 1833, it will be found that the Goomah detachment of 240 sepoys, amongst whom the disease first appeared, underwent much fatigue, and exposure to rain, and often remained for hours, and on some occasions for two or three days, in wet clothes, as they had no tents. They had little or no food for the first two days, and afterwards the amount of it was insufficient and the quality bad. Their water was also impure, containing much vegetable matter. The locality was the Kimedy Hills, covered with lofty trees and an impenetrable thorny underwood, with numberless valleys; the season hot with a burning sun; the streams were dry, but the general appearance of the country was green. Under these circumstances the detachment existed from the 26th of June to the 8th of July, when the epidemic broke out.

The circumstances under which the Goomsur epidemic began were pretty much the same. Eyre states that the 18th Regiment, N.I., was at the time on a long march, which had already extended over a period of nearly three months. On the 23rd of February, on descending to the low country, the toil and fatigue endured by the officers and men were great; there was a want of water, and man and beast suffered accordingly; provisions too were scarce, and men and followers were put on allowance from the 23rd of February to the 5th of March. The epidemic broke out on the 20th of March. On arrival at Russelcondah on the 3rd of April, detachments were at once sent off to occupy posts in the jungles, and amongst the detachments the fever almost exclusively prevailed in an aggravated form. The above is a feeble description of what the actual suffering must have been from want of food. It is not improbable that the inefficient regimental arrangements which led to the distress on the line of march, were repeated at Russelcondah with regard to the supplies of the outposts.

MacNab sought the origin of the Mainpuri epidemic of

1836, which prevailed among the free population before the prisoners participated in it, in the habits or condition of the poorer classes, who were generally neither well fed nor well clad, but especially distressed in that year, when the day labour failed, and the means of livelihood were cut off. The season was the cold weather, the healthiest of the year, and there was no lack of water or vegetation in the Dooab.

The Moradabad epidemic of the same year was almost exclusively confined to the poorest classes, and the circumstances that favoured attack, according to Spencer, were poor diet, bad clothing, dirt, and all the evils attending a closely compacted and poor population. Stuart observed that persons who could afford themselves good food, even though living in indifferently ventilated situations, escaped, provided they avoided exposure to the infection.

In fact in the epidemics not traceable to contagion, the subjects of the disease have been chiefly the poor, or persons temporarily reduced to the condition of the poor, and the one attendant circumstance that was invariably present, whatever diversity there may have been in the others, was want or privation of food. The same antecedent is obvious in the case of epidemics which occurred so frequently in past years among a class of men entirely differently situated, in many respects, from the free population and the troops, namely the prisoners in the jails.

In 1842, Beattie perceived the connection between insufficient food and relapsing fever. He attributed the epidemic in the Allahabad jail in that year to the reduced diet allowance to the prisoners ordered by the judges of the Court of Nizamut Adawlut. The diminished diet consisted of ten chittacks (or twenty ounces) of wheat flour, and two chittacks (or four ounces) of dhall, or pulse, the latter to be replaced, at the discretion of the magistrate, by an equivalent portion of vegetables or rice. This constituted the staple daily food of an adult labouring convict, and it will be observed that it was liable to be reduced in its nutritive qualities by the substitution of less nourishing and cheaper articles. In addition to the above, the judges ordered a small quantity of salt, from a quarter to half a

chittack (half to one ounce) to be served out to each prisoner daily. As an indulgence, and to be so explained, two chittacks of ghee, *i.e.*, rancid butter melted over a fire, and afterwards cooled to a soft consistence, half a chittack of red or black pepper, and half a chittack of tobacco, were sanctioned by the judges to be distributed to each convict once a week. The daily quantity of food, diminished as it doubtless was by peculation by the jail officials and the underpaid and ravenous burkindazes, or warders, afforded one scanty meal in the twenty-fours, hurriedly cooked with insufficient fuel, at the conclusion of the day's labour on the roads. The consequences were debility, emaciation, an epidemic of relapsing fever, which, with some other diseases, more than decimated the prisoners of the Allahabad jail in the year 1842.

In Morehead's account of the epidemic in the Sattara jail in 1858–59, in addition to the other distresses undergone by the prisoners due to the want of sufficient clothing, to bad drainage, and fatigue, allusion is made to their diet having been modified by the judge in such a manner as to affect the health of the prisoners, and to cause discontent.

Prior to 1864, it is generally understood that the prisoners in the Punjab jails were underfed, insufficiently clothed, and crowded. The late Mr. Macintire, Deputy Inspector-General of Hospitals, officially recorded his opinion that they existed in a state of "chronic starvation;" and D. B. Smith has since expressed the same view, changing the words to "modified starvation." By the concurrent testimony of the prison medical officers, the frequently recurring epidemics of relapsing fever in the Punjab jails were shown to have been generated in the prisoners from innate circumstances, and chiefly the deplorable condition to which the prisoners had been reduced by insufficient food. Dr. Dallas, the Inspector-General of Prisons, had no doubt in his mind that the fever owed its origin, in great measure, to unwholesome or insufficient food; and he candidly represented the subject to the Judicial Commissioner, with the result of effecting an improvement in the food and clothing of the prisoners. Sir Robert

Montgomery, urged by the late Mr. Roberts, Judicial Commissioner, thus wrote:—"On the whole the Lieutenant-Governor considers that it is amply demonstrated by the extended experience which has now been acquired, that an improvement in the diet, clothing and lodging of the convicts is, for sanitary reasons, necessary; that it can be made without relaxation of penal discipline; and that the additional expenditure is fully justified. It is to be lamented that the solution of this problem has not been arrived at without much suffering and mortality, and a lesson has been read to us of the vast importance of correct observation and record of the varying phenomena of successive years, the latest of which has alone furnished data for decisive action and practical reform." In the years 1863 and 1864, no less than nine serious epidemics of relapsing fever occurred in the Punjab jails, which could not be traced to contagion, unless from each other. The lesson taught by them was deeply impressed. It was not, however, the first time that such a lesson was inculcated; it was taught almost annually for a score or two of years in the Punjab and elsewhere, as far as authentic information is available, and probably for a much longer period, even from the first establishment of civil prisons in India.*

The foregoing illustrations supply strong grounds for the conclusion that relapsing fever is spontaneously generated by the deprivation of an adequate amount of food,

* In 1866, there was apparently a change of opinion as to the source of the epidemics of relapsing fever, which had caused such lamentable mortality in the Punjab jails in previous years. Mr. Thornton, the Secretary to the Punjab Government, drew the following conclusion, among others, from Bateson's official report on the Umballa jail epidemic of 1866. "That as heretofore urged by the Sanitary Commission of Bengal, and by the Honourable the Lieutenant-Governor in his review of the Jail Report of 1864, the disease is not generated in our jails, but imported from without." The salutary improvement made in the prison diet has not, however, been cancelled; and the evidence on which the change of opinion was based is undoubtedly insufficient. It should be borne in mind that judicial officers, whether magistrates, or judges, or acting in other posts, have, throughout history, as shown repeatedly by medical officers, very naturally evinced an unwillingness to admit that fever, on a great scale, could be generated within the walls of judicial institutions.

or the condition of destitution or want has been invariably antecedent, and never absent, in all of them, although every other collateral circumstance has been variable. The history of the Allahabad jail epidemic of 1842 affords positive experimental proof of the fact; for the reduction of the diet of the prisoners, ordered as it was, as the judges explain, as an "experiment,"* for judicial or financial objects, was practically a pathological experiment on a body of nearly a thousand human beings, under close scientific observation. To Alexander Beattie, the Civil Surgeon of Allahabad in 1842, is due the merit of having conclusively demonstrated, from the experiment of the judges, the direct connection, as cause and effect, between deficiency of food and relapsing fever. Other observers, as MacNab, Spencer, and Stuart, before him, in 1836, had remarked the same connection. The disease was recognised by all these gentlemen as distinct from the ordinary form of fever, and as contagious. The cause of relapsing fever was undetermined in Europe prior to the Scotch epidemic of 1843, and only at this period was it distinguished from typhus, and ascertained to be contagious.

In numerous epidemics, the reporters of which were not able to ascertain the cause, or assigned an erroneous cause, the temporary existence of want and several predisposing circumstances, such as fatigue, wet, crowding and others, are apparent or probable. In the expedition against the hill tribes of Candeish, in 1830, in which 120 only out of 400 native troops, and 90 out of 100 horses returned, the rest having died of fever, similar commissariat disasters to those which befell the troops in Kimedy and Goomsur probably were the cause of the fever, and not the hills or jungles. The Calcutta, or Lower Bengal, epidemic of 1833, described by Twining, followed the destruction of the crops, and consequent destitution, occasioned by the great gale and inundation. The crews of the ships wrecked in the gale at the mouth of the Hooghly, also suffered from the same disease, owing to the want and exposure inevitable after such misfortunes. The individuals who were attacked

* See Appendix II.

spread the disease amongst the crews of other ships who went to their assistance. The great Hydrabad epidemic of 1843, among Sir Charles Napier's troops, if it had not been communicated by the distressed people of Scinde, originated from deficiency of the supplies, and was propagated by crowding and the free intercourse amongst the troops. The irrigation canals and the meteorology of the locality were there before and after the epidemic, and are still there, but the disease was not permanent. In 1857–58 and 1859, the mutiny years, the country was unsettled, and without doubt vast numbers of people were thrown out of employment. To the destitution thus brought about, are attributable the epidemics at Patna and Central India in those years. 1860 was a year of famine in the North-Western Provinces, and thence arose the great epidemic in the Agra, Meerut, Allahabad, Benares, and Ghazepore districts. The famine in Orissa, in 1866, originated the epidemic in that region. 1869 and 1870 were years of scarcity in Northern India, and during them occurred epidemics at Peshawur and Saharunpore. Information is wanting regarding epidemics which arise among the people in the interior of districts, in villages remote from the suddur or chief station in which the European officials reside; so that a very large amount of facts on this subject has lapsed from want of recorders.

A strong proof of the intimate connection between destitution, or the want of food, and relapsing fever, is derived from the remarkable circumstance that the disease disappears on the relief of destitution. When a famine is succeeded by years of plenty, the epidemic lit up during its continuance disappears. Epidemics are unheard of in years in which the people are not in distress for the means of subsistence. I cannot find a better or more apposite illustration of this proposition than the history of the Punjab prisons. Prior to 1864, relapsing fever was a common disease in these judicial institutions, appearing epidemically in some one or other of them. At one time at Mooltan, a hot and arid station; at another time at Sealkote and Rawul Pindee, two of the coolest and healthiest stations in the province; now in Peshawur, an irrigated

station; then in Umballa, a dry station, in which even the European troops are with difficulty supplied with water; in Goojerat, a garden; and in Sirsa, a desert; and occasionally in several of them at the same time. I have already alluded to the fact that in 1863 and 1864, nine serious epidemics of relapsing fever occurred in these jails. This was in the era of chronic or modified starvation. In 1864, the Government of the Punjab improved the dietary and clothing of the prisoners, and endeavoured, as far as was practicable, to enlarge their accommodation. Since that year, few epidemics have occurred in the Punjab jails, and all of them, I believe, were traced to importation. It appears to be the fact that epidemics of relapsing fever have not subsequently been generated within the prisons. The last epidemic that I am aware of took place in 1866, which Bateson traced to importation, but since that year I have heard of none. The last three fever epidemics, at Peshawur and Rawul Pindee in 1867, and at the latter jail in 1869, were typhus, due to the one great sanitary evil which is still permitted, namely, overcrowding,—the government being financially unable to increase the prison accommodation.

It has been seen that epidemics have arisen amongst troops during arduous expeditions. There are also accounts of expeditions, equally difficult and arduous, in which the disease was not manifested. In not one of the expeditions against the hill-tribes on the North-West frontier, since the conquest of the Punjab, has the disease appeared to my knowledge, although epidemics were common enough in the jails of that province. It is most unlikely that the frontier hills are in any essential respect different from the Kimedy hills. The description of the latter by Mc Donell is applicable to the former. Malaria is said to be generated in the frontier hills, and fever, to which the tribes are subject, is actually attributed to this mysterious agency in the present day. It is remarkable that invading troops have escaped its operation, and that they actually return from these expeditions in improved health. In the Umbeyla expedition, the exposure, the hardships, and the frequent call to arms, were very trying to the troops, and

the prospect of serious disaster was imminent. But no epidemic occurred. The main difference in the circumstances of the troops in the Kimedy and frontier expeditions, was obviously the superior commissariat arrangements of the latter.

The history of the 1st Bombay Fusiliers in the Punjab campaign of 1848–49, furnishes another instance of troops keeping free from relapsing fever under the arduous and trying circumstances of war. Arnott thus writes: "From Kurrachee in 24° north, to Peshawur in 34°, the Bombay Fusiliers had traversed a distance of more than eleven hundred miles since leaving the south of Scinde, six months before. During that time they had marched from the southern to the northern limit of the Punjab, had crossed the Sutledge, the Ravee, the Chenaub, the five mighty branches of the Jhelum, and the impetuous Indus. During the whole time they had been under no roof better than that of a tent; they had borne a brilliant part in the memorable siege and capture of Mooltan, and afterwards, by forced marches, joined Lord Gough's army in Jetch Dooab; had been present in the crowning achievement of the campaign on the battlefield of Goojerat; had joined in the arduous and fatiguing pursuit of the enemy into the Sinde Saugor Dooab, where Shere Sing made his submission; and they witnessed the famed Sikh legions surrender at discretion, and lay down their arms at their feet. They then formed part of the force sent in pursuit of the Afghans, till they were chased from the province of Peshawur into their mountain fastnesses. These six months," continues Arnott further on, "had been a period of great mental excitement and bodily activity, labour, and exposure, and we lost only three men by disease." In a part of the Rechna Dooab, between the Ravee and Chenaub, which had been traversed a short time previously by various marauding parties, and by Shere Sing's army which retreated from Mooltan, supplies were scarce and forage hardly procurable; but Arnott does not speak of any suffering experienced by the troops in consequence. The commissariat during the Punjab campaign was, I understand, remarkably efficient.

But after the fatigues and hardships of the campaign had been undergone, without loss of health, while the regiment was in camp in Peshawur an epidemic occurred, in July and August, 1849, the character of which may be inferred from the fact that, out of 798 cases admitted in these two months, not a man died. It is utterly impossible that the disease was generated within the regiment, and its occurrence admits of being otherwise explained. In the non-existence of the Peshawur jail in those days, the disease had doubtless originated amongst the conquered people of the country, from whom contagion was contracted. A similar extraordinary epidemic has already been referred to as having appeared in the 20th Punjab Infantry after the Umbeyla expedition. The regiment returned from the hills in improved health in December, 1863. In March, 1864, while proceeding to Rawul Pindee, a case occurred amongst the men two marches from this station, and an epidemic followed, which proved very destructive to the hospital establishment, while only two fighting men died. The origin of the epidemic was inexplicable at the time. The spontaneous generation of the disease was utterly impossible in one of the most robust and vigorous regiments of the Bengal line. But as relapsing fever was common in the Peshawur jail, and an epidemic was actually in progress at the time in the Rawul Pindee jail, the occurrence of the disease in the regiment admits of being attributed to communication.

But though the foregoing facts strongly indicate the intimate association of destitution or the deficiency of food with relapsing fever, there is apparently some evidence of the existence of destitution unattended by the appearance of the disease. W. J. Moore states that, during the famine in Rajpootana in 1869, there was no epidemic of fever. It is not improbable that the measures of relief carried out had the effect of preventing the degree of want necessary for the generation of the disease. In the Afghanistan campaign of 1841, the supplies of the army were at one time so scarce that some suffering was the consequence; but the evidence as to whether an epidemic of fever did not result is doubtful. Leith states that, at Quetta, the

quality of the food issued to the troops was indifferent,—the butcher's meat bad, and the bread inferior; the natives had no dhall, and there was an almost total want of culinary vegetables, and an inferior sort of fruit was greedily eaten. An epidemic of jaundice occurred at this time, which Leith accounted for by the circumstance that the troops had been hitherto traversing a region with a mean daily temperature of 79° Fahr., and had then got into a temperature of 60°, with a strong wind blowing. The fall in the temperature produced a diminished action of the liver. He does not state that the jaundice was accompanied with fever, although fever was also prevalent.* But there is evidence that a limited epidemic of relapsing fever did occur at Quetta about this period, and at Kelat, although it appears to have escaped Leith's observation. The cases of remittent fever in the 25th Regiment N.I. at Quetta and Kelat were undoubtedly relapsing fever, according to Wright's brief narrative.

Again, in the army of the Indus, in the campaign of 1838 and 1839, there was much distress occasioned at Candahar by the failure of the supplies. "It was found to be impossible," says Henderson, "to put the army on full rations. The sepoys and followers, who had borne up against their half and quarter rations, in the hopes of all their sufferings ceasing at Candahar, found them fallacious, and the reduced rations continued all May and June. Grain sold at enormous prices,—four, three, and oftener two seers for the rupee; the consequence was the scanty ration was eked out by green trash and unripe fruit, and the sick list, shortly after our arrival at Candahar, rapidly increased. Firewood was also extremely scarce about Candahar, so that the food was often eaten uncooked. The Afghans of the poorer classes often supply this deficiency by a most disgusting substitute, which few would adopt. Human ordure, which in this dry climate soon becomes a hard mass, is collected by the poorer women, and used as fuel. Other necessaries of life were at equally high prices: sugar

* *Transactions of the Medical and Physical Society of Bombay*, no. iv., for 1841.

sold for two rupees eight annas, and three rupees a seer," and so on. In addition to the suffering from want of food, there was considerable exposure and fatigue from long night marches and from the climate. At night the thermometer stood at 50°; and in the sun, lying on the bare ground, at 120°. These are circumstances under which the disease has been known to arise; but in this instance the evidence is not clear that an epidemic followed. Henderson states that "sickness became general throughout the army in May and June, 1839; Europeans and natives were equally affected. It was epidemic, and showed itself under the forms of dysentery and diarrhœa, with or without fever. There was early and great prostration of strength, and rapid emaciation. There was no casualty from the epidemic in the detachment during the months of May and June. The cases of fever were not particularly severe. Amongst the officers and Europeans there was a disease so general as almost to deserve the name of epidemic: this was jaundice." He states further on, that for the most part there was little or no fever associated with the jaundice, which complaint he attributed to the influence of the great difference between the day and night temperature on the action of the liver, causing the secretion of thick and viscid bile, which, accumulating in the duodenum, blocked up the hepatic ducts.* It is not improbable, however, that a mild epidemic did break out amongst the troops, although Henderson's account is not sufficiently precise to justify a positive opinion with regard to its occurrence.

Again, in the case of the jails of Lower Bengal during the first third of the present century, an account of which was written by James Hutchinson, Esq., Surgeon of the Bengal Establishment, there is no clear history of epidemics of relapsing fever.† The state of these old jails

* "Medical Report of the Detachment of the 2nd and 3rd Companies of the Sappers and Miners attached to the Army of the Indus." *India Journal of Medical and Physical Science*, edited by Fred. Corbyn. New Series. Vol. vi., 1841.

† "A Report on the Medical Management of the Native Jails throughout the Territories subject to the Governments of Fort William and Agra." Calcutta, 1835.

was far worse than that of the Punjab jails prior to 1864. The daily routine undergone by the miserable convicts is thus described by Hutchinson. They were taken out at sunrise, or a little before it, to their place of labour, which was often at a considerable distance from the jail, perhaps one, two, or even three miles. They continued at work during the whole of the day, till about four o'clock in the afternoon; so that they occasionally did not reach the jail till near sunset. From the hour they returned to the jail till dusk was the only time they had in the twenty-four hours to cook and enjoy their single comfortable daily meal, if so it can be called. In the middle of the day, while at work, they were allowed an hour to rest and refresh themselves; but that time was too short to render it possible for them to prepare a meal. The utmost accordingly they could do, and what they actually did, was to seat themselves under the shade of the first tree that offered, and under this protection from the sun, make a scanty uncooked meal on parched grain or rice, or even on these substances in a totally raw state. Not only was the time for cooking insufficient, but they were also stinted of the means of procuring the materials of the meal. The money allowance was too scanty to enable them to cook twice daily: it varied from two to three pice per diem, that is, a little more or less than one penny. Many of the convicts were of a class accustomed to fare better, and felt, in consequence, keenly the miseries of their scanty pittance. His own subsistence, too, was not the sole object on which the convict expended the government allowance. He had his tobacco and the condiments for his food to purchase, and not unlikely every one connected with him to bribe, from the burkindauz, or police officer, up to the darogah, or keeper of the jail; or he might even divert a trifle of his scanty pittance to the support of his wife and children; but this might be fairly presumed to have been all but impossible. Although the allowance, it cannot be doubted, was miserable in the extreme, yet it would appear that some magistrates, with thoughtless zeal, did not hesitate, as a means of punishing the prisoners, to curtail the poor pittance, which was both insufficient to preserve health,

and to ward off a fatal termination when disease actually occurred. On their return to the jail, near sunset, and after the despatch of their only meal, which was often not very fully dressed, they were locked up for the night, jaded, fatigued, and relaxed, with their stomachs distended with food, to sleep, without protection, on a cold damp floor of stone or masonry.

The clothing of the prisoner might be said to be what to him was tantamount to two suits of coarse cotton cloth in the course of the year; but it is to be recollected that the suit consisted merely of a cloth about his loins, called a *dhotee*, and a loose scarf, or *chuddur*, thrown about his naked shoulders. During the hot season it were, perhaps, needlessly to complain, to say that the above clothing was not enough; but at other seasons, which may fairly be said to constitute two thirds of the year, it certainly was not. During the rains the convicts were frequently drenched to the skin once or oftener in the course of the day; and when they came to the jail to be locked up for the night, having generally no change of apparel, they were obliged to remain in their wet clothes, or to remain exposed almost in a state of nudity to the reduced temperature, which generally prevails at such times.

In some jails, the prisoner would appear, likewise, to be allowed a piece of coarse mat on which to sleep. I say, would appear to be allowed, repeats Hutchinson; for although I have been a good deal about jails, I cannot say that I have observed the mat to be more than casually used. I conclude, accordingly, he adds, that it is not found to add essentially to the comfort of the convict. During the cold season, or Indian winter, the convicts were allowed each one coarse blanket; and scanty as this provision was, and inadequate to the purpose contemplated, it was often not served out until the season was too far advanced to render it of any benefit or advantage.

With the appearance and construction of the jails, there would have appeared, to the superficial observer, to be less cause to find fault than with any other portion of the jail system; and yet such was not the case. It was true that these structures were, in many instances, more like

palaces than jails; and yet they might, perhaps, notwithstanding the humane and munificent intentions of Government, have been more aptly compared to splendid sepulchres. The buildings were solid and imposing in appearance; but they were too often, if not generally, ill adapted to the purposes contemplated, or for the inmates whom they were intended to contain. The floors were often not sufficiently raised, and were, in consequence, naturally damp. They consisted either of stone, of tiles, or of masonry, plastered over so as to present a smooth and well-polished surface. For purposes of cleanliness, it must be admitted that these were admirably calculated, particularly the first and last; but when we come to consider them in a medical point of view, and to reflect that the convicts slept on these floors, with generally no covering whatever but the dhotee about their loins, the case was very different. The three different kinds of floor all attracted moisture from the atmosphere in great quantity, so that it could not have been particularly safe to sleep on them at any time, but much less so when the air was loaded with moisture, or when the temperature happened to be low. The natives of India, and those of Bengal in particular, are a weakly race; and at such seasons, the little animal heat which they generate is carried off by these floors as speedily as formed, and their health suffers proportionally in consequence. From the replies of medical officers to a circular of the Medical Board, it would appear that in very few of the jails in India was the allowance of air to each prisoner above five hundred cubic feet. In some instances, the space was said to be even less than three hundred, an allowance which would be so small, that it is impossible to conceive that the statement had not arisen from some oversight or mistake in making the calculation. The jails were generally surrounded by a high outer wall or inclosure: if this was unfortunately built too close, it could not do otherwise than effectually keep off any breeze that there might be; but when built at a little distance off, it was highly advantageous, as admitting of the prisoners being allowed to sleep in the enclosed area when the jail was crowded or the night sultry, and adding

greatly to security against escape, and thus rendering unnecessary the precaution of stringing the prisoners every night in a body to an iron chain!

The above description of the internal economy of the old Bengal prisons, derived almost verbatim from Hutchinson's work, affords proofs that the condition of destitution and the other predisposing causes of relapsing fever, existed chronically, yet accounts of epidemics of relapsing fever in those jails are wanting.

A fragmentary history of a deadly fever is, however, not wanting in Hutchinson's chapter on "The Diseases which infest Native Jails." He writes: "Every different disease which affects the human body, it will be readily believed, is to be found at times among the inmates of jails; those, however, which may be said to infest the jails of India are fevers, dysentery, cholera, asphyxia, and hospital gangrene." He gives the first place to fever in this catalogue of deadly diseases. In another place, he says: "Towards the termination of the rains, and the beginning of the cold weather, the jails are in the most sickly state; the days are still hot in the extreme, while the nights are raw and chilly. Fevers of the worst description prevail; and, what is a great deal worse, the sequelæ of fevers, in the shape of intractable visceral disorders, and dysenteric affections of the most obstinate nature." One is here reminded of Twining's remittent fever of the rains, and of Bellew's statement that the sequelæ of the relapsing fever of Peshawur fill as many graves as the primary disease itself. The appalling mortality which took place in the jail at Bancoorah from dysentery, hospital gangrene, and fever, Hutchinson suspected was intimately connected with the prevalence of scurvy, in an acute form, occasioned by poverty of living, the influence of the depressing passions, and a too crowded state of the jail. The amount of disorganization of the internal organs found in the post-mortem examination of the dead of the old Bengal jails has probably never been met with by any living pathologist. One of the cases of dysentery (Dial Magee) was probably typhoid fever, and perhaps also one of the cases of fever (Kalleechurn Thewas). All the other cases of fever, as

far as I can judge, appear to have been relapsing fever, as well as a few of the cases of dysentery and gangrene, as sequelæ and complications of this disease. In all these cases the liver was enlarged, sometimes enormously; and in a few cases, there was abscess. The colour of the liver varied from black and intervening shades of grey and drab, to *white* and *very white:* a remarkable colour, never seen in these days, and not mentioned by Annesley, Twining, or Morehead. In many of these cases the spleen is described as healthy; in a few, enlarged. In all, the small intestines were healthy. In four of the six fever cases, *the pericardium contained a large quantity of fluid.* The ghastly statistics of the old Bengal jails, for the year 1833, collected by Hutchinson from the records of the Medical Board, to which he was secretary, show an enormous amount of fever. In a body of 19,438 prisoners in the jails of the Lower Provinces, and of 20,238 in the jails of the Upper Provinces, the following was the amount of fever, and the mortality from this disease.

	Lower Provinces.		Upper Provinces.	
	No. of Cases.	*Deaths.*	*No of Cases.*	*Deaths.*
Continued fever .	3700	158	2462	107
Remittent fever .	636	23	914	12
Intermittent fever .	5170	146	2762	65
	9506	327	6138	184

A large number of these cases, almost equal to that of the deaths, were liberated or transferred while suffering from fever. A remarkable entry was that of jaundice, of which there were 61 cases; and also that of hepatitis, acute and chronic, of which there were 301 cases. The foregoing facts, collated with the phenomena observed in the Punjab jails in recent times, indicate that relapsing fever was a terrible scourge in the judicial institutions of Bengal in former days. I regret that I have no means of referring to the vital statistics of the civil and medical servants of the East India Company in those days for

information regarding the number of them who suffered from bilious fever and enlarged liver. It is hardly possible that they could have escaped with the above large amount of contagious fever in the jails. It is not an extravagant assertion to state that the ill name for bilious fever obtained by India, and perhaps also the proverbial yellowness of the Indian nabob of olden days, might be traced to the lamentable condition of the jails, situated at the suddur, or chief station, of every district of the country. In the present day, yellowness of the complexion and "bilious fever" are rarely met with among the European residents of Calcutta.

The preceding illustrations afford somewhat equivocal proofs of the non-occurrence of relapsing fever among men suffering from destitution. The recent history of the Punjab jails, however, supplies authentic evidence that the disease did not occur in many jails where prisoners were maintained in a state of chronic or modified starvation, while it broke out spontaneously in others. The assertion that in the latter case contagion was imported in all instances, is an assumption for which there is no proof whatever. It is very remarkable that medical officers, after the most careful inquiry, were not able to discover the existence of the disease outside the jails; that troops escaped, while the inmates of a whole series of jails were undergoing decimation; and that in instances in which the disease was seen outside the jail, amongst the free population, the numbers affected were so few as to render the probability that they were infected by released prisoners very strong. Subsequent to 1864, after the improvement of the dietary in the Punjab jails, the disease practically disappeared, and in every instance, I believe, in which it manifested itself within the walls of jails, it was traced to contagion imported by new admissions: that there were many jails which escaped epidemics in the era of chronic starvation, is a fact, however, apparently adverse to the view of the intimate connection between the want of food and relapsing fever as cause and effect.

This difficulty will be overcome by reflecting that in nature no event or phenomenon is the result of a single

cause, but of two or more factors, the combination or simultaneous action of which is essential to its production. When a powder magazine blows up, no one hesitates to attribute the event to the presence of the powder, and yet all powder magazines do not blow up. Although the powder is the chief and most important factor, the contact of fire is essential for the production of the explosion. Other conditions also are required: for instance, the powder must be dry, for the presence of moisture will destroy its explosive quality, and the presence of air is further necessary.

The non-occurrence of epidemics in several of the Punjab jails in the era of starvation admits of being explained, by reflecting that although destitution appears to be the main factor or cause of relapsing fever, some one or more other factors or conditions are essential, as in the case of the explosion of gunpowder. The other factors necessary for the production of relapsing fever amongst a body of ill-fed men are those which have been already described as the predisposing causes of the disease. Even the reception of contagion is dependent upon the existence of some one or other of the conditions spoken of as predisposing causes, for there are undoubted instances of men who have escaped the disease, although exposed to the poison. The exemption, in question, of many of the Punjab jails, was probably due to the absence of the other conditions necessary for the generation of the fever. The jails were not always crowded, for instance; the prisoners were probably never hard worked, or subjected to the excessive fatigue involved in working on the roads at a distance from the jails; their scanty food was well cooked, and they were allowed time for their meals. The discipline was never a fixed quantity, so to speak, but depended entirely upon the leisure or inclination of the magistrate in charge: one magistrate worked them somewhat harder than another; many permitted, or rather cared not to suppress, irregularities, and thus probably the prisoners, none of whom were friendless, were supplied with food over and above the regular rations. These and many other circumstances might be reasonably supposed to have contributed to prevent the generation of

relapsing fever in several of the jails. It is certainly a remarkable circumstance, that as the discipline of the jails improved, the frequency of epidemics increased, till in the years 1863 and 1864, no less than nine serious outbreaks occurred, the most formidable being in the best-superintended jails, as Lahore, Mooltan, and Umballa.

While destitution appears to be essential to the spontaneous generation of relapsing fever, the most powerful of the secondary causes are probably overcrowding, with deficient ventilation, excessive fatigue, and perhaps also wet and exposure. These were the conditions superadded to the primary condition of want or deficiency of food in all the recorded epidemics not traceable to contagion, such as those of Kimedy, Goomsur, and of the jails. In the judicial institutions crowding was generally co-existent with a poor diet and other adverse conditions. Beattie represents that the Allahabad jail in 1842 was capable of accommodating 710 male prisoners, allowing 3×8, or 24 superficial feet to each. The judges of the court of Nizamut Adawlut ordered 890 male prisoners to be confined in it in spite of his remonstrances: thus each obtained 19 square feet, or 8×2 and a fraction. The same judicial physiologists decreed that 950 prisoners of both sexes should be the limit to the number of the inhabitants of the jail; the average number in 1842 was $963\frac{1}{2}$, but the extreme maximum is not given by Beattie. All these superadded causes add materially to the severity of the disease, the rapidity of its spread, and the mortality from it.

All the foregoing evidence is in favour of the proposition that the presence of relapsing fever, and especially of an epidemic of the disease, affords in itself proof of the existence of destitution in the community. In some countries, such as Great Britain and Ireland, the disease has for many years consecutively not been observed; but on the occurrence of famine, or some great commercial crisis, such as the failure of a staple manufacture, when destitution, more or less extensive, is the consequence, the disease reappears. Although the history of the Punjab jails since 1864 has made it certain that the disease, when introduced by con-

tagion, can attain epidemic proportions, even in the absence of destitution, when other circumstances are favourable to the spread of the disease, it is doubtful whether the disease can spread epidemically in the general community, in the absence of general destitution. Although in 1825 and 1833, general epidemics occurred in Calcutta, since the latter year Calcutta has been comparatively exempt. The epidemics of the two Goodeves and of Chuckerbutty were inconsiderable; and the disease was evidently limited to the cooly emigrants in Calcutta in 1864, and subsequent years. These epidemics were similar to the one which occurred in London in 1870, which affected only a few persons. The exemption of Calcutta as of London, from a general epidemic in recent years, might be reasonably attributed to the prosperity and wealth of these cities, and the consequent absence in their inhabitants, or in any large body of them, of the degree of poverty and destitution necessary for the generation of relapsing fever, or for the rapid and universal spread of the disease, even when introduced by individuals.

The evidence in favour of the above proposition is strong, but there are some facts which at first sight appear adverse to it. Irrigated districts, for instance, might be reasonably supposed to be exempt from widespread destitution, or from the consequences of drought; but these districts have been visited by epidemics of fever, which in all instances were probably relapsing fever, and the epidemics of 1869 and 1870, at Saharunpore, were undoubtedly of this disease. It would appear, however, that irrigation canals, although they are sources of prosperity, and afford a security against the evils of a deficient rainfall, and the consequent failure of the crops, do not suffice to preserve the agricultural population, or the village communities, from the deepest poverty. The canals have unavoidably put a stop to the use of wells for irrigation; but it would appear that the supply of water is not unfrequently cut off when a canal is undergoing repair, and sometimes it is stopped as a mode of punishment, or for other reasons, even at times when it is absolutely necessary for the maturation of a growing crop of wheat, cotton, or

sugar-cane, which in the absence of this means of obtaining water, withers and dies, and thus an entire village or a group of villages might be ruined, and deprived of the means of subsistence. The money-lender, or village buniah, is moreover as great an incubus on the peasant in the irrigated districts as in the non-irrigated. His mode of diverting the produce of the soil from the peasant to his own benefit is well known. In this manner is the peasant of an irrigated district kept in a state of chronic poverty, and the slightest shock to his scanty means of subsistence leaves him a prey to relapsing fever. Practically, with regard to the village communities, there appears to be little or no difference as to poverty between the peasantry of irrigated and non-irrigated districts.

The Lower Provinces of Bengal are a naturally irrigated territory of rich soil, whose fertility is unsurpassed. Yet it appears from Twining's writings that he regarded the remittent fever of the Bengal rainy season as the most formidable disease of India. That relapsing fever, a disease intimately associated with destitution, should be a formidable disease in a land of plenty, is adverse to the proposition that the presence of this disease is a sign or indication of widespread destitution. There is, however, authentic evidence of the existence of the direst poverty amongst the inhabitants of Bengal in the fugitive writings of medical officers. Sarun, in Behar, is one of the richest districts of the province; and from an account of it, written in 1838 by Rankine, the following information is derived.* It is described as nearly an island, or rather a peninsula, encompassed by three considerable rivers—the Ganges, the Dewah, and Great Gunduck. These, with the Little Gunduck, are the principal rivers; but there are also several considerable hill streams. They all rise from the hills by numerous streamlets, and empty themselves into the Gunduck and Ganges. The Dinouty, Bagmuttee, Loll Begee, Myah, and Dabbua, traverse the district in various directions. The Great and Little Gunduck are navigable for small

* "Notes on the Medical Topography of the District of Sarun," by Robert Rankine, Civil Assistant Surgeon. Printed by order of Government. Calcutta, 1839.

boats throughout the year. The division of Sarun was well cultivated, and jungle formed a very inconsiderable portion of it. In the division of Chumparun, not more than one third was under cultivation, the rest being covered with extensive forests containing every species of tree common in this country, and abounded with saul, sissoo, toon, mohow, semul, etc. In Sircar Chumparun there were also large uncultivated tracts of country; the inhabitants of it were constantly changing every two or three years, owing, it is said, to the unhealthiness of the place. This part of the country was described by Hamilton, as having suffered severely during the great famine in 1770, when almost half the inhabitants were supposed to have perished. The nature of the soil is exceedingly varied, and its vegetable productions are consequently numerous; that it is not inauspicious is well known. The general soil is a mixture of fine mould and sand. The lowlands in the vicinity of the nullahs are fertilized by alluvial deposit, and yield crops of wheat and barley once in the year. The highlands consist of a rich loamy soil, calculated for sugar-cane. These lands (except where sugar-cane is planted) are frequently cropped twice and three times a year. In Chumparun the soil is alluvial, and particularly favourable for the production of indigo. The indigo factories were very numerous in this part of the district, and in general thriving. No manure of any description was applied to the soil. Three crops, as already stated, were reaped in the year: a summer crop of millet, maize, and different kinds of esculent plants; an autumnal crop, consisting of Indian corn, kadoo, etc.; and a spring crop of wheat, barley, peas, grain, and various other grains of the leguminous kind. Other produce was poppy, cotton, hemp, and oil seeds, such as the castor, mustard, linseed, teel, and poppy seeds. Vegetation was rapid, and the produce sufficiently abundant for home consumption and for large exportations of wheat, barley, cotton, hemp, and tobacco, chiefly for the markets of the Lower Provinces. Agricultural pursuits formed the chief occupations of the inhabitants of the district, and they were allowed by the best judges to be excellent cultivators. In the gardens, every kind of vegetable

and all the variety of country fruits were produced in abundance; and also the English apple, the strawberry, and the vine. The flavour of the apples was equal to any in England, and many of them were of a very respectable size, measuring seven, eight, and nine inches in circumference. One single tree was known to produce one hundred and thirty apples.

In this fine district, the great majority of the inferior zeemindars, from various causes, had fallen into extreme poverty. Many of them were little better than mere peasants: the minute subdivision of property; their proneness to litigation; the extortions practised on them by the mahajuns, to whom they were almost all deeply indebted; their own imprudence; expenses incurred at marriages and festivals,—had all concurred to bring them to a condition very little removed from beggary. The labouring classes of the district had not the means of improving their situation; they seemed to work merely with a view to enable themselves and their families to live; and when they were employed, their labour was not very amply rewarded; and when they did receive a little money, they were generally idle till it was spent. Hunger seemed to be the only stimulus to their efforts of industry. Coolies or daily labourers received about three-halfpence or twopence per day, according to the work they were employed upon; women received about one penny per day. Among the natives it was customary to pay them partly in kind and partly in coin; they were not so well paid by their own countrymen as when employed by Europeans. It was a very common practice with natives to lend a rupee to a daily labourer, and to receive as interest one day's labour every month, which amounted at the end of the year to very little less than 75 per cent.; and the very common practice was for a zeemindar to lend a maund of grain, and receive one maund and a half for every maund lent. The cause of their poverty was intimately connected with the system of oppression which existed amongst themselves, or lay in the relation in which they stood to the soil (which was the chief source of their subsistence), and their complete dependence on the zeemindars. They were rack-

rented by the ticcadars or khutkinedars, and many of the ryots were mere cutters, whose labour at seedtime and harvest was at the disposal of the Assamese, for the consideration of a hut and a beega or two of land.

In the neighbourhood of the large indigo factories in Chumparun, where some thousands of the labouring classes were always employed, they were observed to be more comfortable, better fed and clothed, than elsewhere. Rankine vouches, from his own knowledge, that many thousands of these poor creatures were daily fed, in 1838, by the planters, who were necessitated to import from Purneah large quantities of rice for the purpose, the rice crop in the Terai in the previous year having been almost a total failure. In the northern parts of the district, the inhabitants almost entirely depended on their supply of rice from the Terai, and in a favourable season it was procured at a very cheap rate, 4 or 5 maunds (320 or 400 lbs.) for the rupee, or two shillings. But in such a season as 1837 (only $2\frac{7}{10}$ inches of rain having fallen in ten months), when a scanty spring crop succeeded, and the failure of their chief dependence, the rice crop, they were, in many places, on the verge of famine. When such a calamity occurred, very few, except in the neighbourhood of indigo factories, were able to get work. They left their houses; and being destitute of the means of living by industry, they were driven to subsist by begging or by stealing; and when sickness was added to their poverty, they had nothing to depend on but the precarious maintenance or voluntary contributions of their neighbours.

The miserable condition of the poorer classes described by Rankine and other medical writers, furnishes a clue to the reason or source of the melancholy jail administration of former days. Such conduct as that of the experimenting judges of the court of Nizamut Adawlut, and of the local magistracy, who permitted asphyxia to be one of the diseases which infested jails, of which the latest example was the tragedy of Ujnala in the Punjab, in 1857, cannot be exonerated by any argument of ingenuity or feint of charity. For the pernicious system of jail management, an excuse or plea might be sought in the official vices of

the civil servants of the East India Company. The possession of practically irresponsible power perverted the minds of these gentlemen from rendering due attention to the remonstrances and the counsels of medical officers. The teachings of medical science were disdained by the judicial administrators; and the opinions of medical officers, who in those days, as proved by their writings and the eminence several of them attained, were by no means of a contemptible order,* were held in scorn. The status also formerly allotted to the civil surgeon was inferior, as it would appear that he was regarded less as a public officer than as a member of the household of the judge's wife. This low estimate of his position weakened his influence in the official atmosphere. From neglect of the precepts of the medical sciences, and from erroneous judicial considerations, arose the system of prison economy, which fills a sad page in the history of the administration of former days. Ignoring medical views, the judicial officers appear to have constructed the prison dietaries and the scale of necessaries on principles formed from independent observation made by themselves of the habits and mode of living of the free population; it would further seem that they were of opinion that judicial considerations demanded that the convict should not be better off than the poorest of the honest classes. The penurious mode of living of the latter was accordingly adopted as the standard for the prisons. That this was the fact is manifest, not only from the writings of Hutchinson and others, but also from the Report of the Committee on Prison Discipline, to the Governor-General of India in Council, in 1838. Nothing is more extraordinary in this

* In talent and education the medical officers were fully the equals of the judicial officers of the East India Company. Joseph Hume, Horace Hayman Wilson, John Leyden, the poet, and a few others were well known in England. Hugh Falconer died as vice-president of the Royal Society. Annesley, Twining, Morehead, Geddes, and some others, were distinguished amongst the European pathologists of their day. All these were members of the Company's medical service. Oriental scholars, botanists, and naturalists were not wanting. Maclean is a professor of a great military school of medicine, and Murchison is one of the greatest living authorities on fever: both these gentlemen were formerly in the Company's service.

most remarkable report, than the circumstance that the evidence of medical officers was rigidly excluded on such matters as the food, clothing, and housing of prisoners and similar medical and sanitary subjects. The judicial officers who gave evidence on these matters, proved satisfactorily that the prisoners in the old Bengal jails were better off than the free labourers. The magistrate of Hooghly, for instance, stated that the food of prisoners was of superior quality, and that few ryots can afford to spend even two pies and 39 ghundies a day; while prisoners under simple imprisonment without labour, obtain two pice, and those sentenced to hard labour three pice a day. He conceived that the prisoner was better off than a large proportion of the labouring population. The prisoners of the Allyghur jail received an allowance of three pice per diem, and regarding them the magistrate wrote: "Two years ago, I entered into a calculation, which went to show that their condition is superior to that of the lower ranks of labourers, who on an average do not earn more than four pice a day, out of which they have to supply themselves and family with food, clothes, and lodging. Their food is inferior in quality, and generally small in quantity, while the prisoners use the best wheaten flour, many of them enjoy the use of tobacco, they become quickly sleek and fat in jail; and after purchasing their food, salt, firewood, etc., there is every reason to believe that they can save from their allowance, as those prisoners who for any breach of jail discipline are reduced to two pice a day, appear to be able to live on much as usual, and I have known an instance of a prisoner's mother being killed in a dispute relating to an iron pot which he had purchased out of his savings and sent home to his family. There is also good reason to suspect that a portion of the allowance is given to the burkindazes for their connivance at idleness and irregularities." There can be no doubt that the magistrate of Allyghur believed all that he wrote, and that there was much truth in his statements, although some of his data might have been communicated to him by the native officials, who were fully awake to what their master was striving to demonstrate. Not a few of the old magistracy expressed

the opinion that the food of prisoners should not be "savory"! Even making full allowance for the natural desire of the magistrates who supplied evidence to the committee to extenuate the miserable plight of the prisoners, there can be no doubt that there was much truth in the pictures they drew of the poverty of the honest labourer, and of the comparisons they made between him and the prisoner, in favour of the latter. The results of prison life in the old Bengal jails are to be found in the statistics of Hutchinson, and it is but rational to believe that similar results occurred in peasant life, the model followed, although one is willing to admit that the latter was spared the many thousands of cases of dislocations and sprains, fractures, insanity, and gangrene, which happened annually in the old Bengal prisons. The information thus obtained from a remote source is consistent with the fact that relapsing fever, or the remittent fever of the Bengal rainy season, was a formidable disease of India in Twining's time.

There are indubitable instances of people in comfortable circumstances who have suffered epidemically from the disease. The most remarkable of these are the epidemics that have occurred amongst the troops in garrison, such as the Berhampore epidemic of 1825, the Tatta epidemic of 1839, the Peshawur epidemic of 1849, in the Bombay Fusiliers, and the Roorkee epidemic of 1869, and those at Mercara and Mangalore in the years 1842 and 1845 respectively, and many others. It is most improbable that destitution could have existed amongst the troops in question. Although direct evidence of importation is wanting in the accounts, the indirect evidence, associated with the general conclusions already adverted to, are in favour of contagion having been the cause of these epidemics. There is positive proof that some of them at least were contemporaneous with, if not preceded by, the appearance of the disease amongst the free population. In 1825, the entire country along the course of the Ganges suffered; and the general population was affected, in 1869, before the disease appeared amongst the Sappers and Miners at Roorkee. In the Tatta epidemic, the disease was probably introduced by the recruits who

had recently joined, who had contracted the disease at their homes or on the journey. Military surgeons rarely had information regarding the epidemics prevailing amongst the general population. A noticeable circumstance is that the mortality was trifling, and in some epidemics even nil; and that the disease was generally less formidable amongst the European troops than amongst the native. This fact is consistent with the relative comfort enjoyed by Europeans and natives; the predisposing conditions engendered by defects of housing and food being less prominent amongst the Europeans than amongst the natives. It is thus seen that in the absence of direct proof of contagion, the probabilities are in favour of the disease having been introduced amongst troops in quarters. The appearance of the disease admits of being explained otherwise than by spontaneous generation. The contagious character of the disease will enable it to penetrate and maintain its existence amongst a body of men, whose circumstances are such as to render its generation *de novo* improbable.

I have entered thus fully into the question of the spontaneous generation of relapsing fever, from a deep sense of the great importance of the subject and of its bearing on the welfare of the people of this country. It will be seen from the section devoted to the history of the disease, the vast extent to which it prevailed in the past, and there can be little doubt that the recorded epidemics form but a small fraction of the actual amount of the disease which has not been recorded. If the view of the cause of the disease here brought forward be correct, a great step will be gained towards the amelioration of the condition of the people of India, amongst whom no disease, I believe, has made greater havoc than relapsing fever. I have endeavoured to show that the origination of the disease is intimately connected with want, while it is spread by contagion to classes amongst whom it could not otherwise arise. These views are the same as those entertained by the physicians of Europe, and they are well supported, as I believe, by the circumstances under which the disease has appeared in this country in all epidemics of which tolerably complete accounts exist, as well as by the circumstances under which

the disease has disappeared in communities among whom it was wont to appear. "Of all the causes," says Murchison, "that can be assigned for the origin of relapsing fever, it seems to me that destitution is the most tenable. 'We give the name,' says Brown, 'of cause to the object which we believe to be the invariable antecedent of a particular change;' and such appears to me to be the relation of destitution to relapsing fever. But whether or not they stand in the relation to one another of cause and effect, the intimate connection between them is indisputable. The facts bearing upon this point are most important, even if the theory founded upon them be not accepted."

A passing reference is due to the belief that was at one time paramount, but which is now undermined and fast crumbling away, regarding the origin of the special form of fever which is the subject of this work. It was imagined that this disease, which was described under various names and imperfectly understood, and even hardly discriminated from other forms of fever, was due to malaria, or some subtle atmospheric agency which was generated under certain physical conditions of locality. It is unnecessary to enter into the reasons which justify the rejection of the malaria theory of the origin of fever. It might be observed, however, that the theory proceeds upon the fact of the spontaneous generation of fever, while it denies the element of contagiousness. Jungles were supposed to be at certain seasons, if not throughout the year, favourable to the production of malaria which caused relapsing fever, or, as it was called in earlier days, jungle fever and bilious remittent. A tract of country covered with wild vegetation and abounding in moisture was, in fact, according to the old theory, the home of relapsing fever. Enough, however, has already been said to show that the home of the disease is indifferently the jungle, the jail, the village, or the camp, whenever want or deficiency of food exists. The circumstance that jungles were inimical to human life was not contrasted by the old pathologists with the fact that in jungles the finest of mammalian animals are met with in good health—namely, the tiger, and other feline animals, and the elephant. Oldham, an Indian medical officer, has

recently, in a valuable work,* collected together a number of facts which expose admirably the inconsistency of the malaria theory, and its inadequacy to explain the generation of fever in all the varied terrestrial conditions in which the disease has been known to arise. It is to be regretted, however, that the views expressed by this author regarding the cause of intermittent and remittent fevers are not tenable. He has made the great error of not discriminating between the various known forms of fever, and of attributing to what might be called an immediate determining cause, the action of which is further only occasional, the origination *de novo* of all the different forms of intermittent and remittent fevers, which are met with in India. Chill, or the sudden depression of temperature, might suffice to produce the intermittent and remittent forms of simple fever, but it cannot generate the same forms of relapsing, typhus, and typhoid fever.

Intermittent fever, in a special manner, has been supposed to be due to malaria or marsh miasm. The difficulty of accounting for the generation of this disease in localities in which marshes and jungles do not exist, was usually got over by fetching miasm from a distance; some authors have procured it from a distance of one hundred miles, and a few have gone the length of 400 and 500 miles! Instances are recorded of malaria having been blown by the winds from the plains to the summits of lofty hills, for the special convenience of malarious pathologists! A strong reason for the association of intermittent and remittent fevers with the emanations of marshes is generally supposed to be the fact of the disappearance of these diseases in London, although two hundred years ago they prevailed there to a great extent. To the drainage of the London marshes is credited the extinction of these fevers. The prevalence of intermittent and remittent fevers in the jails of Upper India and of Bengal Proper is much less in the present day than it was in the past; and it has been further remarked that prisoners now suffer less from these diseases than the

* "What is Malaria?" By C. F. Oldham, Assistant-Surgeon H.M. Indian Forces. London, 1871.

general population of the country. The explanation offered of the latter phenomenon is, that the walls of jails exclude miasm or malaria! I cannot avoid thinking that as the intermittent form of relapsing fever is found to be more abundant than the same form of typhus or typhoid fever, the extinction or abeyance of this disease is due to the circumstances which have brought about the extinction of relapsing fever. The abatement of intermittent fever appears to have been *pari passu* with the gradual disappearance of relapsing fever. It need hardly be pointed out that a country whose marsh lands have been drained and brought under cultivation is so much the more prosperous, and better able to provide for the sustenance of its inhabitants than an undrained country. The comparative exemption of the prisoners in the jails is doubtless due to the humane administration of prisons in the present day; and the greater liability of the free population to the disease is to be attributed to widespread and permanent want, of the existence of which there cannot be a doubt. The extinction of remittent fever in London is to be traced to the fact that the disease is now regarded as continued fever; and the remittent fever of marshy countries is erroneously attributed to malaria or marsh miasm.

Although, as shown by the preceding illustrations, deficiency of food is in the main the condition under which relapsing fever is spontaneously generated, it is not intended to convey the idea that this cause is the only one that will produce the disease. As already stated, crowding is a powerful predisposing cause; but as the disease has been generated amongst men not subjected to its influence (as, for instance, when living in the open air, as in the Kimedy epidemic), this cause cannot be considered as essential. I am aware, however, of one instance in which a man contracted an attack of relapsing fever apparently from the influence of this cause alone; for there was an absence of any other. I have in a previous passage alluded to the case of a single prisoner of the Rawul Pindee jail who had a distinct attack of the disease in October, 1868. There was no instance of the disease in the jail at the time, or prior to his attack, or subsequent to it, except the few men who

were infected by this case. The man himself was strong and robust; had been one year in confinement; and with the good diet allowed to the prisoners, it is impossible to attribute the disease to a deficiency of food. The only insanitary condition which existed at the time was overcrowding; but it is difficult to debit the disease in a single individual out of nearly a thousand others to overcrowding, seeing that all were in common subjected to its influence, and yet the disease manifested itself in one individual only. But there was no other cause to which it could be attributed, as no contagion from outside could be traced. The usual consequence of crowding resulted a couple of months afterwards, in January, 1869, in a general epidemic of typhus; but no case of relapsing fever occurred during the five months it continued.

SECTION XIII.

Treatment of Relapsing Fever.

A. *Prophylactic Treatment.*

The prevention of relapsing fever is of greater importance, and in fact more practicable, than the cure. The means of preventing the origin of the disease are in our power, and they are clearly indicated by what has been already stated regarding its causes. The nature of these requires that the subject should be discussed under two divisions, namely, how to prevent the generation of relapsing fever, and how to prevent its spread.

1. *The prevention of the generation of relapsing fever.*—It is plain from the knowledge acquired regarding its origin, that an adequate supply of nourishing food is what is needed for the prevention of the disease. It is to be hoped that the awful experience of the past will suffice for all future time to prevent the starvation of prisoners in the jails for any reasons whatever. Much, if not all, the misery that has been unnecessarily inflicted upon the inmates of

Indian prisons, was due to thoughtlessness and a blind adherence to traditional modes of administration. Starvation was practised in the old Bengal prisons; but it was ascertained to be a prolific source of disease and mortality, and was accordingly corrected. The experience derived from the working of these prisons was lost sight of on the extension of British dominion to the North-Western Provinces, or the old presidency of Agra. As we have seen that even so late as 1842, the entire body of prisoners in that province was subjected to an experimental course of low diet, by the judges of the Court of Nizamut Adawlut. As British territory extended, and new provinces were formed, and placed under separate civil administrations, it would appear that the prisoners underwent the traditional probation of starvation. Even in the model province, the Punjab, for a long series of years the traditional judicial discipline of starvation was in vogue up to 1864. The assumption of the government by the Crown in 1859 had apparently not sufficed to break the force of tradition. Should British territory further extend to any of the outlying regions around India, and a new province be created, its prisoners are liable to be subjected like their predecessors to the same traditional mode of treatment. Let us hope, however, that this ancient tradition will have become materially weakened, and rendered incapable of resuscitation should opportunity again arise for its possible operation in a new field.

Military epidemics of relapsing fever, spontaneously originating amongst the troops, from failure of supplies, have been for many years almost unheard of. Generals are fully alive to the importance of the physical comfort of their troops.* We have seen, how in the earlier years of the present century, the paltriest expeditions, and even the ordinary marches of troops from one station to another, were attended by awful devastation and loss of life from fever. Epidemics such as these were latterly unknown, or

* In support of this statement, I need only to refer to the nature of the preparations made for the Abyssinian campaign, and of those now being made for the troops and the *coolies* who are about to proceed on the Looshai expedition.

rarely heard of, though the hills, the streams, the jungles and the air were unchanged. I do not know of any better proof than this of the efficiency of the Indian Commissariat. There have been few serious epidemics within the current century amongst the troops, though this period has comprised many great campaigns: the conquest of the greater portion of India, and latterly the Afghanistan campaign, the Sutledge and Punjab campaigns, the mutiny, Persian, China, Burmah, and Abyssinian campaigns, besides numerous minor expeditions. The Burmah and Hydrabad epidemics were exceptional. I am not aware of the nature of the fever that occurred epidemically amongst the troops in the recent Bhootan expedition, but it is not unlikely that the 11th Regiment (Native Infantry) suffered from this disease at Pattakowah, in 1865. An efficient commissariat is the surest remedy against the generation of the disease in armies. Attention should be paid equally to the supply of food for the camp-followers, at rates proportional to their wages, and for the baggage cattle as for the fighting men.

The operation of want of food has been more prominent amongst the general population than amongst the troops or prisoners in Indian jails. I have endeavoured to show by such direct and indirect proofs as I have been able to gather, the amount and degree of destitution prevalent in the past amongst the people. Much difficulty is experienced in obtaining a knowledge of the actual condition of the people. No Indian Mayhew has yet appeared to give us information regarding the Indian poor. There can be little doubt, however, that poverty is wide-spread, and that in ordinary circumstances the people are just able to keep body and soul together. The condition of the domestic servants of Europeans and the native troops might be taken as the criterion of the state of the mass of the people. Excluding the upper servants of wealthy Europeans, the lower grades of domestics receive wages varying from eight rupees, or sixteen shillings a month, to four rupees, or eight shillings, without further help generally in the way of food or clothing. Our domestics, though miserably paid, are reckoned amongst the comfortable and

well-to-do of the lower orders of the people. The sepoy, or native soldier, receives a monthly pay of seven rupees, or fourteen shillings in the lower grades, and of nine rupees, or eighteen shillings in the upper grades, after many years of service. He has to provide himself out of his pay with many necessaries, such as his half-mounting or summer clothing, his boots, and various other articles, and with the balance he maintains himself and family, and perhaps assists his parents, or other relations. Besides his pay, he is provided with free quarters, and in periods of scarcity or dearness of provisions he receives compensation for the increased cost of articles of food. The sowar, or trooper of the cavalry, is proportionally paid much about the same as the infantry soldier, considering that he has to purchase a more expensive uniform, accoutrements, and to provide himself with a horse, and maintain it out of his pay of twenty-seven rupees or fifty-four shillings per mensem. Comparing themselves with the classes from whom they are derived, the native infantry and cavalry soldiers consider themselves well provided. Let us now see how the native soldier feeds himself in periods of scarcity. The recent volumes on the medical history of the native army of Bengal for the years 1868 and 1869, issued by Surgeon-Major J. T. C. Ross, F.R.C.S., secretary to the Inspector-General of Hospitals, Bengal Medical Department, afford authentic information on this subject. Throughout these reports the complaint is tolerably general that the men of the native army are underfed. Dr. G. Saunders, the Deputy Inspector of Hospitals of the Presidency Division, is loud in his representations thatthe men of the Presidency regiments are badly nourished. The men of the 2nd Regiment (Native Infantry) only take one meal a day, whereas they ought to take two to maintain themselves in good health. Several men of the 9th Regiment (Native Infantry) were habitués of the hospital, suffering from no particular disease, but constantly seeking admission in a weakly state. On investigation being made into the cause of their debility, it was ascertained that all these weakly men were living on barely half diet. In the other divisions of the army there is the same tale. Mr. Morice, the surgeon of the 16th

Bengal Cavalry, reported in 1868 that owing to the high prices of everything, the men were hardly able to provide themselves with sufficient nourishment: "their pay is barely enough to pay for feeding themselves and their horses, and to provide uniform and accoutrements, etc.; a sowar has so much taken out of his pay on account of the various funds, etc., that he has to subscribe to, that in time of scarcity he has hardly enough left to live on, and as regards food is often very much worse off than the sepoy of an infantry regiment." Mr. Currie, of the 10th Bengal Cavalry, thus reported in 1869: "The ordinary articles of food in use amongst native soldiers are to be had in abundance, but the prices at present are so high that many of the men must, I fear, be obliged to use the very coarsest and inferior descriptions of grain, and can rarely indulge in either meat or fish. In fact a purely vegetable diet is all that the majority of them can afford at present. . . . . If the present famine prices of grain continue much longer, it will most unquestionably affect the physique of the men, and predispose them to disease. I am given to understand that at present their expenses exceed their pay considerably." Mr. Eteson likewise reported in the same strain of the Sappers and Miners, in 1869. Many of the sepoys stinted themselves in order to increase their remittances to their families in hard times, and he suggests that "some simple and efficient check should be enforced to ensure that native soldiers do their duty to themselves and to the State in the matter of good diet, both in dear times and in cheap times, before remitting to their homes so much more than is required for the very laudable purpose, the maintenance of their families, to be expended in expensive marriage ceremonies." Mr. Veale, in medical charge of the 30th Regiment Native Infantry, states that the men received compensation for dearness of food throughout the year 1869, at Jhelum, but the measure did not obviate all the ill effects resulting from scarcity. He says "men from different motives would be tempted to subsist themselves on the cheapest and coarsest food; one class, for example, that they may be able to provide food for their families living with them; another class for the

sake of increasing the amount of their remittances to their families left behind in their villages, and who would otherwise suffer from the prevailing scarcity and high prices; and still another class for the purpose of adding to their savings. From these causes, their nutrition may be supposed to suffer, and the efficiency of the soldier for fighting purposes proportionately diminished during years of scarcity." The author ascertained from personal inquiries and observation the amount of animal food used by the men of the 4th Punjab Infantry, and reported in 1869 as follows: "The daily use of flesh is beyond the means of the sepoy. The price of goat's flesh in the bazaar is four seers per rupee, or 3*d.* per lb., which is inordinately expensive to men whose daily pay, after deductions, is three annas, or 4½*d.*, with which they maintain themselves and families also in many instances. In conversations with the men, I have gathered that sepoys of the seven-rupee grade can afford to eat meat on the average about three or four times in the month, expending on such occasions usually about two pice, which sum purchases two chittacks or four ounces of goat's flesh. The higher paid grades of sepoys can afford to obtain meat about eight or twelve times in the month. The daily use of meat is within the means only of the higher non-commissioned and commissioned ranks of the regiment." To the same purport are the reports of numerous other medical officers of the Native Army of Bengal.

Such is the condition of the better classes of the lower orders as described by medical officers, who, in all countries, are brought into close and constant contact with misery, and are reliable exponents of the physical condition of a people. From these official reports may be judged the penury of the masses, in the absence of authentic and detailed accounts of their actual state.

In the large towns, as Calcutta, Allahabad, Benares, and others, the lower classes appear to be fairly nourished. These are the centres of commerce, and the abodes of wealth. The requirements of trade and the wants of the rich ensure a sufficiency of employment for the people, and enable them to obtain an adequate supply of food. In the

smaller towns and villages the people are almost exclusively dependent on agriculture, for there are no trades to speak of, the manufacturing pursuits of the people having been practically destroyed. The means of subsistence of the agricultural population are scanty and precarious. From them the native army is recruited; and the eagerness displayed to obtain the pay and the prospects of the sepoy is an index of the poverty of the people. It is unnecessary, and would be out of place in India, to have recourse to the blandishments of the recruiting sergeant, to offer bounties for enlistment, or to render the purchase of discharge from the army compulsory. On the contrary, the choice of selection from the sons of respectable village families is invariably exercised by the recruiting officer. No special pecuniary inducement is needed; and, in general, the native soldier is allowed to leave the army whenever he pleases to do so, no difficulty being experienced in replacing him, as in the case of the British soldier. As a means of livelihood, the native army, although the pay and the prospects are small in our eyes, offers greater advantages than almost any other pursuit within the reach of the mass of the people.

To fix upon the circumstances of the native army as a standpoint from which to judge of the poverty of the people is perhaps reaching too high, for it would appear that the prisoners in the jails are better provided with the necessaries of life than the masses, even as was the case in the most lamentable period of prison history. Hutchinson, in his endeavour to show that the maintenance of the prisoner was miserable in the extreme, found some difficulty in getting over the fact that the peasant was not much better maintained. If the prisoner received a daily allowance varying from two to three pice for his own maintenance, he was not much worse off than the agricultural labourer or ryot, whose earnings were seldom more than was absolutely necessary to support existence, and in scarcely any district realized more than a couple of annas per diem, or about four rupees per mensem. But supposing that the peasant earned this amount, there was the maintenance of his wife and children to be considered. Hut-

chinson could only account for their remaining alive by referring to the fact that the ryot was enabled to make his scanty earnings go a great way, by partly supporting himself and his family on the produce of his own field. Under the present administration, each prisoner in the jails of Lower Bengal costs the Government for food, clothing, and bedding alone 34*r*. 9*a*. 1*p*. per annum, according to Dr. Mouat's Annual Report for 1869; and in the Punjab jails, 40*r*. 13*a*. 2*p*., in the same year, or 2*r*. 14*a*. 1*p*. to 3*r*. 13*a*. 2*p*. per mensem. The earnings of the ryot has been variously estimated in the provinces at from three rupees in Lower Bengal, to five rupees per mensem in the North Western Provinces. The ryots form the mass of the people of India: they number over three-fourths of the population.

I would not, however, be understood to imply that the sepoy, or even the prisoner in the jail, should be reduced to the level of the ryot, with regard to the provision of the necessaries of health. The judicial maxim or consideration that the prisoner in the jail should not be better off than the ryot, has had a full and complete trial, and the results have been recorded in the medical history of former prison administration. The most deadly diseases to which the human race is subject were the consequences. The specific fevers which, on the whole, have caused more loss of life amongst mankind than any other diseases, were investigated by the pathologists of this country, chiefly in the jails, for there the best opportunities were afforded. Ewart, one of the first investigators of typhoid fever in this country, carried on his researches during an epidemic of that disease in the Ajmere jail; and I believe it was the writings of this gentleman which removed all the doubt formerly felt regarding the occurrence of typhoid fever in India. The subject of this work was investigated almost exclusively in the jails. The fact of the occurrence of typhus in India was finally established by the observations of the author and of his successor, Dr. Fairweather, made within the walls of a Punjab jail. The jails, in fact, were converted into schools of pathology by the practical application of this and some other judicial maxims or considerations for-

merly current in this country, and not yet extinct. No stronger argument can be advanced to deprecate the assimilation of the economy of prisons with that of the household of the ryot.

On the contrary, the truths of physiology and pathology, as far as they have been ascertained, indicate that the condition of the ryot is not conducive to the maintenance of health, but favourable to the generation of disease. Such being the case, it is unjustifiable to take it as a model or standard for imitation or guidance. No subject more urgently demands attention than the amelioration of the poverty of the agricultural labourer, and the improvement of his means of subsistence. His permanent elevation to the condition of even the prisoner in the jail will be attended with the happy result of the extermination of one of the most deadly diseases prevalent in India—relapsing fever, epidemics of which have been of frequent occurrence. The supply of an adequate amount of food was the measure which practically exterminated the disease from Indian prisons; and the like result will surely follow, if the mass of the people, the ryots, could obtain permanently the necessaries of life.

The immunity from relapsing fever enjoyed by the people of European countries, cannot be anticipated in India for perhaps the next century or two. Under British rule for the past century, the monthly income of the mass of the people has reached the average of four rupees, or eight shillings, per individual, an amount manifestly insufficient for the maintenance of health. In another century or two, we might hope that the present average of the people will be doubled, and become sufficient for the purchase of the necessaries of health. Doubtless the improved legislation of recent years will expedite the advent of the period when the people will be able to obtain permanently the means of subsistence; though it is a subject for grave concern that its immediate result appears, to a medical observer at least, to be the filling of the jails to distension, even to the generation of an awful disease hardly known hitherto in India, namely, typhus, which is more destructive than relapsing fever. Meanwhile, some measures are

immediately practicable, and, indeed, loudly called for, whereby the penury of the people might be relieved.

Usury is one of the greatest social evils in India, and its suppression will do as much good to the people as any measure in operation for their benefit. The bane of the ryot is the usurer: the produce of his fields and the sweat of his brow contribute but little towards his own maintenance, but are diverted, in great part, from this necessary purpose, to add to the wealth of the usurer. A writer in the *Indian Observer* of 9th September, 1871, admirably explains how the ryot of the North-Western Provinces is impoverished by the usurer. In a village of fifty ryots or cultivators, there are two, or perhaps three, men, who sow from their own store, or have the ready-money to buy seed. The rest are under the necessity of having recourse to the money-lender. A ryot has six acres of land. The following is his history for a year, beginning in October, abridged from the account of the writer:—Of his six acres, three are under autumn crops, and three are ploughed and ready for wheat and barley. He requires, in round numbers, three maunds of seed. Wheat is now selling for fifteen seers, and barley for twenty seers, the rupee; and the ryot borrows the seed from the usurer, and is booked as follows:

	r.	*a.*	*p.*
Two maunds of wheat	5	5	4
One maund of barley	5	0	0
	7	5	4

He sows his spring crops, and is looking after his autumn harvest, none of which is yet ready to gather, except, perhaps, a little field of maize, near the homestead, that he has sown for his own use; when, towards the close of October, the first autumn instalment of his rent falls due. He has no cash, for, as we have seen, he has just borrowed his seed. He has half-an-acre of sugar-cane that would sell for twenty rupees about the end of November, but is not marketable now. He has half-an-acre of cotton, but it is not ready to pick. The remaining two acres are tall with jowar, which will be fit to gather about the end of November.

What is he to do? It is useless to appeal for mercy to the zemindar, or landholder. He also has to live, and is not a rich man for his station. On the fifteenth of November he must pay his revenue. If he shows mercy to his tenants, will mercy be shown to him? The British Government is inflexible in the collection of revenue—it never falters or flags. This he knows well. He threatens the cultivator with distraint, which means ruin. The end is, that fifteen days after he borrowed the seed, the ryot is now obliged to borrow cash. The whole country-side is then wanting cash; all at the same time; all for the same purpose; all because their crops are not ripe and their rents are due. The annual rent of six acres of fair land is thirty rupees. There is also one anna added to every rupee for the patwaree, or village accountant's pay, and half-an-anna for the school tax; altogether, the rent comes to 32*r*. 13*a*. He has to pay one-fourth of it now, 8*r*. 3*a*. 3*p*., which he obtains from the money-lender. The total debt now amounts to 15*r*. 8*a*. 7*p*. Let us see what the interest will be.

It is universally the custom to recover the advances made for seed in October at the harvest time in April of the following year. The interest charged is twenty-five per cent.; that is, at the rate of fifty per cent per annum. If the loan be repaid in money, the account stands:—

	r.	*a*.	*p*.
Principal	7	5	4
Interest	1	13	4
Total	9	2	8

If the loan be repaid in kind, the account is a little more difficult. The price charged for the seed is the highest selling price at the time it is borrowed, one of the dearest months of the year; on the return of the loan, the grain is valued at the very lowest harvest price. First, he had two maunds of wheat, value 5*r*. 5*a*. 4*p*., with interest 1*r*. 5*a*. 4*p*. —total, 6*r*. 10*a*. 8*p* Wheat will sell at harvest time at twenty-five seers. He will, therefore, have to give four maunds and six seers of wheat in April for the two maunds that he borrowed in October. From two acres of wheat he

will get, if his crop is a very good one, twenty-four maunds of grain. One-sixth of the crop, therefore, goes to pay for the seed. The actual seed amounted to one-twelfth of the produce, and the interest to one-twelfth. So with the barley. If the harvest price is thirty-five seers, he will have to return two maunds and seven seers in repayment of the maund he borrowed six months before.

Cash loans for the payment of rent are given for a month only, and interest is charged at the rate of one anna per rupee, *i.e.*, seventy-five per cent. per annum. If the debt is unpaid at end of a month, it continues to bear interest in succeeding months at the rate of half-an-anna in the rupee, or thirty-seven and a-half per cent. per annum.

The next instalment of rent, of 8*r.* 3*a.* 3*p.*, falls due in the last week of November to enable the zemindar to meet the revenue demand of December. The ryot now finds no difficulty in paying off his loan from the usurer, as well as in meeting his rent, because the autumn harvest has now been gathered in. After paying off all, the ryot will have twenty rupees left to pay for his food and other expenses until the spring harvest in April.

About the end of April, while the harvest is being gathered in, down comes the zemindar again for another instalment of rent, as the revenue falls due on the 15th of May, and he must get in his rents a month or a fortnight before. The ryot has again to borrow 8*r.* 3*a.* 3*p.*, at the same moderate interest of seventy-five per cent. per annum. The next demand for rent is not made till the end of May. By that time the wheat and barley have been gathered in and are ready for sale. The grain dealers are going about buying. Every one has to pay his rent, no one has any money; the market is flooded with produce, and the cultivator gets a rupee for wheat he would get one and a-half for if he could wait a month. If, however, the harvest is good, there is no difficulty in paying the remaining rent, and the debt due to the money-lender for the seed, and the April instalment. When all is paid, the ryot will have about twenty rupees left; and unless he sows indigo for a planter or takes an advance for cotton from some speculator, he will get no cash again until the autumn harvest is in.

The writer proceeds to observe that he has taken the circumstances most favourable to the cultivator. He has been supposed to be able to repay the money-lender, and to give his second autumn instalment of rent from the proceeds of his autumn crops. But very often he cannot do this. The autumn crops are not so valuable as the spring harvest. Yet an equal amount of rent is often made to depend on each.

"Under the most favourable circumstances," he continues, "the cultivator must borrow to pay half his rent, and pay interest for one month, at the rate of seventy-five per cent. per annum. Out of every hundred rupees of rent, fifty rupees are borrowed, and three rupees four annas paid as interest to the money-lender. The revenue of the North-Western Provinces is about four million pounds sterling. The rental cannot be less than seven millions. Therefore, in round numbers, about three millions are borrowed every year, and one hundred thousand pounds paid as interest by the cultivators. And what is the necessity for this? Absolutely none. All this burden is simply thrown on the peasantry by the system of taking the rent before the crops are harvested. If we ask why this is done, we are told on account of the improvident habits of the people. No other reason whatever can be assigned.

"It appears, then, that by our system of collections, in the most favourable circumstances, at least one hundred thousand pounds sterling of the produce of the land are made over annually to the money-lenders. This, however, represents only a fraction of the loss actually caused to the peasantry. For it is seldom that things go on so smoothly as we have supposed them. And the share of the money-lender in the produce, is probably much more than the sum we have named."

This philanthropic writer attributes the growth of usury to the system of collecting the revenue before the ryots have gathered in and marketed the harvest. The only reason assigned, he states, for the perpetuation of the system, is the improvident habits of the peasantry. He thus combats this pretended reason. "Are our servants improvident? Can extravagance be alleged against the horse-keeper who, out of a monthly wages of ten shillings,

contrives to put by thirty? Are the native soldiers improvident? Yet they are the sons and brothers of the men who till the soil. There is no more thrifty race in the world than the people of Hindustan. Their rural economy would put any of us to shame. There is not a straw left to go to waste; not a weed, that is not poison, which has not its use. Yet we are told they are improvident. Doubtless there are the Thakoors and others of once powerful clans who do spend money. There are the robber clans, such as the Goojurs. But even against these it is a mistake to bring a sweeping charge of extravagance. The ordinary peasant is the most thrifty and frugal of mortals. He is no glutton; he does not drink. His sole luxury is an extra buffalo or two; yet he is in debt. He is the slave of the usurer." No one can be amongst natives without being impressed with their thrift and frugality. The care they take of their clothing is something remarkable. Amongst the lower poor, every rent is carefully sewed, and patches follow patches for as long a period as the texture of the cloth will endure. The same carefulness and frugality is prominent in their eating. No native of the poorer classes, such as sepoys or domestic servants, cooks a grain of food more than he can consume. It would appear that these classes are always on allowance; their food is always a definite quantity. Every particle of food prepared is eaten, and none left to waste. This cannot be said of any other people. Even the Scotchman does not eat all his porridge. I observe the same thrift in the sepoys of the 13th Regiment N.I., at Fort William, which is recruited chiefly from the Goojurs of Central India. Upon a monthly pay of seven rupees, or fourteen shillings, it is incomprehensible to me how they live, and contrive to provide themselves with native and military clothing. Their white uniform, or half-mounting, as it is technically called, is always well-washed, well-ironed, and in good order; they wear country-made boots, of English fashion, which they keep well-blackened and polished; they have other expenses for military equipments; and yet, with all the expenditure thus unavoidably incurred, they put by money, to be remitted to their families in the villages. There is no crime in the regiment; no drunkenness. These

men are Goojurs, hereditary robbers. Their thrift is a wonder.

Usury is an evil of long standing, and well known in India. That it is one if not the main source of penury of the agricultural population, the sole remaining class who are liable to the spontaneous generation of relapsing fever, the appanage of want and destitution, as Murchison styles it, is universally admitted. We are even told that the Santhal rebellion was due to the extortions of the usurer; and yet it is surprising that a system of revenue collection which engenders and supports usury has maintained its ground to the present day. The only thing necessary, so far as I can judge, to effect the salutary change needed of postponing the periods of collection till after the harvest has been gathered, is an official representation of the subject to Government. There can be no doubt as to the result, if a full and well supported representation be made to Government that the traditional system of revenue collection before the harvest fosters usury, and thereby impoverishes the agricultural population, and thus is indirectly a prolific source of relapsing fever.

It would appear that the agricultural population of India, the ryots, are less comfortable under British dominion than they were under Eastern rulers. The worst form of usury, which battens, not on the follies of the extravagant rich, but on the necessities of the industrious and thrifty poor, was unknown under the Mogul emperors. The native rulers, although they might have exacted a larger share of the produce of the land, though it is doubtful that they did so, collected the revenue after the harvest, and they were willing to take it in kind. There is direct evidence that the agricultural population of provinces under native rule were better fed and more comfortable generally, than in the provinces under British rule. Rankine draws a remarkable comparison between the agricultural population of Burmah under native rule, and that of Sarun, one of the most fertile and prosperous districts of India, which in his days had been under British rule for two-thirds of a century. He says, "While on service with the expedition in Ava, during the late war, I was forcibly struck, not only with the

superior comfort enjoyed by the lower classes in their dwellings, but with the superior intelligence and physical qualities of the inhabitants, contrasted with this country. In the numerous towns and villages the army passed through on its long march from Rangoon to Prome, I do not recollect a single village or house, in which the poorest inhabitants lived, that had not the floor raised a few feet from the ground, and this was the case, even on the high banks of the Irawaddy. The Burmese are gross and uncleanly in their food, compared with many castes of natives in Hindustan; but they are a much finer race of men, they are more athletic, more active, and of a much more lively disposition; the poor are better fed and clothed, and the greater number can read and write the vulgar tongue."

Arnott's descriptions of the Punjab under the Sikhs are graphic. The following is his account of Peshawur:— "Were the province entirely dependent on rain it would be a barren desert, at least for the greater part of the year, but it is not so; for besides canals from the Cabool River, another stream, which issues from the hills near the fort of Bara affords a constant and plentiful supply of water to the upper part of the valley; and so admirably is it distributed, by the most surprising and perfect network of aqueducts, each with its noisy little flour mill, that every yard of ground is cultivated, and the supply of water is never failing. The rich cultivation which abounds everywhere, in consequence of this plentiful irrigation of a soil more than ordinarily prolific, may be imagined. Almost every village has its stock of the choicest fruit-trees; and round Peshawur large and numerous orchards abound, filled with mulberry, bhair, plum, peach, quince, pomegranate, and fig-trees of a large size; whilst gigantic vines are seen scaling their highest tops, and spreading from one tree to another, with enormous bunches of grapes hanging from every branch. Some of the best Indian fruit-trees, however, are not to be met with. The mango tree is not to be seen, nor the guava, or custard apple, and even the plantain is scarce. A pretty-looking willow is common along the water-courses, and also the poplar; the neem, peepul, and banyan trees are few, and reach no magni-

tude, and the milk-bush and prickly pear are not met with. The camel-thorn is abundant at a distance, as is the tamarisk near the river. The ordinary hot weather crops are bajra, jewarry, and Indian corn, which last is grown in greater abundance than I have elsewhere seen it; sugar-cane is not abundant, and it is small; tobacco I did not see, and cotton is grown merely for home consumption, and has a short fibre; but various sorts of pulse, rice, and melons grow in the greatest perfection. Culinary vegetables, such as are met with in the monsoon in India, are also in great abundance, as brinjals, bhendy, cucumbers, tinai, doodya, pumpkins, etc., and are in great perfection. The cold weather crops are, as I have already said, wheat and barley, with turnips, which reach a large size, and are grown in the open fields, as in Europe. We got a hundred and ten pounds of barley for the rupee, and on this we fed our horses, and all other supplies were moderately priced, as eggs, fowls, animal food, etc.; and, as might be expected, the inhabitants are a happy and contented looking people, robustly made and very healthy." Peshawur has since acquired a reputation for its pathological produce of cholera and relapsing fever.

Speaking of the return march of the 1st Bombay Fusiliers, Arnott thus writes: "We had thus a second time traversed our new acquisition from one extremity to the other, to accomplish which we had taken within three days of two months. We had on this occasion probably a better opportunity of judging of its vast extent and value than in our march upwards, a year before, and we could not fail to admire its unsurpassed capabilities. Between the Indus and the Jhelum, it is true, the features of the country are of a description that forbids the expectation of any great or immediate improvement; but even there we marched through the rich and extensive plain of Chuch, the beautiful valley of Wah, and some rich tracts near Rawul Pindee; but when we descended into the vast plains on the banks of the Jhelum, nothing could exceed the fertility of the country. From Jhelum across the Jetch Dooab, *viâ* Ramnugger, Jhung, and Mooltan, to Bukree, the whole extent is one vast alluvial plain, rivalling in resources even the

lower provinces of Bengal or Guzerat. We saw luxuriant crops of wheat and hemp (the mulberry grows almost wild), and silk, cotton, indigo, the sugar-cane and poppy might be cultivated to an unlimited extent. As yet, unfortunately, much of it lies in a state of nature, and utterly neglected; and the inhabitants appear impoverished, ill-clad, and void of energy. But now that the spear may be converted into the ploughshare, and the sword into the pruning-hook,—that strife, turbulence, and war have been succeeded by the blessings, it is to be hoped, of a lasting peace,—that property will be secure, and the inhabitants may calculate on being able to reap where they had sown; and, it may be expected, that the fostering hand of a liberal government will be extended to develop its resources,—the country of the Five Rivers may within a few years be one of the richest countries on the face of the earth." Arnott's sanguine expectations have not been realized. The province is poor, agriculture is retarded by penury and ignorance, and the manufacturing industry of the people has been destroyed. The great native cities of Mooltan, Wuzeerabad and some others have decayed, and new cities have not arisen in their places. The fine races whom we conquered in the Punjab, are degenerating in spirit and physique.

The benefits derived from British rule are numerous and valuable, but the amelioration of the condition of the cultivators, who form the mass of the people, cannot be included amongst them. The suppression of usury is prominently indicated as a measure which will reserve to the cultivator that share of his resources which is now absorbed by the money-lender. It would be premature to say that the cause of relapsing fever, that is the want of the necessaries of life, will be removed on the suppression of usury; but it is self-evident that the means of subsistence of the cultivator will be increased. It is not improbable, however, that in the irrigated districts the disuse of usury will practically exterminate the disease. The abolition of laws and taxes which weighed heavily on the poor has been known to banish the disease from a country. To the repeal of the corn-laws, as much as to the generosity of

the English public, Murchison attributes the extinction of relapsing fever in England.

We have seen that the penury of the Indian peasant is so deep, that he is often unable to procure of his own means the seed necessary for his fields. The common practice appears to be to borrow the seed at a ruinous interest. The great native zemindars or landholders doubtless help their tenants with advances to meet this need. A custom of this nature exists amongst the Indigo-planters, whose ryots by the aid thus rendered are observed to be more comfortable, better fed and clothed than others. In the case of the smaller landlords who are unable to help their tenants, the Government, on due representation being made, might assist them with the necessary advances at a reasonable rate of interest. A practice somewhat of this nature was carried out by the East India Company, under the name of Tuccavee advances, and the revival and extension of it is advisable under present circumstances.

Other measures calculated to improve the condition of the agricultural population, and to secure to them a larger measure of the necessaries of health and life, so that relapsing fever might be ultimately exterminated from the land, will doubtless obtain the attention of Indian statesmen in future years.

Before leaving this subject of how to prevent the generation of relapsing fever, I am desirous of speaking of the influence of the mode of dealing with the turbulent people on the North-West border, on occasions on which they misconduct themselves, in originating the disease. Epidemics in Eusufzai and Huzara have been recorded or known to occur. The dealing alluded to is the following: a military force is sent to the offending villages; the inhabitants fly to the hills; the villages are knocked down and burnt, stores of grain, and the standing crops, are burnt or destroyed. The villagers are thus deprived of the means of subsistence, and are reduced to destitution. This is the condition under which relapsing fever is generated epidemically. A more lenient punishment is indicated. Invading armies should never pillage the people of a country of the necessaries of life, for the diseases

generated by this conduct amongst a conquered people is apt to spread to the invaders.

The failure and the destruction of the crops brought about by drought or inundations, which of late years have been of frequent occurrence, are calamities whose prevention are beyond human efforts; but the former is capable of mitigation by the construction of canals in districts which are now entirely dependent on rain. Whenever these disasters are impending, relief measures should be at once organized, so that they might be seasonably carried out before the consequences of want manifest themselves. An epidemic once began is difficult to stop, and much greater suffering arises, and larger measures of relief become necessary than when timely aid is rendered. The present cumbrous and sluggish official machinery for obtaining information of the prospects of a bad season, and of the probability of scarcity ensuing, is wanting in celerity, and it would appear that it is even unreliable. The newspapers have hitherto published accounts of the actual condition of districts in which the rainfall has been deficient, before overworked district officials were apparently aware of impending distress, or set about reporting the circumstance. The importance of timely aid on these painful occasions is not fully understood. Of its ultimate economy of life, health, and money, there can be no doubt. To the prevention of an epidemic of relapsing fever, the proverb *bis dat qui cito dat* is applicable in its full significance.

2. *The prevention of the spread of relapsing fever.*— A supply of a sufficiency of good food is not only the remedy against the generation of relapsing fever, but it is, to a certain extent, a protection or safeguard against the propagation of the disease. Individuals insufficiently nourished are predisposed to the disease, and readily take it when unavoidably exposed to the contagion. It is thus that the native troops so readily contract the fever whenever an epidemic prevails amongst the general population. However poorly they might feed themselves, they are never reduced to that degree of innutrition which would generate this disease epidemically; and thus although they

are liable enough to scorbutic and other affections dependent on mal-nutrition, there is no unequivocal instance of the disease having originated *de novo* amongst regiments in garrison. With few exceptions, there are no accounts of epidemics which were limited to the troops in question; but in most instances the troops have participated in epidemics which were wide spread amongst the general population. There are several examples of this fact to be found in the Medical Histories of the Bengal Army for 1868 and 1869, previously quoted. The 42nd Regiment Native Infantry, stationed at Debrooghur in Assam in 1869, had 700 admissions for fever during the year. The vast majority of these are said to have been simple quotidian ague, requiring only a few days' treatment, and characterized by frequent relapses (attributed to scarcity of quinine), the same individuals appearing in the hospital register suffering from ague frequently three or four times in one month. There was no death. The Hindoostanees suffered the most, and half of the sickness occurred amongst them, although they comprised only about one-fourth of the corps. The medical officer, Mr. White, pointed out in a previous report (1868), that the disparity in the sickness and death-rate between the Sikhs and other races in the regiment and the Hindoostanee was, in his belief, entirely due to the superior nature of the diet of the former. The prevailing disease of the district was "malarious fever," and the death-rate from all diseases was about 7 per cent. of the population. In 1869, a mild epidemic occurred in the 9th Bengal Cavalry at Meean Meer in the Punjab. Every man, says Dr. Mantell, passed through the hospital; the type of fever was mild quotidian; the men usually remained in hospital eight or ten days, but many returned two or three times. There was a good deal of subsequent debility after the fever; the only bad case was complicated with bronchitis. The mortality was trifling, and apparently only one man died of fever. "As the season got colder," writes Dr. Mantell, "it was extraordinary how many patients suffered from hepatic derangement, especially jaundice. Most of the cases of fever in November were attended with slight jaundicing of the eye, or with bilious

urine, and these cases were far less amenable to treatment than those which occurred earlier in the season. Few cases only were accompanied with enlarged spleens." With regard to the general population, Dr. Mantell tells us there was an epidemic amongst them from August or September, which attacked all classes, Europeans and natives at Meean Meer; every one was prostrated at one or other period, though happily the disease never assumed anything but a mild type. "The few deaths that occurred were amongst those who were enfeebled by age, general debility, want of proper clothing, and chiefly by starvation in consequence of dearness of provisions, and the great scarcity which had existed during the previous eighteen months." The 26th Regiment Native Infantry, stationed, the left wing at Mehidpore, and the right wing at Augur, in Central India, also suffered from an epidemic of the intermittent form of relapsing fever. In September it assumed a "bilious form," and many of the men were jaundiced. There were 1130 cases, almost all in the left wing, and only one death. The 2nd Bengal Cavalry at Deolee in Rajpootana also suffered from an epidemic in 1869, which is thus described by Dr. D. Crawford. "The intermittent fever was of a severe type, and unusually obstinate, with a greater tendency to become remittent, and to congestions of the lungs, liver, and spleen, than in former years. It was also in several cases complicated with scorbutic and dysenteric symptoms; convalescence was very protracted in many cases, and weakly men were constantly readmitted after any slight exertion of duty." Dr. Crawford's account of the general population of Rajpootana does not support W. J. Moore's statement that there was no relapsing fever in that province during the famine. He says, "Intermittent fever was rather common in August. It increased in prevalence until the month of October, when more than two thirds of the population of the district were said to be prostrated by fever, and, as far as I can learn, this disease caused many more deaths in the villages throughout the district than the previous epidemic of cholera had done. In November the disease had abated considerably in prevalence, notwith-

standing the famine existing at the time, and the great number of starving wretches who crowded into the station. I observed them gathering various weeds and roots, the seeds of grasses, berries of the small briar bush, etc. The low castes immediately cut up and devoured all the cows and bullocks, etc., that happened to die in their neighbourhood, and I heard that many mixed a portion of the oil-cake, ordinarily given to cattle, with their other food. . . . In fact the scarcity and high price of provisions of all kinds caused such distress all through the district, that numbers must have perished from starvation but for the establishment of relief works, and a poor-house at Deeolee." Dr. Crawford also states that he observed no cases of famine fever. But it is plain that he did not recognise the intermittent fever that was prevalent as a variety of relapsing fever. Similar epidemics were contracted by the troops in other stations from the general population being themselves at the time predisposed to the disease by the stinted diet brought to notice by medical officers.

The European troops appear to have held out longer than the native regiments against the vast amount of contagion that was generated amongst the general population in 1869. Dr. Beatson, the Deputy Inspector-General of Hospitals, thus remarks in connection with the Roorkee epidemic, described by Eteson: "For four months the fever alluded to may fairly be said to have been epidemic, embracing all classes and colours. At first the well-housed, well-clothed, and well-nourished European seemed to enjoy an immunity, but later this exemption disappeared, and all soldiers, officers, and civil residents at Roorkee suffered just as sorely as the natives."

It would thus appear that good and substantial living, although it does not confer an immunity from the reception of the poison, is, to a certain extent, a safeguard, inasmuch as persons in good circumstances are less liable to contract the disease readily from the sick, than those in reduced health from poor living.

We have already seen how readily the fever, when once introduced into a crowded place, spreads and attains epi-

demic proportions: crowding is therefore a condition to be avoided. This predisposing cause has been very prominent in the past amongst prisoners in the jails, and there can be no doubt that it exists in the present day to an alarming extent. Judicial officers, it is to be feared, care little for the consequences to prisoners of incarceration in crowded jails. Individual after individual is committed to prison, without due regard being paid to the important fact that the accommodation in a jail is limited. When a jail has already within its walls the full complement of inmates, it is not justifiable to add to their number. Recourse ought to be had to other methods of punishment which are sanctioned by the law for minor offences on these occasions, or arrangements should be made for the temporary extension of the accommodation by the use of tents, sheds, or wooden huts. With regard to troops, equal attention should be paid to this subject, more especially when an epidemic is prevalent amongst the general population. The style of erecting houses in villages in close proximity to each other, and with narrow lanes between them, should be discouraged. Land is so plentiful and of little value in the districts that there can be no difficulty in spreading out the houses over a wider area than is at present the practice. The number of inmates in a house should also be proportioned to the accommodation.

Free ventilation renders the poison of relapsing fever absolutely inert; we have seen that in the great hospitals in the Presidency towns, which are well ventilated, there has not apparently been observed a single instance of the spread of the disease; whereas, in the ill-ventilated jail hospitals, the proportion of disease by contagion has been repeatedly observed. Attention should therefore be paid to secure good ventilation, and if possible to improve it wherever an impending epidemic is to be feared. The importance of having windows to their huts should be impressed upon the natives.

Although the facts bearing upon the communicability of the fever by means of articles of clothing or bedding are few, it is well to take precautions against the spread of the disease by this means. The clothing and bedding of patients

on discharge from hospitals should be disinfected. I see no reason for adopting other measures than the shaking and hanging of infected articles for several hours in the open air. There can be little doubt that of every kind of disinfectant pure air is the best. It is, however, advisable for the sake of satisfying minds of weak faith, to have recourse in addition to the ordinary modes of disinfection.

Care should be taken, when an epidemic is abroad, to avoid as much as possible the operation of the other predisposing causes that have already been spoken of. Cleanliness of person, good clothing, or protection from cold, and avoidance of exposure to wet and rain, and of excessive fatigue, are plainly indicated.

The immediate separation of the sick is a matter of great importance, and this precaution alone, as we have already seen, has sufficed effectually to prevent an epidemic. The best instances of its value have hitherto been obtained in jails. Military and jail hospitals should always be erected at some little distance from other buildings, and should have an open space of ground around them. For the benefit of the poor, and for the protection of the people, temporary fever hospitals should be erected on all occasions when an epidemic breaks out amongst the general population. This should be done, not merely from compassion for the helpless sick, but for the sake of preventing the spread of the disease amongst the healthy.

The best of all measures for preventing the spread of relapsing fever is the removal of the cause of the disease. Every class of a community, every individual of an army, and even the animals that minister to the wants of man, should have a sufficiency of wholesome food. To lean exclusively on any one or other measure previously stated for the prevention of the propagation of relapsing fever is unphilosophical, and too often unsatisfactory in results. The only sure and certain means of avoiding the spread of the scourge is the extinction of its cause. The better classes are not safe when the disease exists amongst the poor; the fighting men of an army are in danger when the camp-followers are liable to the disease, and it is even tolerably certain that the baggage animals are capable of

generating the disease, and of communicating it to human beings. Allusions have already been made to the fact that dogs and horses have contracted the disease from men, and it might be safely asserted that the converse process is liable to occur.

B. *Remedial Treatment.*

The remedial treatment of relapsing fever is hygienic and therapeutic.

1. *Hygienic treatment.*—The patient should be placed in a large airy room, and thorough ventilation must be secured by means of open doors and windows, care, however, being taken not to expose the patient to a draught. Whenever perfect or good ventilation is feasible, as in the large metropolitan hospitals, patients suffering from relapsing fever might be promiscuously put into a ward with other patients; but in badly ventilated buildings, it is always advisable to keep them apart from the others. Excessive light in the ward should be excluded. Perfect quietness should be enjoined, and the patient be disturbed as little as possible. Means should be provided for protection against the annoyance of flies and mosquitoes.

When an epidemic breaks out in a village, the sick should be at once removed to isolated huts, or to tents specially provided. In the Lower Provinces, and in other parts of India, where the cocoa-nut and palmyra abound, there can seldom be any difficulty in erecting sheds, roofed with the leaves of these trees, at very short notice. It would even be advisable, in cases of emergency, if the weather be not excessively hot and sultry, or rainy, to put the sick out in the open air, or under such shelter as might be obtained from trees, or by spreading out a cloth or a blanket upon poles, care being taken to provide suitable covering from cold.

Measures of relief which are necessary for the supply of food to the people in periods of scarcity should not be concentrated in one or two towns or villages; for to those centres the poor will naturally resort in great numbers, and thus the dangers of crowding will be superadded to

those of want. It is advisable, in order to obviate the evils of the assemblage in one or two places of great crowds of destitute people, to distribute relief at a number of depôts within a district. In this manner, while the convenience of the people will be suited, and the fatigue of a long journey avoided, the danger of the generation and spread of disease will be materially lessened.

It would add to the comfort of the patients to provide them with charpoys, or the light bedsteads used by the natives. Suitable provision should be made for bedding: a ruzzai, or light quilt, forms a soft and comfortable bed, and is preferable to a mattrass stuffed with straw. In hot weather, little or no covering would be needed, but a light sheet would be all that would be necessary. In the cold weather, a coarse country blanket over the ruzzai, and a couple of blankets spread over the sheet would be advisable, in order to preserve the warmth of the patient.

Suitable attendance should be provided. Intelligent natives should be selected to act as nurses, and they should receive general instructions regarding their duties. In addition to these a proportion of *mehters*, or scavengers, should be employed to remove the excreta of the sick, and to keep the place clean. The evacuations of the sick should be received in *gumlahs*, or earthen pans, in which a quantity of dry earth had been previously placed, and dry earth should be immediately sprinkled over the excretions, so as to destroy smell. At a convenient distance trenches should be prepared for the burial of the excreta. Whenever procurable, MacDougall's disinfecting powder, or a solution of carbolic acid or other disinfecting agent, should be sprinkled over the floors, so as to put down as much as possible the disagreeable smell that is almost unavoidable amongst agglomerations of native sick.

The bodies of the sick should from time to time be sponged with cold tepid water, to which might be advantageously added a small quantity of vinegar, or of Condy's fluid, or of carbolic acid, whenever these are procurable. The temperature of the skin will be cooled by this practice, the sense of comfort thereby induced will be agreeable to the patient, and at the same time the risk of contagion

incurred by the attendants will be moved by the removal of the cutaneous exhalations.

Very great attention should be paid to the diet, and it should be as nutritious as can be procured for the sick. In each province the people are accustomed to different articles of diet, so that any specification of the articles will not probably be universally applicable. Milk, however, is everywhere procurable and used, and it is by far the best nutriment that can be given to the sick during the fever. Other articles can be added if the patient is accustomed to them, and can be prevailed upon to partake of them. In the severe cases solid food is objectionable, but in the milder cases, if there be not much irritability of stomach, its use in moderation will be useful. The choice of the patient, whenever he is able to make it, should be consulted. Food should be given at regular intervals, every third or fourth hour: in this way attendance and time will be economized. The more severe and enfeebled cases will require to be fed more frequently, and in smaller quantities at a time. In the intermission, solid food can generally be partaken of, and is clearly indicated except in cases in which some serious complication has occurred. The improved, and often sharp appetite that follows convalescence should be gratified, but with care to avoid surfeit or excess.

To relieve the thirst, cool water will be found on the whole to be the most refreshing; but lime-juice, a little diluted sulphuric acid, sugar, or tamarind, might be at times advantageously added. The patient should not be encouraged to drink too much, and in general about a couple of ounces at a time will suffice. Whenever ice is procurable, it will be found to be a very useful adjunct to the drink. According to Lyons, of Dublin, camphor is often a specific against thirst: it might be given in the form of camphor mixture. It occasionally relieves nausea. Congee or rice-water is recommended by Geddes, and hot or cold tea will often afford relief.

A suitable staff of medical officers is indispensable; one European, or fully educated native medical officer, or more, should always be provided for the people during an epidemic.

He should be relieved of all other duties, and should confine his attention to the epidemic. One sub-assistant surgeon or more will be necessary to assist him; as well as a body of native doctors or hospital assistants, in the proportion of one to at most every fifty patients. These men should have a fair knowledge of medicine, and be competent to treat the more ordinary cases after receiving general instructions. The practice too often resorted to of dubbing a hospital coolie a native doctor, and sending him out to render medical aid to the people suffering from a fatal epidemic is discreditable, and is calculated to bring scandal and ridicule on a noble and beneficent profession.

The duties of the European and native medical officers should not be confined to the mere care of the sick, but they should give their attention to the observation of the symptoms and proclivities of the disease, as well as to the circumstances under which the epidemic arose and was propagated. These gentlemen too often forget that they owe a duty, not only to their patients and their employer, the Government, but to the profession to which they belong and to society. Whatever observations they might make on these subjects should be recorded and published for the improvement of the science of medicine, and for the ultimate benefit of mankind. However unpalatable or embarrassing to the local authorities they may be, these important and valuable observations on the causes and modes of spreading of a deadly disease should not be suppressed or withheld from publication. By close observation of the causes and manner of propagation of diseases, whereby alone can be obtained the knowledge needed for their prevention, will the science of medicine ultimately found its chief claims to the gratitude of mankind.

It is a subject of history, that the extinction of relapsing fever in the jails of the Bengal Presidency was due to the observations and persevering representations of medical officers, made in spite of opposition from influential judicial officers, and occasionally from members of their own profession. There can be little doubt that much good can be done to the agricultural population, and this terrible

scourge of relapsing fever be exterminated from the land, if the members, and more especially the native members, of the medical profession in India would exert themselves, and supply the Government and the public with accounts and authentic information regarding the penury of the people, and the effect it has on their health and lives.

Authentic information is much needed in the present day regarding the state of the provincial population; and could it be provided by the Sanitary Commissioners, these gentlemen would thereby render themselves useful to the Government, and worthy of the gratitude of the people. Representations of this quality require the aid to be derived from the honest and authentic observations of executive medical officers. The paucity of medical officers in the country, and the excessive duties exacted from the few employed, render any efficient assistance from them in this direction almost impracticable.

The Europeans resident in India, including the troops, suffer from relapsing fever, and although the disease has not proved as fatal to them as to the agricultural population, the loss of health and the temporary suffering is so great that in their interests as well, the extermination of the disease is very desirable. Owing to the contagious character of the disease, no one is safe from it in a country where it is liable to be spontaneously generated at any time amongst the largest section of the population.

2. *Therapeutic treatment.*—There is no remedy that can arrest or shorten relapsing fever. The disease goes through the various stages previously described without interruption by any mode of treatment that we have yet discovered. The milder cases recover without any treatment whatever beyond ordinary care. The aim of the physician in dealing with the more severe cases, is to manage the relief of the patient from distressing or dangerous symptoms, to sustain his strength, and to avert, cure, or alleviate local complications. Although the disease cannot be cured in the proper sense of the word, the physician can guide the patient through it with comparative safety, and he can render material relief. The chief distressing symptoms in relapsing fever, are the following: headache, nausea and

vomiting, thirst, muscular and arthritic pains, pain in the hypochondria and epigastrium, and wakefulness.

Headache.—Murchison states that an emetic will sometimes afford relief. The application of cold to the head is a well known method of allaying headache. It might be done by a stream of cool water being poured over the head from time to time; or by placing on the head a couple of folds of cloth wetted in cold water or some evaporating lotion, or by applying ice put into a bullock's bladder, or a thin oilskin bag. A handkerchief tied firmly round the head is occasionally resorted to; small circular blisters, of the size of an eight-anna bit, applied to each temple; or kidney-shaped blisters behind the ears, as employed by Bateson, not unfrequently greatly relieve the headache. If there be much constipation, a purgative will be of use. The best remedy of all is opium or morphia, which relieves not only headache, but other distressing symptoms. The use of nitre, put into the medicine or the ordinary drinks, reduces the headache, and might remove the symptom entirely.

Murchison states that *vomiting and pain and tenderness in the hepatic and splenic regions* are often greatly relieved by the exhibition of an emetic, by clearing out the bowels, and by dry cupping, or the application of warm fomentations, sinapisms, turpentine stupes, or blisters, over the seat of pain. But if these measures fail, opium is again the remedy. Hydrocyanic acid, creasote, the oxalate of cerium, ice, effervescing draughts, and other remedies, sometimes succeed in allaying nausea and vomiting. These measures are also calculated to relieve the pain or sense of burning in the epigastrium.

The relief of *thirst* has already been spoken of.

The best remedy for the *muscular and arthritic pains* and *wakefulness* is opium, which is of great value in the treatment of relapsing fever. It is also indicated when delirium occurs. Liniments, containing opium or camphor, rubbed on the limbs, afford relief, as also does simple shampooing.

In the application of remedies, care should be taken to proportion them to the degree and intensity of the symptoms to be relieved. Caution is necessary in the use of

opium, for though a full dose is needed to produce a good effect generally, it would be injudicious to keep a patient constantly under its influence. A full dose at bedtime, proportioned to the age, sex, and peculiarities of the patient, will be generally sufficient. The same or smaller doses might be given during the day, but only when needed. Should, for any reason, opium or morphia be not advisable, as when coma is impending, or in the case of young children or of persons whom it is known to affect injuriously, hyoscyamus might be substituted. The chloral hydrate has not yet been tried in relapsing fever to my knowledge, but it promises to be a useful remedy. The same precautions are necessary in the use of blisters: they should not be used except where the need is great, for they are apt sometimes to cause as much, if not more, distress to the patient than the symptoms which they are designed to relieve. Milder means of counter-irritation will, in some cases, be preferable.

Jaundice, in general, need cause no concern, as it invariably passes off spontaneously, and in no way distresses the patient. It might, however, in some cases, be disagreeable to a patient, when the diluted nitro-muriatic acid in small doses might be given. Sir Dominic Corrigan recommends turpentine, in doses of from one to two drachms three times a day, as a remedy that is usually efficient in removing jaundice in a few days. Dr. Baillie, Surgeon of the Calcutta Native Hospital, states, "that the free use of the juice of the ripe pine-apple is all that is generally required. The juice of other sub-acid fruits, such as oranges, grapes, lemons, and the pumplenose, are serviceable, but not, so far as my experience goes, equal to the pine-apple in this disease, which, under its influence, generally subsides in a week or ten days. When none of the fruits above mentioned are procurable, I have found excellent effects follow the use of the carbonates of soda and potash, with citric acid, in effervescing draughts, or the following formula, which in some instances may be taken simultaneously with fruit:—Take of tartrate of soda and potash, two ounces; compound gentian mixture, or infusion of serpentary, twelve ounces; extract of taraxacum, two drachms; mix. Of this mixture, an ounce or more to be taken each morning early,

and repeated every four hours till the bowels freely respond; then half doses at similar intervals during the rest of the day. I have tried this plan in very many instances, and rarely found it to fail."—*Indian Medical Gazette*, 1st Feb., 1870.

The temperature may be reduced by occasional sponging of the surface of the body with cold or tepid water, as already pointed out; by the use of the spirit of Mindererus or solution of the acetate of ammonia, in doses of one or two drachms repeated every fourth hour, and by small doses of from one to three grains of quinine.

The prostration, the liability to sudden collapse, and coma, are dangers to be guarded against in relapsing fever. The vital powers are to be sustained by appropriate food, as already pointed out. Stimulants are also needed, such as the ethers, the aromatic tinctures, and ammonia; but the alcoholic stimulants are those which are most readily procurable, and the most economical. These, like all other remedies, are only to be used when needed; the milder cases, in which the prostration is not considerable, do very well without them; but they should not be withheld when the sinking and extreme depression of the patient indicate their employment.

The tendency to coma from uræmic poisoning will have, in the more severe cases, to be guarded against. The use of the spirit of Mindererus and nitre is calculated to maintain the free action of the skin and kidneys, and thus to avert head symptoms. Should, however, coma be impending, the bowels, if they be constipated, should be freely moved by compound jalap powder or a turpentine enema. Sinapisms and dry cupping to the loins, increased doses of nitrate of potash, the hot-air bath, if means are available, and other remedies, should be tried, with the object of promoting the secretion of the kidneys and skin. A blister to the nape of the neck or to the scalp is useful in these cases, and has maintained its ground in Indian practice as a means of averting or relieving the condition of coma.

Some remarks on the use of quinine in relapsing fever will be interesting in this place, more especially as I believe that the exaggerated notions that have obtained currency

regarding the virtues of the drug were due to the remarkable feature of this disease of ceasing, not unfrequently in a sudden and abrupt manner, after a course of a few days. A reference to the history of relapsing fever will show that this was, and is still, the most common fever of any, and that almost all the more important observers experimented upon it.

Mr. Hare, I believe, was the gentleman who first announced that malarious remittent fever could be cut short by the administration of large doses of quinine. His observations were carried on in Upper India, in which, to the best of my judgment, the chief, if not the only fevers prevailing, are simple and relapsing fever. In November, 1847, this gentleman published, at Delhi, a pamphlet, called "Hare's Hints," in which he described his plan of treating remittent fever. "This pamphlet," says Ewart, in an able article called "A Review of the Treatment of Tropical Diseases," which appeared in the *Indian Annals of Medical Science*, no. xiii., for 1860, "took the profession by surprise, and created quite a sensation amongst its members: a strong proof of the startling novelty of the propositions therein advocated, at least among the general body of practitioners in India at that time." A trial of Mr. Hare's system was made at the Presidency General Hospital at Calcutta in 1848–49. Mr. Hare was placed in charge of a large ward, under the eye of the Physician-General, Sir James Thompson. Twelve months, to comprise all the seasons of the year, were fixed as the term of the trial; and the results were to be compared with the results of the old treatment for the twenty previous years. Mr. Hare's new plan consisted in giving one scruple of quinine on the moment of admission; and if the bowels were not loose, a dose of castor oil or compound jalap powder. The patients afterwards took three, four, or six scruples of quinine during the twenty-four hours. The more severe the fever, the more frequently was the scruple dose given, till complete cinchonism was produced, namely, singing in the ears and deafness. General bleeding and even leeches were rarely required, and only for plethoric sailors just arrived in the country. "The Medical Board's

most favourable report, in 1851, on Hare's experimental trial, at the Calcutta General Hospital, as also under the Surgeon of Her Majesty's Regiment in Fort William (1849–50), gave the final death-blow to spoliative treatment by depletion, as that of spoliation by mercurialization had been sealed many years before." Hence, also, arose the belief, still strong in Calcutta, of the efficacy of large doses of quinine in malarious fever. The recognition of typhoid fever by Scriven, at the General Hospital, and afterwards by Edward Goodeve, at the Medical College Hospital, did not weaken the belief, for it was perceived that this disease was not malarious.

Of Mr. Hare's success in lowering the mortality, there can be little doubt. He did not despoil the patient, as Ewart well points out. Whether he found success in cutting short typhus and typhoid fevers, we might be permitted intelligently to deny. Relapsing fever was probably common in his days in Calcutta, although it is practically extinct now; and in dealing with this disease, his apparent success must have been startling. The natural cessation of the fever after a short course was doubtless attributed to the treatment.

I have not been able to gather any proofs that quinine can stop relapsing fever before its natural period of subsidence. It is well to collect in this place a few of the remarks made on this subject by writers who had treated the disease with quinine. Eyre, already known to the reader, says, writing in 1857, "The result of some years' observation has led me to the conclusion, that the duration of remittent is not shortened by the exhibition of quinine, and that the fever may be safely treated without it. . . . In remittent fever I do not give quinine. At Nagpore in 1846, I had many opportunities of testing its powers. I had reason to regret having administered it, but never of having omitted its use. The like result obtained in Goomsur. Quinine may be useful as a tonic in convalescence; but the attempt to cut short a remittent fever by it, I ever found attended with failure. . . . I have long been impressed with the belief that remittent, like continued fever, runs a certain course, and cannot be cut short.

I have tabulated 36 cases of remittent fever. Recovered 25; took no quinine. Average duration of fever $7\frac{1}{2}$ days. Recovered 11; took quinine. Average duration of fever, 8 days."—*Indian Annals of Medical Science*, for April, 1857. There can be little doubt that Eyre experimented upon relapsing fever chiefly.

In 1860, Walker considered quinine to be positively injurious in the treatment of the epidemic of relapsing fever which occurred in that year in the Agra jail.

In 1864, the author reported officially with regard to the treatment of the epidemic which occurred in that year in the 20th Regiment Punjab Infantry at Rawul Pindee, that although quinine was liberally administered both during the febrile condition and in the interval of freedom from fever before the relapse, his general impression was that the fever was little influenced by the drug, and the remedy had certainly no appreciable influence in preventing the relapses. This report was written at a period when the author had a firm belief in quinine.

Bateson tried quinine in the Umballa jail epidemic of 1866: he writes, "As an antiperiodic quinine is no good at all; it is of no use whatever. I dosed all the prisoners round with it on three different occasions, determined to leave no stone unturned that might possibly check the fever progress; this did not matter: on went the admissions into hospital. Quinine mixture, if strong, provokes hiccup. Decoction of bark is the better medicine in this sickness. The alkaloid is strong and bitter. There are properties connected with the decoction that are of use with feeble men inclined to have bowel illness."

In 1868, Hugh Clark likewise failed with quinine. He writes, "Quinine was freely given, but in none was it of the slightest use. In one case the patient was kept under the influence of quinine throughout the intermission, but without benefit. In another I suspected that the quinine either brought on or aggravated a most distressing and obstinate hiccup."

Gray met with no success in the use of quinine, in the Mooltan epidemic of 1868. He writes: "I found no medicine efficacious in cutting short an attack, or in ward-

ing off relapses. In a few cases I tried large doses of quinine, but it had no influence on the disease."

Even amongst the older authors there were a few who saw no benefit from the use of quinine. In 1836, MacNab employed the drug in the Mainpuri epidemic. He says that he found it hurtful, and one death was attributed to its use. R. H. Hunter found it of no use in "gastro-hepatic fever." McDonell was disappointed in the expectations he had formed regarding it.

I can only attribute the belief that quinine can cut short malarious fever to error. The disease treated being relapsing fever, its natural cessation after a short course, was very naturally credited to the quinine which was administered. In Geddes' "Clinical Illustrations of the Diseases of India," the disease described in the chapter on Fevers, is relapsing fever. This author thus expresses himself regarding quinine. "There is no more certain fact, among the results produced by remedial agents, than that of the power of this preparation of the cinchona to put a stop to the whole phenomena of fever." Geddes, however, had an idea that the fever spontaneously terminated. He says, "It is certain, that often in these cases, the disease had terminated by a kind of crisis, after one or more paroxysms; and the patient has accordingly been discharged from hospital, in such instances, at as short a period as if the sulphate of quinine had been employed for his relief. It is probable, also, that such critical terminations have taken place in many of those cases where quinine had been afterwards used, and where the non-recurrence of the febrile paroxysms was incorrectly attributed to the power of this medicine." He states that he got better results with quinine, than when he employed the old method of treating fever; and on this point, as explained by Ewart, there can be no doubt. Geddes' statistical tables show that he neither shortened the duration nor prevented the relapse of the fever by quinine.

In the absence of knowledge of the disease, no error can be more natural than that of attributing the sudden cessation of the fever to the remedy. A patient often comes under treatment on the penultimate or even final day of

the fever; quinine is given in large or small doses; he is found next day, or the day after, to be free from fever: behold, exclaims the physician, the efficacy of quinine! A rather amusing instance of this is related in a paper on the Hypodermic Injection of Quinine by A. S. G. Jayakar, the civil surgeon of Ahmedabad, in the July number of the *Indian Medical Gazette*, 1871. "In one case in particular, remittent fever, complicated with pneumonia, the hypodermic injection of $2\frac{1}{2}$ grains of quinine was followed by the entire disappearance of the fever, much to the patient's surprise, although the patient had a relapse of it in about a week." This anecdote was brought forward in proof of the value of the hypodermic injection of quinine! There cannot be a doubt that the injection was made on the last day of the fever, and the fever would have left spontaneously under no treatment whatever.

The truth probably is, that quinine is of the same use in relapsing as it has been found to be in typhoid fever. It reduces the temperature and thus adds to the comfort of the patient, and it is a good tonic and supporter of the vital powers. It might, however, be injurious and cause annoyance in some cases, and then its disuse will not in any way reduce the chance of recovery. The prospects of recovery are little influenced by quinine.

The above short account of the use of quinine might be appropriately concluded by a quotation of the opinion formed regarding it by W. J. Moore, of Rajpootana, who is a fervent believer in malaria. "I am not among those who believe that quinine, and quinine alone, is the one thing needful in the treatment of malarious fevers. I do not regard quinine as a specific. . . . After much consideration and attentive study of fever cases, I have come to the conclusion that the virtues of this substance have been much exaggerated. I very much doubt if it deserves a tittle of the praise it has obtained. . . . I have seen many natives recover from all types of malarious disease without taking a particle of quinine. I believe the celebrity of quinine is as much due to the spontaneous decline of febrile attacks as to any other cause."—*Indian Annals of Medical Science*, no. xxi. for 1867.

As to quinine has been credited the departure of the fever, so has the return of the fever in the relapse been by some attributed to it: a fact to be noted and pondered by those who have a blind faith in the virtues of this drug.

The general outline of treatment of an ordinarily severe case of relapsing fever might be stated as follows:—A small dose of quinine, varying from one to three grains, washed down with a mixture made up of one or two drachms of spirit of Mindererus, or the solution of acetate of ammonia, fifteen or twenty minims of the spirit of nitrous ether, the same quantity of the tincture of hyoscyamus and of gentian or other bitter tonic, and an ounce of infusion of gentian or chiretta, or camphor mixture, three times a day. At bedtime one or half a grain of morphia, which may be also given at any time during the day, if the symptoms that call for it are severe. It is an act of mercy to use an anodyne in this disease, for there is no other remedy that will so effectually relieve the headache, the vomiting, and the pains of the back, limbs, and other parts, which are sometimes excruciating. Its use, however, requires precaution. The other remedies previously spoken of should be employed as contingencies arise. The use of aperients or purgatives should be sparing; except when coma is impending or has actually supervened, purgation is objectionable. The mildest aperients simply to open the bowels gently are all that are necessary to relieve uneasiness whenever it is complained of. The object of the treatment should be to relieve as much as possible, without causing annoyance or reducing the strength of the patient. The main reliance is, after all, to be placed on good nursing and feeding.

On the cessation of the primary fever, a tonic mixture, consisting of ten minims of diluted nitro-muriatic acid, fifteen or twenty minims of the tincture of gentian, and an ounce of the infusion of gentian or chiretta, three times a day, might be given. The use of opium or morphia will likewise in general be needed, and sometimes other remedies for contingencies that might arise. The treatment suggested above might be repeated on the occurrence of the relapse, and during the final convalescence. A

change of air for a short period is advisable to those who can afford to obtain it, after an attack of relapsing fever.

The principal *complications* and *sequelæ*, which call for treatment in relapsing fever, are bronchitis, muscular and arthritic pains, œdema, diarrhœa and dysentery, enlargement of the liver and spleen, ophthalmia, and paralysis.

In the milder forms of bronchitis an ordinary expectorant mixture repeated occasionally is all that is needed. In the more severe forms it will be necessary to have recourse to stimulants and expectorants, such as the ethers, ammonia, ammoniacum, senega, in addition to squills and ipecacuanha. Inhalation of the steam of hot water, to which a little vinegar might be added, and counter-irritation by rubefacient liniments, mustard plasters, and turpentine stupes to the front and back of the chest are useful. Should the secretion be very plentiful, a small blister, four inches in length and three in breadth might be applied with advantage over the sternum. In the epidemic in the 20th Regiment, in 1864, I employed the tartar-emetic ointment, and found it useful. In some cases, however, ulcers formed over part of the vesicated surface, which were slow in healing, caused annoyance long after the illness had been relieved, and were followed by ugly cicatrices, similar to those from burns. The addition of a diuretic, such as the nitrate or acetate of potash to the expectorant mixture, is advised by Murchison. Anodynes should not be withheld, and the compound tincture of camphor, or the tincture of hyoscyamus will always be found useful in relieving the cough. Morphia at bedtime, if the danger from suffocation be not great, is necessary to give relief at night, and to induce sleep. Alcoholic and other stimulants, and good nourishing food, are of primary importance in these cases.

When the secretion is very profuse, and the patient has not the strength to cough, Murchison recommends the use of turpentine in doses of from ten to fifteen minims, with half a drachm of spiritus junip. comp. in mistura acaciæ, mistura amygdalæ, or yolk of egg. The dose may be repeated every two hours at first, until the desired effect is produced. The quantity of urine is likewise increased by

this medicine, but Murchison has never known strangury to be produced. Creasote may also be tried in these cases.

The pains will always be relieved by opium or morphia, but if they and other sequelæ dependent on great debility are prominent, the medicine to be given during convalescence previously noted might be changed to a mixture containing quinine and iron.

Diarrhœa and dysentery are the most frequent complications met with amongst natives. The simple or compound chalk mixture, the mineral acids, with laudanum, bael, and other astringents should be used to check diarrhœa. Sometimes the lax state of the bowels will yield to the tincture of steel in doses varying from fifteen to twenty-five drops or more, after other remedies have failed. For dysentery, the sovereign remedy is ipecacuanha in scruple or half drachm doses morning and evening; unless the debility be considerable, the nausea and vomiting caused by this drug will not injuriously affect the patient, if the intervals be wide between the morning and evening doses, during which he might take food. When the strength is much reduced, smaller doses should be used, as fifteen or ten grains, twice or three times a day; three doses are less liable to produce vomiting. Opium might be given before or shortly after the dose, in the hope of preventing vomiting from the ipecacuanha, but I cannot say that I have ever succeeded with it in effecting this object. In the almost hopeless cases of dysentery that occur during famines, such as those spoken of by Udoy Chund Dutt, as seen by him in the Orissa famine of 1866, it would not be advisable to resort to large doses of ipecacuanha; but tannic or gallic acid, opium, sulphate of copper, acetate of lead, diminutive doses of ipecacuanha, and other remedies might be used to retard the progress of the disease, in the hope that the administration of stimulants, nourishing food, and a general improved hygienic condition, under the care of a medical officer, will revive the strength of the patient so as to admit of the use of ipecacuanha in moderately large doses. *Mudar*, or the powdered root of the *Calotropis gigantea*, is also of use in dysentery.

When serious hæmorrhages occur from the bowels, the use of large doses of tannic acid, from five to fifteen grains, frequently repeated, acetate of lead, and other styptics should be immediately resorted to. An injection of the tincture of steel, pure, or diluted with an equal part of water, might also be thrown into the bowels in these cases.

Œdema of the lower extremities is best treated with steel and mineral acids, a nutritious diet, and bandaging the legs.

The pain and enlargement of the liver and spleen are relieved and reduced by the mineral acids, and chiefly the nitro-muriatic. The liver spontaneously decreases in size, and does not usually give much annoyance. The enlargement of the spleen is in some localities considerable, and sometimes is permanent. It might be reduced by the use of the ointment of the biniodide of mercury, made up of from eight to twenty, thirty, and even forty grains of the biniodide to the ounce of simple cerate, according to the delicacy or the reverse of the skin. A milder absorbent application is the tincture of iodine. These measures are also applicable for enlargement of the liver. A change of air and the improved health thereby induced will ultimately remove the enlargement of the spleen.

In recent enlargement of the spleen, Garden states that he has found the infusion of bindaal, or carala, the *Luffa ikinata* of the N. O. Cucurbitaceæ, of great use. The stems and leaves are to be used; the seeds, which are drastic purgative, being rejected. Dickinson and Waring speak well of this remedy.

The treatment for the relief of dimness of vision and other simple amaurotic symptoms, consists in the use of tonics and the application of blisters behind the ears, repeated if necessary. The inflammatory stage might thus in general be avoided. But should it follow, Murchison advises the following treatment. "As soon as this stage shows itself, a few leeches are to be applied to the temples, and a powder containing one grain of calomel, one or two grains of quinine, and a quarter of a grain of opium, with a little sugar, may be given every four or six hours. When

the gums become affected, the quinine is to be continued without the calomel. At the same time, the pupils are to be kept dilated by dropping occasionally within the eyelids a solution of belladonna or atropine, and the leeches are to be followed by blisters behind the ears, which should be kept open for some time. These remedies should be combined with a nutritious diet."

Macnamara, who states that retinitis almost always depends upon "constitutional dyscrasia induced by malaria, or some such poisonous influence," recommends the following treatment: The eyes are to be closed with pads of cotton wool. If there is great pain, it will be effectually relieved by the injection of a solution of morphia, beneath the skin of the temple. A *bhang* (Indian hemp) poultice often tends to ease the pain, and the poppy-head fomentations are frequently most soothing. Should the eyeball feel tense, the cornea may be punctured, and the aqueous humour drawn off. This proceeding, he states, will always give relief, and he has never seen harm arise from it, if care be taken to prevent the aqueous humour escaping in a gush. If this occurs, the congested retinal vessels will be in danger of giving way, and extensive hæmorrhage may take place into the vitreous chamber.

In some cases, in which the patient's tongue is coated, and he complains of want of appetite, a few doses of hyd. c. creta with quinine and soda to be given. A warm bath at bedtime will relieve any febrile symptoms. It is often necessary to administer bark and ammonia. The patient should be allowed a generous diet, and every available means be taken to improve his health. Macnamara thinks blisters are not of much use.

If the patient is full-blooded, leeches to the temple are to be used, and purgatives, with bicarbonate of potash and iodide of potassium, in ten-grain doses, three times a day. If the pain does not abate, two grains of opium every six hours, with poppy fomentations, should be resorted to.

The paralytic symptoms will usually disappear as the health becomes restored. In obstinate cases recourse may be had to galvanism, and small doses of nux vomica and strychnia. A general tonic treatment, comprising the use

of quinine and iron, and a change for a short period, are the chief restoratives to be relied upon.

The above comprise the chief complications that have been met with in India. The less common complications of relapsing fever are to be treated on the well known principles applicable to the disease.

SECTION XIV.

Clinical Illustrations of Relapsing Fever.

I have collected the first four cases from the old records of the Presidency General Hospital. They are interesting and valuable as historical proofs of the existence of the disease in Calcutta in former days, and they illustrate some of the forms assumed by it.

Case I.—Nicholas Abany, 67th Regiment, admitted on the 6th October, 1806. Was attacked six days ago with violent headache, pain in the back and loins. Tongue loaded. Belly costive. Pulse quick and small. Thirst urgent. Has taken an emetic and purgative which did not operate.

7th.—A bad night. Physic did not operate. Tongue still loaded. Thirst urgent. Skin cool. P.m. Physic operated well.

8th.—A bad night: violent vomiting. Skin hot and dry. Pulse quick, and watery stools during the night. Tongue seems much loaded. The cold effusion to be applied immediately. 6 p.m. Skin cool: febrile symptoms much relieved.

9th.—Rested well during the night. Skin at present cool. Pulse moderate. Thirst not so urgent. P.m. Skin hot and dry. Pulse quick. Tongue clean.

10th.—A bad night. Skin at present pungently hot. Pulse quick. Tongue still loaded. Vomited this morning.

11th.—A good night. Skin cool. Thirst moderate.

12th.—A good night: free from fever.

19th.—Convalescent. P.m. Had a return of fever to-day about two o'clock. Skin at present pungently hot and dry. Pulse quick and full. Tongue furred.

20th.—A bad night. Physic operated well. Skin at present cool. Pulse moderate. Tongue still furred. P.m. Skin at present cool. Pulse moderate.

21st.—Rather better. P.m. Pulse quick and full. Skin pungently hot and drv.

22nd.—P.m. Ditto.

23rd.—Rather better. Complains of pain in his abdomen. P.m. Pulse quick and full. Skin hot and dry. Thirst urgent.

24th.—Feels better this morning. Sweated very much during the fit. P.m. Ditto.

25th.—Ditto. P.m. Skin hot and dry. Pulse quick and full.

26th to 31st.—Ditto.

November 1st.—Rather better.

3rd.—Doing very well.

8th.—Discharged.

The prescriptions have been omitted in the preceding case.

Case II.—Reported by Twining.

Mr. Devine. Admitted 9th November, 1834. Patient in a miserable state of health. Says he has been ill twelve days of fever, with enlarged liver and spleen. Countenance cadaverous. P. full. T. pale and flabby. Eyes and skin jaundiced. Blue pill and colocynth, aa., gr. xx. Inject. domest. Sago. P.m. B. acted on. Side over the liver tender. Pil. hyd., gr. vj.; ext. col. co., gr. vj.; gummi, gr. ij., at 8 p.m.

10th.—Three stools in the night. Ol. ricini ʒvj.; quinæ sulph., gr. ij.; pil. hyd., gr. v.; thrice daily.

11th.—Had six stools. Cont. med.; chicken for soup; sago.

12th.—Much the same.

13th.—Spleen and liver enlarged. B. not open. Pul. jalapæ co., ʒj., nocte. Apply a patch of lunar caustic over the right and over the left side, each three inches square.

14th.—B. not open. Pulse quick. Ol. ricini, ℥j. Cont. med.

15th.—Medicine acted twice, and he feels better. No fever. Cont. pilulæ ter die.

17th.—B. moderately open. Cont. med.

19th.—Better. Cont. med.

20th.—Improving.

24th.—Has frequent purging of pale thin fæces. Rhei, mag. carb., aa., gr. xv.; aq. menthæ pip., ℥iss.; now. Purged often in the day. Pil. hyd., gr. x.; ext. opii, gr. j.; h. s.

25th.—Seven or eight stools at night. Tinct. kino, ℥j.; mist. cretæ, ℥j.; tinct. opii gtt. x.; ter die. Rept. pil. h. s.

26th.—Pulse quick and skin hot this morning. Bowels continue relaxed: he does not retain the chalk mixture. Pul. ipecac. co., gr. x.; ter die. Pil. h. s.

27th.—Stools less frequent. Cont. med.

28th.—Ditto.

29th.—B. still relaxed. Five or six stools in the night, of pale matter. Pil. hyd., gr. iv.; ipecac., gr. j.; ext. cinchonæ, gr. iv.; rhei. pulv., gr. j.; ter die.

30th.—Better. Cont.

1st December.—Often at stool. Add opii, gr. ½, to each dose of pills.

2nd.—Better. Cont.

3rd.—Four stools. Feels better. Cont. Wine, measures ij.

4th.—Only two stools at night. Cont.

6th.—Four stools at night of curdy matter. Cont. pill. Rhei. et mag. carb., aa. gr. xvj.; pulv. zingib., gr. iij.; now.

9th.—Medicine acted three or four times. Cont. pill.

10th.—Improving. Bowels quiet. Cont. pill.

18th.—General health improving. Two stools. Some pain at the right side. Cont. pill. Rhei et mag. carb., aa. ℈j. Now.

22nd.—Cont. pil. om. nocte. Inf. gent. co., ℥ij.; quinæ s., gr. j.; bis die.

29th.—Much better. Cont. med.

No further entry made, and the diagnosis was not noted.

Case III.—Reported by Twining.

George Mitchell, æt. 19, H.M.'s 13th Regt. Admitted 15th November, 1834. Ill two days with headache and eruption of vesicles on the wrists, neck, feet, hands, and ankles. Pul. jalapæ co., ʒj.

16th.—Purged twice, very trivial pyrexia, vesicles unchanged.

19th.—Some large inflamed blotches on the forearms, with small vesicles on them.

22nd.—Better. 28th.—Well.

29th.—Slight morbid heat of head and pain in the eyes; face little flushed.

30th.—Face much flushed and head hot. Six stools. Feels occasional flushes and chills. Little sleep.

1st December.—Slight pyrexia and heat of forehead. No sleep. Seven stools.

2nd.—Much better. 8th.—Convalescent.

21st.—Discharged.

The diagnosis was not noted. The prescriptions are omitted.

Case IV.—Reported by T. Spens.

Duncan Spearer, admitted 29th November, 1833.

30th November.—Was attacked with a slight shivering, followed by fever yesterday. At present he is easy and without pyrexia. He is giddy at times.

1st December.—Had ague last night at twelve. The hot stage lasted long, with vomiting and uneasiness of epigastrium, which now continues. Purged seven times.

2nd.—He fainted on losing a few ounces of blood, but felt relieved, and is now much more cool and easy. Has slight headache. Eight stools during the night. Blood firm. Vesp. Ardent heat of skin. P. 90, strong. Some pain of the head.

3rd.—He is still hot, and his pulse is quick and feeble. He did not bear the bleeding well. Vesp. Still slightly hot. Skin getting hot; pulse quick.

4th.—Skin quite yellow; slight heat of skin. He feels easier, and says he is hungry. Vesp. Hot, pulse rapid. No particular pain. Skin quite yellow.

5th.—Easier this morning. He had some sleep. Skin slightly hot. Mouth a little tender.

6th.—Bowels opened three times. He is cool and comfortable. Tongue clean and moist.

7th.—Bowels opened twice. No return of pyrexia.

8th.—One stool. Cool and easy. Slept well.

9th.—He had three epileptic fits since yesterday morning. P. slow and weak. B. not open.

10th.—Had another fit last night. B. open.

12th.—No fit since the 9th. 13th.—Better. 14th.—Doing well. 18th.—Had slight fever. 2nd January.—Well. Discharged.

The diagnosis was not noted. The treatment, which consisted chiefly of venesection and calomel, is omitted.

The following two cases are illustrations of the eruptive fever. They occurred in the Calcutta epidemics of 1853 and 1864.

Case V.—Reported by Edward Goodeve, in the *Indian Annals of Medical Science*, no. i.

Ramuthar, age 26 years, up-country man, police chowkeedar, of Coomar Tooley Thannah, admitted June 22nd, 1853. Is a man of temperate habits, and has always enjoyed very good health. Four days before admission he was attacked with fever, which he believes to have been caused by exposure to the rain. The paroxysm began daily at 10 a.m., with shivering, which lasted for an hour, succeeded by heat of skin, headache, and extreme thirst, which continued for three hours, and was followed by sweating. June 22nd.—Present symptoms. There is a slight reddish or brownish tinge of surface, most marked in the upper part of thorax and face, disappearing on pressure. Palms of hands are also slightly coloured; inside the lips and gums are of a vermilion hue; front part of palate is natural, though the back part and uvula are injected, with a few distinct specks as large as a split-pea at the root of the uvula; complains of cough, but there are no morbid sounds on auscultation. Knows nothing as to the time of the appearance of the eruption.

June 23rd.—There is less fever this morning; gums and lips are rather less red; posterior part of palate the same; tongue furred; minute red papillæ very prominent on the fore part; reddish flush of the upper part of the thorax much the same. Complains of cough; respiration sounds natural. Bowels have been freely moved.

June 24th.—Had less fever yesterday; increased towards the evening, still slightly warm; conjunctivæ a good deal injected; redness of upper surface of chest disappearing on pressure; it exists more or less over the arms and legs; lips and gums continue the same; posterior half of palate increased in redness; blush extending over the whole posterior part of fauces; tongue dryish in the centre, much furred, whitish at the edges, with very prominent red papillæ; complains of pain in the loins, and of cough; pulse soft; sp. gr. of urine 1035, acid in reaction; tested for albumen: its presence doubtful.

June 25th.—Fever continued throughout yesterday, is less this morning. Pulse 86, soft; conjunctivæ less injected, surface of trunk slightly less red; redness scarcely perceptible on the arms; that of the lips and gums declining; posterior part of palate and fauces is still very red; tongue has partly lost its fur, and is of a bluish red colour, moist. Complains of increased cough, but there are no morbid sounds; also of loss of appetite; bowels twice moved yesterday. On testing for albumen, its presence was very distinct; about one-sixth the quantity of urine. Sp. gr. 1035.

June 26th.—He has no fever since last report. Pulse 72; there is no aching of the limbs; mucous membrane of the lips and gums is less red, inclining to a bluish tinge; tongue moist and relaxed, fungiform papillæ less distinct, furred posteriorly; posterior part of palate and fauces injected, less red than yesterday; redness of skin scarcely perceptible. Bowels have been freely moved.

June 27th.—Free from fever since last report; colour of lips and gums more bluish than yesterday; tongue clean; surface of thorax still visibly tinged, not very vividly; eruption visible over the lower extremities; appetite is good; still complains of cough; bowels have been freely moved.

June 28th.—No fever since last report; cough is easier; complains of some heat of stomach and nausea; upper part of thorax, lips, and gums have nearly recovered their natural hue; there is no desquamation. Posterior part of fauces still slightly injected. Says that he has pains in the limbs and joints, these are evidently not severe. There is no swelling of the hands and feet; bowels are regular.

June 29th.—Had an attack of shivering at twelve o'clock yesterday, which continued for an hour, ending in fever, which remained for three hours, and was followed by a gentle perspiration. There was increased redness of surface during the paroxysm; there is no pyrexia this morning. Complains of pain in the loins, which increases on pressure; redness of surface almost gone; no desquamation. Lips and gums much as yesterday; tongue furred white; complains of debility; bowels have been moved four times since yesterday.

June 30th.—Is free from fever this morning; complains of relaxation of bowels during the night; cough continues; urine of natural colour, rather turbid and scanty; on testing for albumen by heat and nitric acid, its presence was not perceptible; sp. gr. 1010; contained a moderate quantity of epithelial scales; appetite is good; slept well.

July 1st.—Is free from fever this morning; redness of mucous membrane is completely gone.

July 2nd.—Redness is completely gone; there is slight cough. Discharged from hospital at his own request.

Case VI.—Reported by Chuckerbutty, in the *Indian Annals of Medical Science*, no. xix., Art. "Pathology of Dysentery."

Thomas Karr, an English printer, 17 years old, was admitted at the Medical College Hospital on the 18th August, 1864, with a three days' fever and diarrhœa. On the 19th his pulse was 120, small and weak, tongue furred, bowels still loose, and the whole body, face, and extremities had become covered with patches of a red papular eruption, which disappeared under pressure and returned on the pressure being withdrawn. By four o'clock in the afternoon, this eruption had completely disappeared. On the 20th,

the bowels were moved twice, epigastrium full, liver projecting into it three inches below the ensiform cartilage, and was very painful on pressure; complexion slightly jaundiced; tongue covered with a dirty gray fur, dryish, and dull red at edges; skin harsh and hot; countenance expressive of suffering; pulse 112, very small and feeble, but regular.

On the 23rd, there was no more hepatic tenderness; pulse 100; bowels moved three times; gurgling in cæcum. On the 24th, two stools, slimy and bloody; tongue moist, but very dirty; skin dry, but of ordinary temperature; pulse 96. On the 25th, he had a sleepless night, and eleven stools, scanty and slimy. On the 26th, a large hæmorrhage occurred from the bowels. On the 1st Sept., he passed sloughs, and also on the 2nd Sept. On this date, hectic spots were observed on the cheeks; the tongue was dryish and dirty; skin warmer than natural; thirst considerable; pulse 108, small and weak. On the 5th, the statement it again made that the skin was moist, and very slightly warm; his appetite was now voracious, and made him beg food of his neighbours. The dysentery continued very bad; and he died on the 12th Sept. The above case is slightly abridged.

Case VII.—Reported by Mr. R. F. Knight, Assistant Apothecary, Presidency General Hospital.

"Mr. Edward Scott, aged 40, admitted at one o'clock p.m., on the 9th September, 1871, suffering from yellow fever. According to the statement of his wife, he enjoyed good health up to the 5th September, when he was suddenly attacked with fever (without ague). On the night of the 7th, his bowels became quite relaxed, which so depressed him, that on the morning of the 9th, his state became worse; in fact, he was thought to be dying when his wife brought him to the General Hospital. No abatement of fever from date of attack.

"At present has high fever; is in a semi-comatose state; pupils contracted; skin and conjunctivæ quite yellow; bowels tympanitic; no tenderness in iliac regions; deep-seated pain of liver; tongue coated with a deep brown fur and parched; pulse 120, weak; respiration short and

hurried; countenance anxious. Temperature 104° Fahr. in the morning, and 102° in the evening.

"10th September.—Passed a tolerably good night; had four or five hours of sound sleep; took a fair amount of nourishment; had two copious motions of a dark bilious colour and highly offensive; is quite sensible this morning, and pronounces himself much better; temperature as seen by the chart, almost normal, 99° Fahr.; pulse 100; respirations 23, full. About 10 a.m., his temperature began to rise; and at 12, midday, he was found to have suddenly gone into a state of complete insensibility; pupils contracted and insensible to the stimulus of light; pulse not countable; respiration laborious. Temperature in the evening 101°. He continued in this state until four the following morning, when death closed the scene."

At nine on the following morning, I made a *post mortem* examination, assisted by Messrs. Knight and Malins.

The body was in good condition; the surface was of a bright yellow colour; on the posterior or dependent part of the body, the skin was of a dark purple colour. The internal organs, cellular and adipose tissues, were yellow, except the muscles, liver, and spleen. *Lungs;* very slight hypostatic congestion posteriorly; healthy and without adhesions. The *heart* was fatty on the surface, but otherwise healthy; no serum in the pericardium. The *liver* was of a dark green colour. The *gall-bladder* was moderately full; the bile black and viscid, and could be drawn into strings with the blade of the scalpel; the bile ducts were pervious; the cystic duct was narrow in calibre, but quite healthy. The *spleen* was dark green, hard, and enlarged. The *kidneys* were light yellow on the surface and on section, but healthy; the cortical and pyramidal portions were clearly made out. The *stomach* was filled with a green bilious fluid, and quite healthy. The large and small *intestines* throughout healthy, the former being only slightly injected in a few places; they contained yellow fæces. Peyer's patches and the solitary glands could not be seen, though carefully searched for. The mucous membrane of the intestines, was yellow. The *pancreas* and *bladder* were healthy. The head was not examined.

The weight of the principal organs was as follows:—Liver 4 lbs. 5 oz.; spleen, 1 lb. 4 oz.; right lung, 1 lb. 2 oz; left lung, 1 lb.; right and left kidney, each 6 oz.; heart, 10 oz.

The above case was under the care of Dr. Coull Mackenzie, of the General Hospital, to whose kindness I am indebted for it.

Case VIII.—Mr. R. J. A——d, aged 30, an Assistant in the Financial Department of the Government of India, was admitted into the Presidency General Hospital on the 25th March, 1871, under the care of Dr. Brougham. I saw him on the 28th, and kept the diary of his case. He had an attack of intermittent fever at Simla in August last, and since continued in weak health. He returned to Calcutta in November, made no improvement; and as the heat increased, he had occasional bleedings from the nose. He had no appetite; and for about ten or twelve days prior to his present illness, he states that he completely lost it, and he ate scarcely anything.

About four days before admission, while sitting at dinner, fever suddenly set in, without shivering, but with vomiting of green fluid. He suffered from great prostration of strength, and had to go to bed; very severe pains came on in the back and limbs. There was no pain in the left side, but on the right side, over the liver, pain was felt, for which his first medical attendant had applied a blister. Does not remember whether he was delirious; but his mind was not perfectly clear, and he was sensible that he could not speak distinctly. He incessantly tossed about day and night in bed, and could not sleep at all. His bowels were loose, but he had taken Cockle's pills and various mixtures. He had no jaundice. For the relief of the pains in the legs, the tincture of iodine had been applied from the knees to the ankles.

The nurse who attended to him on admission, stated that he was not yellow, but of very dark complexion. He was very weak, and obliged to be carried into bed, and to be lifted up to take anything. He had nervous twitchings of the hands. The fever was on him. His eyes were glazed, and he did not seem to be able to move. He complained

of pain in the stomach. He was quite sensible, and able to ask for what he wanted, and to understand what was said to him. His tongue, teeth, and lips had a thick black stuff sticking to them.

I saw him on the forenoon of the 28th, and ascertained that the fever had left him on the 27th. On the 26th, the temperature in the morning was 100° Fahr.; and in the evening, 103°. On the 27th, it fell to 97°, and continued normal ever since. He was deeply jaundiced, and much prostrated, and had a painful, anxious, and haggard expression of face. He was quite sensible, but was a little confused at times when much questioned, and had a slight difficulty of articulation. No sordes. The tongue was dry, with a dense dark brown fur. It became moist on the following day, and soon quite clean. The abdomen was tumid, and a little gurgling was heard here and there on pressure. There was no enlargement or tenderness of the spleen. The liver could not be examined on account of the blister, but he had no pain in it. The pulse was soft and of moderate strength, about 88. Both legs had extensive dark red vibices, chiefly on the calves, distinctly observed not to be merely a discolouration of the skin by Iodine, though probably due to the application. The ankles and wrists were slightly tumid. The bowels were loose. No pain complained of anywhere except in the back, where it was severe. Is unable to sleep, though he dozes a little; no appetite, but does not refuse his food. The urine was of a dark green colour in mass, and orange-yellow in a test-tube; sp. gr. 1011; reaction alkaline; a copious sediment of feathery stellate crystals of a light yellow colour; no albumen; the presence of bile confirmed by the usual tests with sulphuric and nitric acids; examination made on the 29th.

He improved very little, continuing weak and unable to get out of bed. The tumidity of the abdomen persisted. Bowels were kept open by medicine; the stools passed were pale, and some portions of them even whitish. The pulse kept up good strength, and was about 86. There was no pain anywhere but in the back. Was troubled occasionally with hiccup and bleedings from the nose. The jaundice remained, but was sensibly fading; objects

appeared yellow to him. His appetite improved, and he took his food well. Obtained sleep some nights, and occasionally during the day. No return of fever after the 27th March.

On the 1st April his temperature at 7 a.m. was 97·2°, at 9 a.m., 99°, and it rose in the evening to 100°. On the 2nd April, 97°; during the day, 98°; and in the evening, 99°. On the 3rd April, 99°, and it rose in the evening to 100·2°. The patient was not sensible of febrile heat, but it was perceptible to the hand. On the 4th and 5th of April, the temperature was 98° in the morning, and 99° in the evening. Careful thermometric observations were made from the 26th March to the 14th April, and during that period febrile heat occurred only on the dates mentioned. In the relapse the pulse was 96 to 99. On the permanent cessation of the fever on the 5th April, it was 84; on the 6th, 86; on the 7th, 76; on the 8th, 72; and on the 12th, 66.

Permanent but very tedious convalescence followed. On 3rd April, the blister being healed, the liver was examined. It was not tender, but enlarged, extending from a finger's breadth below the right nipple to nearly two inches below the ribs, where it could be distinctly felt. The tumidity or fulness of the abdomen persisted; its shape in the recumbent posture and when erect, and a peculiar flabbiness about it, gave me the impression that there was some amount of fluid in it. Its girth round the navel on the 8th April, was 35 inches; on the 18th, 31 inches. The urine continued alkaline and bilious; the sediment now consisted of prisms of ammoniaco-magnesian phosphates and amorphous salts; the colour gradually became lighter and natural; on the 21st April, and after, the reaction was acid. The bowels in general were open, but on a few days some loose stools of a dark colour were passed. He very gradually improved, but did not recruit sufficiently to enable him to return to his duty. On the 8th May, he left hospital, and proceeded to Simla. His eyes still retained the faintest tinge of yellow; and he stated that the left eye was a trifle weaker than the right. His complexion was bronzed, though prior to his

illness it was fair, he being a native of Devonshire. The growth of the abdomen was still much for a man of his slight build, being 30 inches; the liver was still enlarged, extending from a little below the nipple to an inch beyond the margin of the ribs, showing a decrease of size. He had gained in weight from 9 st. 8 lbs. on 21st April, to 10 st. 2 lbs. on 8th May. His weight prior to his illness was 10 st. 7 lbs. About a couple of months after leaving Calcutta, Mr. A——d wrote from Simla informing me that his health was fully restored.

Case IX.—J. H——ton, a seaman, aged 43, was admitted into the Presidency General Hospital on the 15th May, 1871, under the care of Dr. Ewart, but the diary of his case was kept by me. He stated that he had been ill with fever for the last four or five days on board his ship. The fever began suddenly one night, without shivering, but with severe headache and weakness of his limbs; he was not able to turn out for work on the following day. He had been very loose in his bowels for about a week before the fever came on. He had suffered for five weeks on the outward passage from scurvy, from which he thinks he is now pretty free. He has, however, several small spots of the size of a sixpenny piece, and of a dark colour, on the lower extremities, and his gums are foul and spongy. On the day of admission he had the usual diaphoretic mixture every second hour. On the 16th, he had one scruple of quinine in the morning; calomel, gr. ij.; pul. Jacobi ver., gr. iij.; every third hour; and the diaphoretic mixture every hour. He was put upon beef-tea diet, with the following extras: lemonade, two bottles; ice, 2 lbs; beef-tea, 2 lbs; sago, 2 oz.; sugar, 1 oz.; and milk 2 pints.

I saw him on the 18th May, and ascertained that he had continued fever since admission, and that it left him that morning; temperature 98°. His eyes were injected, and, as well as the skin, were jaundiced; they were first observed to be so last evening. There was tenderness over the liver and spleen, but no enlargement; the abdomen was not tympanitic; pain was felt on pressure over the cæcum, but there was no gurgling. He was quite sensible

and intelligent, but he had been delirious on the night before last. He had severe headache yesterday and the day before, but none at present. He was very thirsty, tongue dry and brown, but red on the edges; pulse 88, full and compressible. He had two or three stools last night; they were whitish in colour, and floated on the surface of the urine. He had no pains in his body, but only a stiffness. He had no appetite, and took his food indifferently. Fever came on in the course of the day, and in the evening his temperature was 100°. He had a scruple of quinine in the morning. Quinæ dis., gr. v.; acid. sulp. dil., m. x.; mag. sulp., ʒij.; aq. ℥ij.; thrice daily. Vinegar lotion to the head. The allowance of milk was increased to 4 pints.

On the 19th May, he was again free from fever in the morning. Pulse 96, soft and compressible. He did not sleep well last night, and had four loose and light-coloured stools. Was much prostrated in strength, and said that he felt himself to be dying. Had what he called "stiff pains" in his limbs, felt only when he moved. Jaundice much the same. Tongue dry and brown at base. Urine copious, of an orange colour, which nitric acid changed to a light green; contained bile, but no albumen; reaction alkaline; sp. gr. 1018; the sediment entirely of ammoniaco-magnesian phosphates. In the evening the temperature was 100·2°, the pulse 100, and full. He had two or three loose stools in the day, and about as many in the night.

On the 20th May, he expressed himself very much better; he had slept well, and was now able to walk. No fever; pulse 94. No pain over liver, spleen, or cæcum. Tongue reddish brown and dry. Takes his food well. Passes urine freely. No return of fever in the evening.

He continued free from fever for several days. His bowels, which had been loose, soon became regular, and he passed firm and formed stools, but the colour for a few days was white. The jaundice which had hitherto tinged the eyes, face, and neck, and the thorax, became universal in the intermission, even colouring the scalp; but the tint everywhere was light. The pulse fell to 88 and 70. The tongue became natural; there were no

pains or headache, but he was occasionally sleepless at nights. His appetite improved, but he did not gain strength rapidly. Slight deafness was also observed. He had wine, but it was changed at his own request to porter. Aperient medicine was given occasionally, and on the 26th the following mixture was ordered. Acid. nitro-muriat. dil., m. xv.; tinct. chirettæ, ℥j.; aq., ℥j.; three times daily. On the 25th, the urine was still yellow; sp. gr. 1010, reaction alkaline; no albumen. He complained of irritation or itching of the skin, but there was no eruption. On the night of the 31st there was slight fever with thirst; it left next morning, but returned in the evening, and the pulse rose to 114. The fever returned daily to the 8th June, after which it ceased definitely. The temperature was carefully taken from the day following his admission for upwards of thirty days. The following is a copy of the chart:—

	Morn.	Eve.		Morn.	Eve.
16th May	—	102	1st June	98	100·4
17th ,,	99	102	2nd ,,	98	101
18th ,,	98	100	3rd ,,	98·3	99
19th ,,	98	100·2	4th ,,	99	100·4
20th ,,	97·5	98·6	5th ,,	99	100·4
21st ,,	98	98	6th ,,	98	100
22nd ,,	97	98	7th ,,	99	99·3
23rd ,,	97·8	97·4	8th ,,	98	99·6
24th ,,	96·8	98	9th ,,	98	98·6
25th ,,	97	98·2	10th ,,	97·8	98
26th ,,	97·5	98	11th ,,	97	98
27th ,,	97·4	98	12th ,,	97	98
28th ,,	97	98	13th ,,	97·6	98
29th ,,	97	98·4	14th ,,	97	98·8
30th ,,	97	98	15th ,,	98	99
31st ,,	97	99	16th ,,	97	98·3

The relapse was very moderate, and caused the patient little or no inconvenience; only on one evening did he shiver. I ceased to see him after the 19th June. His skin was still of a dingy brown colour; and he was thin and weak, but able to go about, and generally doing well. He was discharged from hospital on the 3rd July.

The following two cases are examples of the intermittent variety of relapsing fever.

Case X.—Eugene McS——y, aged 13 months, son of Sergeant McS——y, of the Viceroy's Band, resident at Fort William. A delicate and emaciated child, has cut all eight incisors. Seen on the 14th July, 1871. He had a severe catarrh, with loud râles in chest, and frequent cough. The mother gave me the following history:—Fever set in on the 30th June; it would leave in the morning, but return again daily, up to the 4th July. On the 5th, 6th, and 7th, the fever had no intermission, but was constantly on. It left on the morning of the 8th, but returned in the evening. It ceased altogether on the 9th. There was apparently no affection of the liver or spleen, and a fair examination was not practicable. During all this period the child daily consumed many grains of quinine, besides aperient and other medicine. The fever returned on the 13th, and application was made to me on the following day. The child was remarkably cross, but said to be generally quiet. The appetite reported to be good, the thirst great, the mouth was moist, the pulse rapid, and perspiration at times pretty copious. The most marked feature of this illness was the severe catarrh, which was of a few days' standing. On the 14th there was no fever; fever on the 15th, but none on the 16th; fever again on the 17th (temperature 100·4°), and hardly any on the 18th, (99°). The fever was always greater at night than during the day. There was no return of fever after this date. There was obstinate constipation during this period. The cough improved under simple treatment. Quinine was given daily in one-grain doses every third or fourth hour; and on the days on which the fever was expected, in three-grain doses. The appetite improved: but not the child's temper. There was so second relapse. I saw the child last on the 28th, and it was doing well, though still somewhat emaciated.

Case XI.—Captain S. B. H——e, aged 29, 13th Regiment Native Infantry, had been enjoying his privilege leave at

Parisnath during July and August, 1871, and returned to Calcutta on the 27th August in good health. On the evening of the 4th September, he had passed the evening at the Penny Readings, held at the Soldiers' Institute at Fort William, and on returning home he was suddenly seized with fever, vomited bilious matter, felt a continuous nausea, and had a severe headache. The fever continued all the rest of the night, and did not leave him till the evening of the 5th September. On the 6th, he was free from fever, and was tolerably well, with the exception of attacks of nausea and vomiting, which caused annoyance. He was obliged to keep his bed, as he could not stand without immediately feeling giddy and becoming sick. On the evening of the 7th September, there was a slight return of the fever for a few hours. On the 8th, he continued free from fever, but still suffered from nausea, and some pain in the right side. In the evening, high fever set in, with violent and constant vomiting, but there was no headache; the night was restless from pains in the body. The fever left in the course of the morning of the 9th September; and, with the exception of some pains in the limbs, he was tolerably easy all the rest of that day and all the night. In the evening, a slight jaundiced tinge of the eyes, face, neck, and shoulders was observed. He had slight headache, but the sickness at stomach was still distressing. On the 10th, there was no return of fever. The jaundice spread to the chest, arms, and abdomen, but the lower extremities were still white. He was free from sickness and bilious vomiting in the first half of the day, but these symptoms were distressing in the afternoon. He had slight headache, but no pains; and complained of thirst.

He now began to mend a very little. The jaundice became brighter. The pulse was 96 on the 11th, and fell to 88 on the 12th. The tongue continued to be white; the bowels costive. There was much prostration of strength, and he was too weak to get out of bed. A sharp pain was felt occasionally in the liver on the 11th, and, on examination, the organ was found to be somewhat tender, and enlarged an inch beyond the margin of the ribs. There was no enlargement or tenderness of the spleen. Head-

ache occasionally annoying; but worse than it were the severe pains felt in the back, knees, and back of the thighs. The sickness and vomiting were still very troublesome, generally in the morning. The nights restless, but sleep was procurable with a grain dose of morphia.

On the night of the 12th September, slight fever was observed; but he was quite cool on the following morning: pulse 74. The pains left, and the sickness abated. Jaundice became universal, and of deeper colour, and on some occasions itchiness of the skin was felt, but there was no eruption. Improvement was more apparent after this, and he began to gain strength, and was able to sit out in the verandah. His bowels were costive, and castor oil produced white stools. On the 16th September, he complained of a feeling of numbness in the arms, and of "pins and needles," or some similar anomalous sensation, all over the body. In the evening his skin was warm and perspiring, and the unpleasant sensations complained of in the morning had passed off. On the 17th, he complained of rather severe pains in the front of the chest and in the arms, and the right side was also tender. On the 20th, his face, which had previously a worn appearance, began to resume the look of health and ease. The pains were still felt, especially in the liver.

On the 22nd, he stated that his eyesight had for the last few days begun to be weak and dim, and that he saw small black spots before his eyes. He had been feverish the previous night, and had a rather severe headache. Bowels costive, and castor oil now produced stools of dark colour. In the evening, fever set in; temperature, 101·8° at 6 p.m. Suffered from headache, nausea, occasional vomiting, and general pains: he felt altogether unwell, and was irritable in temper. On the 23rd, no fever in the morning; but in the evening the skin was dry, and felt warmer than natural to the hand, but the thermometer indicated only 98°. On the 24th, the fever returned very slightly in the night; there was occasional vomiting, and the pains were annoying. On the 25th, the fever again returned in the evening: temperature 100°. On the evening of the 26th, he felt as he did for the last few evenings—headache, nausea, pains,

and "seediness"; but the thermometer marked 97°. On the 27th he felt all right, and the fever was not again observed. He now began again to improve. The jaundice slowly faded; the vision had become dim and cloudy, so that he could not see to read; pain was also occasionally felt around the orbits, and sometimes in the globes. The left eye was more affected than the right. Under the use of blisters, twice repeated, behind the ears, the vision was fully restored, and the black specks disappeared. No subjective symptoms were observed beyond a few congested choroidal vessels. The ophthalmoscope was not used. He began to gain strength somewhat more rapidly; was able to go out for short walks. The pains left, and he was only occasionally troubled with a slight headache, and sometimes a twitch in the liver. Captain H——e returned to duty on the 17th October, 1871.

Case XII.—A non-relapsing case.

The wife of a staff officer of the garrison of Fort William went to Barrackpore for a couple of months, for the benefit of her health, which was delicate. For about four days before the fever set in she used to be troubled daily with a sickness of stomach and violent vomiting in the early morning. On the 26th September, 1871, the fever commenced. There was much depression, with nausea and vomiting, but the temperature was not considerable. The next day the fever increased, the vomiting was violent, and the matters brought up were green and bitter; there was headache and severe pain at times in the right shoulder and hypochondrium; at the same time agonising pains were felt in the back, attended with "bearing down," and also in the limbs. There were cold perspirations, much restlessness, considerable prostration of strength, but no delirium. The bowels were kept open by medicine. All these symptoms continued till the evening of the 30th September, when the fever, the headache, vomiting, and pains, ceased abruptly. The temperature on the 30th September, before the fever left, was 102° Fahr. The above history was obtained by me from personal inquiries from the lady and her husband.

The medical officer who attended the lady at Barrack-

pore, kindly sent me the following account:—"She got the form of fever, which, for want of a better name, I have been used to call the congestive remittent. It is not a frequent form of disease, and it is, as far as I know, generally fatal. The symptoms are a continued remittent fever with occasional exacerbations and occasional shivers; but the pulse is always above 100, and the skin hot and harsh to the feel. The most prominent symptom is the vomiting; that does not stop for a moment as long as there is the least heat, and it comes on now and then again when the fever has left the patient. The vomit is at first watery and scanty (?), but it becomes gradually mixed with dark shreds of discoloured blood, and after a little while a regular coffee-ground vomit appears. No food is retained, and the patient wears down from constant vomiting. At the same time there is a slight diarrhœa of dark jelly-like stools, spare but tolerably frequent. There is much headache; the eyes are sunken and dark; the pupils much dilated; the face grey and deadly. There is hardly any urine secreted, and that is dark and scalding. There is no sleep, but there is no delirium, or very little of it. The tongue is at first white and moist, but becomes gradually brown and dry in centre.

"I gave Mrs. —— quinine in gr. x. doses, with dil. sulph. acid and t. card. co., three times a day, with mustard plasters to stomach, draughts of hydrocyanic acid (m. iv. doses) every three or four hours; dry cupping to pit of stomach, wet cloth to head; and as diet, iced milk in wine-glassful doses, repeated hourly.

"The fever lasted steadily for five days, and she appeared as though she could not live many hours longer. On the evening of the fifth day the fever stopped, and she slept well for a few hours. Quinine was kept up and ice milk diet, and she began to be convalescent, or rather to be improving or not getting worse on Sunday. She has been improving slowly since, but she is very weak. Catamenia appeared two or three times during her illness and reduced her a little. It has now stopped. She now takes a little chicken, a little game, and a small quantity of iced milk." The letter is dated Barrackpore, 4th October, 1871.

The lady returned to Fort William on the evening of the 4th October, and came under my care. She had the appearance of a person recently recovered from a severe illness; thin, worn, and very weak. Beyond debility, there were no special symptoms. She complained occasionally of pains in the knees and ankles, slight headache, and twinges of pain in the liver and right shoulder. The liver on examination was felt to be enlarged to a small extent, downwards only; and on percussion the dulness extended about an inch beyond the margin of the ribs. The spleen could not be felt. The tongue was clean, the appetite good, and latterly approached the degree of "hunger." The pulse was weak, but slowly improved in strength, ranging from 74 in the morning to 86 in the evening. The temperature was below the normal degree, and lower in the morning than in the evening; the extremes were 95·6° and 98·2.° The thermometer was used twice daily from the 6th to the 14th October. There was no recurrence of the fever. Since her return from Barrackpore she had been taking daily nine grains of quinine, and latterly a simple tonic of diluted nitric acid with taraxacum, and the tincture and infusion of gentian. A dose or two of a gentle aperient was also found necessary. She gained strength so far as to be able to drive out in the evenings.

Mrs. —— further informed me that she suffered at Peshawur in 1867, from the fever prevalent at the station in the cold weather of that year, which affected almost everybody. For three days she would be ill with a "violent ague;" the fever would then leave, and before she had recovered her strength it would return after a fortnight. She had relapses of this sort during October, November, and December. Her child was born on the 10th December, 1867, and the fever returned after her confinement. She suffered from similar returns of fever for a couple of years, until she came to Calcutta in 1870, when they ceased.

On the morning of the 14th October, at about 2 a.m., she was attacked with nausea and vomiting, which continued till daybreak, and then gradually subsided. The same symptoms recurred about the same hour on the morning of the 15th. On the evening of the 16th the skin was dry,

but the temperature was 97·6°. She was awakened out of her sleep at about one o'clock on the following morning by severe pains in her abdomen and right side; she took a dose of gr. ½ of morphia, which excited her very much. On the morning of the 17th she had a "fit of ague," accompanied with anomalous sensations in her hands and fingers, which lasted for nearly an hour between ten and eleven o'clock. It was followed by perspiration, but the thermometer did not indicate fever. She also complained of pain in her right side, and was much alarmed by it. She calmed down and felt relieved of her pains in the course of the day. She informed me on the evening of the 18th October that she fancied she had fever between three and five p.m., but was not sure. Later in the evening, when the thermometer was used, fever was absent. On the evening of the 19th October the pulse was 92 and the temperature 98·8°, this was the highest degree noticed since the termination of the primary fever. She continued free from fever, and suffered only occasionally from pain in the loins and right side. The pulse was about 70, was weak, and some beats were of less force than others. Pains were also occasionally felt in the limbs and back. The right side continued to be tender on pressure and slightly enlarged, and twinges of pain that were now and again felt were relieved by the application of mustard plasters. I last saw her on the morning of the 23rd October, the day before she left for England, viâ Malta, where she intended to reside for a period. She was in good spirits, but still weak, and was unable to walk about: pulse 88, of good strength, and the beats of uniform force. Her liver was still somewhat tender.

This lady was seen at Barrackpore, in consultation, by an eminent Calcutta physician, who, I believe, considered her illness to have been malarious fever subdued by quinine. On the occurrence of the ague fit on the 17th October, in the absence of this gentleman, his colleague was called upon, who diagnosed inflammation of the liver, and feared the formation of abscess. In deference to this opinion, although I did not concur in it, the lady was urged by me to anticipate her intended return to England

by a couple of months, and to start at once, according to the advice tendered.

Since the transmission of the manuscript of this work to England the author has had the opportunity of observing in part an epidemic of the intermittent variety of relapsing fever in the Cooly Corps attached to the Right or Chittagong Column, under Brigadier-General Brownlow, C.B., of the Looshai Expeditionary Force. The disease, though mainly prevalent amongst the coolies, affected some of the native soldiers and a few Europeans. I am not aware that any European officer had been attacked up to date 20th January, 1872. The following are illustrations of this variety of relapsing fever.

Case XIII.—Havildar Seetul Sing, aged 40, of the 13th Regiment N.I., attached to the Cooly Corps, came into the General Hospital at Kasalong on the 4th December, 1871. He had had constant fever for three days. It set in with shivering, and was accompanied with severe pains in back and limbs, but without headache. He had vomited occasionally. On the morning of the 5th December, he was free from fever, temperature 98°, but the pulse was 100. He had slight pain on left side; tongue coated white; no appetite, and he was pulled down and weak. Ordered ℥j. of the diaphoretic mixture, with two grains of quinine, three times daily. At ten a.m. fever set in with shivering and vomiting. His temperature in the evening was 101·2. He complained of headache, and pains in the back and bones. The fever abated in the course of the night, and he slept a little. On the 6th December, he was again free from fever; there was no headache and only slight pains in the loins. The bowels had been moved naturally. The tongue was slightly coated. Fifteen grains of quinine were ordered. Fever returned at five p.m., he stated; his temperature at six o'clock was 101·6°. He was much troubled during the night with severe pains in the head, loins, limbs, and everywhere, which totally prevented sleep. He passed four scanty stools, with straining. On the morning of the 7th December, he was again

free from fever, temperature 98·2°, and all his pains had left him. His evening temperature was 99·2°. One grain of opium was ordered at bedtime, and he enjoyed some sleep during the night. On the 8th December he was again free from fever; temperature 98°. He now began to mend, and a light tonic, consisting of two grains of quinine, ten minims of the diluted sulphuric acid, and an ounce of the infusion of chiretta was ordered three times a day. On the 13th December, he complained of severe pains in the loins and knees, and thought he had contracted rheumatism. He felt chilly in the evening, and slight fever occurred in the night, but with a dose of opium at bedtime he had good sleep. From this date there was no return of fever, but the pains troubled him at times. He left hospital at his own request on the 15th December, wasted and weak, and was seen for about a week after pottering about the station leaning on a stick, an object of general commiseration. Towards the end of the month he had sufficiently recovered his strength to be able to proceed to the front.

Case XIV.—Sepoy Mata Deen, aged 26, of the 3rd Company Sappers and Miners, was admitted into the General Hospital at Kasalong, on the 22nd December, 1871. He stated that he was well on the previous day, except that he had a slight headache, and was not able to take his food as usual. Last night he was suddenly seized with shivering, and continued to shiver the whole night. He was that morning in high fever; pulse 88, and small; headache and thirst; tongue slightly dry, coated white with red edges; bowels costive. Ordered ʒj. of the diaphoretic mixture, with two grains of quinine, three times a day. The fever continued all day. Evening temperature 104·3°. The fever left at night. On the 3rd December, he was free from fever the whole day and night, and felt tolerably well with the exception of some weakness and a slight headache.

At 5 a.m. on the 4th December, he was attacked with shivering, and felt cold and chilled at my morning visit at 8 o'clock. T. 103·4°. Pulse 102. He complained of thirst and severe headache; tongue coated white. The bowels

had moved once naturally yesterday, but not this morning. Ordered cold lotion to the head; the mixture to be continued. During the day the fever hardly abated, although he perspired occasionally. He was attacked with sickness at stomach and vomiting. Evening temperature 102°. The fever left about midnight, and he slept fairly. On the 5th December, he was free from fever; and, with the exception of a slight headache, he was tolerably well. The temperature was 98·4°, and the pulse 72. Fever set in in the afternoon, and at my evening visit his temperature was 101°; he complained of feeling chilly, of great thirst, and of severe headache and pains in every part of the body. The tongue was coated white, and the bowels ordinarily open. He was ordered a sherbet of limejuice, and one grain of opium at bedtime. Throughout the 6th December, he was in high fever. The morning temperature was 104·8°; the evening 102°; the fever left or abated at 11 p.m., with a little perspiration. On the morning of the 7th, the temperature was 99°, and there was slight headache. At about 3 p.m., shivering, with increase of headache set in. The thirst was distressing, and a large quantity of urine was passed. The evening temperature rose to 103·6°. Hardly any sleep during the night. On the 8th, the fever was still persistent. Slight headache; tongue coated pale yellow; bowels costive; a little appetite felt. The fever continued all day. Temperature 102·6°; pulse 92, in the morning; in the evening, temperature 102°. Ordered one grain of opium at bedtime, which had the effect of procuring a good night's rest. On the 9th December, he was almost free from fever the whole day, and felt tolerably easy. The temperature in the morning was 96·6°, and in the evening 99·2°. About midnight he perspired profusely. He did not take opium at bedtime, and had no sleep. On the 10th December, he was perfectly free from fever; temperature 97°. The pulse likewise fell to 72. The tongue was thickly coated with a yellowish brown fur. Though wasted and much weakened, he was to-day much improved, in better spirits, and felt a sharp appetite. He continued well during the day, but was not able to gratify his appetite, as he could not eat his rations.

The fever, however, returned in the evening; temperature 100°. He was ordered a grain of opium, and enjoyed a good night's rest.

He now gradually but steadily improved; the fever kept away; indeed his temperature was occasionally as low as 96·8° in the evening. His appetite was remarkably sharp; and means were now available for providing him with an occasional ration of goat's meat, and he was likewise allowed a ration of rum. A light tonic of three grains of quinine, one ounce of the infusion of chiretta, with five drops of diluted sulphuric acid, was prescribed twice daily. He continued free from fever up to the 17th December. During the last three days of that period, a slight diarrhœa occurred, for which the simple chalk mixture was considered sufficient.

About 5 p.m. on the 17th December, the relapse set in with shivering. His temperature rose to 100·4°, and he cooled down again in the early part of the night. On the morning of the 18th, his temperature was 99·4°, in the evening 100·6°. The diarrhœa ceased, but slight headache was complained of. His nights were free from pain, and he slept well. On the 19th there was no fever in the morning, temperature 98·4°, but it returned with some severity in the afternoon, with shivering, severe headache, and restlessness. Temperature 103°. One grain of opium was prescribed at bedtime, and the tonic mixture continued. The fever left during the night, and he slept well. On the 20th December the fever returned again in the afternoon with chilliness and headache; temperature 101·4°. Opium was repeated, and he passed a fair night. A slight attack of dysentery now set in, and he had two scanty and slimy stools. On the morning of the 21st, his temperature was 90°, and he looked much pulled down in the face, and his body was emaciated. One scruple of ipecacuanha, twice a day, was ordered. The fever increased in the afternoon, and about 4 p.m. he had a fit of shivering. Evening temperature 102°. During the day he passed four dysenteric stools. The opium was repeated at bedtime, and he passed a fair night. About 2 a.m. the fever abated, with perspiration. On the 22nd, the temperature in the morn-

ing was 100°, and in the evening 100·4°. No dysenteric stools. The fever caused so little inconvenience that he was not aware of its existence. On the 23rd December, his temperature was 98·4°. There was no appearance of blood or slime in the stools, and the bowels had apparently recovered. The ipecacuanha was now omitted, and the light tonic only continued.

He now again began to mend, but very slowly. Beyond leaving behind considerable debility and some wasting of the body, the fever had not done any serious damage. There was neither pain nor enlargement of the liver or spleen, or apparent derangement of any organ, except perhaps of the stomach, as the appetite was indifferent.

On the afternoon of the 30th December, fever returned unexpectedly, with shivering and headache. It lasted for about two hours, from 2 to 4 p.m.; at 6 p.m. the temperature was 97·4°. On the 31st December and 1st January, 1872, there was no fever; but on the evening of the 2nd January, the fever returned, temperature 101°, but so slightly that the patient was not aware of it. On the morning of the 3rd, the fever was still mild, temperature 100·2°; but at midday it increased, and severe headache and pains in limbs set in. The tongue became slightly dry and coated white. Passed two stools said to be slimy, and perspired profusely. Evening temperature 101·5°. Opium, gr. j., at bedtime. He slept well, and in the morning of the 4th he was free from fever; temperature 98·8°. He passed one stool, feculent and formed. Quinine and chiretta continued. At 3 p.m. high fever set in without chilliness preceding, but with severe headache and pains in the limbs. Bowels not moved during the day. Evening temperature 103·2°. A grain of opium at bedtime. He passed an indifferent night. Was sick at stomach, and vomited twice a green and bitter fluid. Passed two scanty and loose stools streaked with blood. On the 5th January, the fever continued all day; he was much distressed by headache and pains in the back, legs, and thighs, and a constant sickness, so that he could not retain his food. Temperature in the morning 100·6°, in the evening 102·8°. Effervescing draughts were used during the day. A grain

of opium at bedtime. The fever abated during the night, and on the 6th there was hardly any fever. The temperature in the evening was 99·8°. He complained of severe pain in the back, and of twitchings or spasms of the fingers. A grain of opium at bedtime. On the 7th he was tolerably easy, but had no sleep the previous night. Complained of dryness of the mouth; and limejuice with sugar and water was ordered as a drink. Temperature in the morning 100·8°, but increased in the evening to 104·6°, with a rapid pulse. The abdomen was tympanitic. A grain of morphia at bedtime. In the earlier part of the night was much distressed with pains in the legs, and difficulty in passing urine. The fever left him with copious perspiration. He slept in the latter part of the night. On the 8th January he was free from fever, temperature 96·2°. The pulse had fallen to 78. The emaciation was marked, the voice was husky, and the debility and prostration considerable. Micturition was easy, but pains in the legs were still complained of. There was no pain or enlargement of the liver or spleen. His exhaustion was so great that it was thought advisable to provide him with animal food; pigeons were accordingly supplied by the commissariat for his use, as these were the only animals procurable that his caste permitted him to eat. A ration of rum was also allowed. Ordered ten grains of quinine with the following mixture:—twenty drops of the tincture of gentian, ten drops of the diluted nitric acid, and one ounce of the infusion of chiretta, three times during the day. On the 9th January, there was again slight febrile heat for the whole day, the temperature being between 99° and 100°, and the pulse 82.

From the 10th January, the fever definitely ceased; the temperature being on some days as low as 96·4°, and the pulse varying from 64 to 84, being generally somewhat accelerated in the evening. He gradually improved and gained strength, but is still far too weak to return to his duty, 20th January, 1872.

Case XV.—A non-relapsing case.

Cooly Cadhun, was admitted into the General Hospital,

at Kasalong, on the 21st December, 1871. He had been resident nearly three months in the place, and the present was his first attack of fever. It set in suddenly on the night of the 20th December, without shivering, and was accompanied with headache and a very loose state of the bowels. He complained of a peculiar spasmodic action of the muscles of the right hand, and of pains in the muscles of the thigh and calves; but there was no pain in the back. Ordered quinine, gr. iij., with acidulated infusion of chiretta, twice daily. On the morning of the 22nd he was free from fever, temperature 98·6°, but the fever returned in the course of the day, and in the evening his temperature was 101·6°. On the morning of the 23rd, he was again cool, temperature 98°; and there were no special symptoms beyond headache and pains in the calves of the legs. At 2 p.m., fever again set in without shivering; in the evening the temperature rose to 105°. There was headache, and profuse loose stools were passed, which weakened him considerably. Ordered an ounce of compound chalk mixture every third hour, and a grain of opium at bedtime. He passed a bad night, but the diarrhœa was very much relieved. The fever continued all night, and in the morning of the 24th, his temperature was 103°, and his pulse 118, small and weak. The urine was scanty and scalding. He was much reduced, and continued to complain of pains in the calves. Ordered one ounce of the diaphoretic mixture, three grains of quinine, and fifteen minims of the tincture of hyoscyamus. A ration of rum was allowed. During the day he passed two watery stools, and the temperature fell at 9 p.m. to 101°. A grain of opium at bedtime, but he passed an indifferent night. One watery stool. On the 25th December the fever left him. Temperature 97·2°. He was very weak and much wasted in flesh. The pulse fell to 70. No return of fever during the day. Evening temperature 98·4°; pulse 84. No looseness, but he complained of pain in the abdomen at the umbilicus. A sinapism ordered, and a grain of opium at bedtime. No diarrhœa; the abdominal pain left, but he was kept awake by a severe pain in the loins. On the 26th, temperature 98°, pulse 66. Able to take food, but

the appetite was indifferent. Ordered two grains of quinine with an ounce of acidulated infusion of chiretta. Evening temperature 97°, pulse 87. On the 27th, temperature 96°, pulse 60. Appetite still indifferent. A small boil had formed on the left thigh. Evening temperature 96·6°, pulse 68. On the 28th, temperature 97·8°, pulse 58, weak soft and small. Complains only of debility, so that he was not able to walk or to prepare his own food. Appetite improving. Evening temperature 97·2°. He continued free from fever, gained strength gradually, and picked up sufficiently to leave hospital on the 3rd January, 1872; a slight diarrhœa occurred which did not much trouble him. On the 8th January he had recovered sufficiently to justify his being sent on to the front.

Case XVI.—Cooly Surjoo was admitted into the General Hospital at Kasalong on the 21st December, 1871. He was a brother or companion of the preceding patient, and both occupied the same hut. He had no attack previously, although he had resided for three months at Kasalong. The fever commenced on the morning of the 20th, and had never left him. He complained of headache and severe pain in the loins, but there was no vomiting or diarrhœa. Tongue coated white, and the pulse was rapid and full. Ordered diaphoretic mixture with three grains of quinine. The fever continued all the next day, the 22nd December. Morning temperature 100·2°, evening 101°. On the 23rd, the temperature fell to 99·4°, but in the afternoon it rose after a shivering fit, and attained 102·2° in the evening: pulse 100. No pain complained of. As his nights had been hitherto restless, he was ordered one grain of opium at bedtime. Passed a good night. On the 24th the temperature was 99·8°. Except a headache, there was no pain elsewhere. He was becoming emaciated. Said his urine was turbid and as thick as oil. The temperature increased in the evening to 103·6°. Ordered a grain of opium at bedtime. He was said to have been delirious during the night. On the 25th, the temperature was 99·8°, the pulse 90, full and soft. No pain complained of; but emaciation and debility were increasing. In the evening the tempera-

ture rose to 103·6°, and the pulse to 96. He complains of scalding of the urine. There were no pains. No opium ordered; but he was again delirious during the night. On the 26th, the temperature was 102°, pulse 84. Tongue red. No pain in liver or spleen, nor anywhere. No stools passed. Was able to take some food to-day with a little appetite. In the evening, temperature 100·2°; pulse 84. Delirious again at night. On the 27th, the temperature was 101°, pulse 84. No headache nor pains anywhere. Continued to complain of his urine, which was thick and turbid, and not copious. The colour was yellow, but not changed by nitric acid. Ordered five grains of the nitrate of potash to be added to his mixture. He felt well this day, he said, and was able to take food. Evening temperature 98·8°, pulse 80. A grain of opium at bedtime. He passed a good night. On the 28th, temperature 98°, pulse 74: in the evening, 97·2°, pulse 80. Made no complaint, except of headache. On the 29th, the temperature was 100·2°, pulse 86 and weak. He was much pulled down in flesh and strength. Had no appetite this day. Evening temperature 98°.

On the 30th December the temperature and pulse ceased to be febrile, and on some days were even below the normal standard. He began to work, and was troubled only with a slight diarrhœa.

At 10 a.m. on the 6th January, 1872, the relapse set in, with shivering, headache, and pains in the joints and all over the body. In the evening the temperature was 102·2° and the pulse 100. He had perspired during the day. Ordered a grain of opium at bedtime. He was delirious during the night. On the morning of the 7th the fever had left; temperature 96·5°, pulse 68, and weak. Severe pains felt in the joints; was in much distress, and groaned. Weakness considerable. Fever set in at 5 p.m.; temperature 102°. Complained of headache. One grain of morphia ordered. There was no delirium during the night, and he slept soundly. On the 8th, the temperature was 103·8°, pulse 100. No headache, but severe pains in the whole body, especially in the elbows and knees. Neither tenderness nor enlargement of the liver or spleen. Tongue

moist and lightly coated. Much thirst complained of. Ordered limejuice. In the evening he complained of excruciating pain in both knees, so that he could not straighten them; also in the wrists, but less severe. No headache. Evening temperature 101°, pulse 100. Ordered fomentation and a grain of morphia at bedtime. He slept well during the night. On the 9th, temperature 97·2°, pulse 80. Pains in knees and wrists less severe. Evening temperature 98·4°, pulse 80; pains somewhat relieved. A grain of morphia at bedtime. On the 10th temperature 99°, pulse 78. He slept well, and was this day altogether much relieved. Evening temperature 99°, pulse 76. Morphia at bedtime. On the 11th the temperature was 97°, and the pulse 62, weak. The pains were almost gone. He was easy but weak. Had some appetite today, and took his food well. Evening temperature 96·8°, pulse 66.

He again began to mend, and there has been no return of fever, except on the evening of the 12th, when the temperature was 99·6°. A slight diarrhœa occurred on the 14th and 15th, which was readily stopped. He has recovered much of his strength, and is now (20th Jan.) in a fair way towards recovery. He is still occasionally troubled with slight pains in the limbs, and since the 16th he has complained of a rather severe pain felt now and then in the left biceps muscle. There is no heat or swelling in the upper arm, and he obtains relief from rubbing with the linimentum opii.

SECTION XV.

Relapsing Fever as Described by the Systematic Writers.

In this section an attempt is made to show the light in which relapsing fever appeared in the eyes of the old Indian authors, and of those modern writers who have adopted their views. The disease was observed and imperfectly described by all of them. So far as the diagnosis of a disease might be made out from an imperfect des-

cription of a case, the cases of relapsing fever described under other names in the works of the old writers will be noted.

Annesley's great work on the diseases of India was published in 1828. This author is the greatest pathologist that India has produced. He held the doctrine of the identity of the intermittent, remittent, and continued fevers. He says: "The same causes which produce continued fever in one person will often occasion an intermittent in a second, or a remittent in a third; the type of the disease being the effect of the habit, diathesis, and predisposition of the patients, together with the activity and combination of the exciting causes" (vol. ii., p. 417). He considered exhalations from the soil to be the chief cause of intertropical fevers; and that atmospherical vicissitudes and the seasons produce fevers chiefly by generating terrestrial exhalations and noxious miasms. He further points out that the changes of season and the weather also act upon the natives of the soil in an indirect manner "chiefly by influencing the productiveness and quality of the crops, upon which they are chiefly dependent for nourishment. . . . There are no causes more influential than a scarcity of nourishment and food of a bad quality in disposing the system to the effects of noxious inhalations; and it generally happens that the weather which is most injurious to the productions of the soil, and to the collecting of them in their due state and season, is also most calculated to promote the generation of such exhalations, and to favour their operation on the human frame. Fevers, which are usually only endemic to certain places, not unfrequently become epidemic under circumstances like the above, and are aggravated in character, owing both to the greater intensity of the causes thus generated, and to the increased predisposition of those affected. During famine and defective crops, the body is not only insufficiently nourished, but the quantity of nourishment afforded is generally of an improper and even hurtful quality. Hence the greatest debility is occasioned, and predisposition to fever is thereby heightened to a proportionable extent upon the slightest exposure to any of its exciting causes"

(vol. ii., 420). I have not met with an exposition similar to the above in the writings of any other Indian author, regarding one of the most prolific causes of fever.

Annesley states that although he believed "in the influence of infection as respects the continued adynamic fever of temperate climates, we have, during an experience extending through a quarter of a century, never observed fever to proceed from contagion in this part of the world." But he does not deny that fever has been propagated by contagion in India, for he was sensible of the difficulties that beset the question, but only asserts that he did not observe an unequivocal instance of communication. His remarkable observations on this subject are well worth perusal. (Vol. ii., p. 422.)

Relapsing fever is described under the terms "bilious remittent" and "malignant remittent fever," the former being a milder form of the same disease. The malignant fever is thus described: "In some cases this fever presents, at its commencement, but indistinct remissions: the febrile action being extremely great; the skin harsh, dry, and burning, with delirium and determination to the head and biliary organs; great pain in the loins and limbs; constant sickness and vomiting of greenish yellow matter; hurried respiration; quick full pulse; clammy perspirations on the extremities; loaded tongue; bilious state of the alvine evacuations, the motions being watery, green, curdy, and variously deranged. In other cases the vascular excitement is less remarkable, and the symptoms altogether of a more typhoid kind. The delirium, instead of being marked by maniacal excitement, as in the foregoing cases, is sometimes low or muttering, the pulse small and quick, the abdomen tumid and hot, while the extremities are cold and clammy; the evacuations, foul, morbid, and offensive; hurried respiration, fuliginous tongue, with aphthæ or spongy gums; frequent or constant vomiting, at first of ropy, bilious fluids, afterwards of a grumous fluid, resembling black coffee-grounds; a dark pitchy appearance of the motions, etc. In both these varieties of malignant remittent fever, a yellowness of the surface of the body occasionally presents itself about the third or fourth day

of the disease, commencing first in the *tunic adnata* of the eye, neck, belly, and breast. In some cases the yellow seems to pass into a light greenish tinge. Dysenteric symptoms not unfrequently accompany this form of remittent" (vol. ii., p. 430).

The bilious remittent fever is most prevalent in low marshy situations. It is an extremely frequent form of fever during the hot months following the rainy season, especially when the previous rains have been unusually great, and at the commencement of the monsoon. It is very dependent on the nature and vicissitudes of the season, and on some occasions it seems to assume an epidemic character. (Page 429.)

Annesley did not consider the duration of a fever of any importance. He says the duration of intermittents and remittents is extremely indefinite, one being often converted into the other. The more violent attacks of remittent and continued fever may terminate in twenty-four hours, although usually extending from three to fourteen days; whilst the more mild forms go on for a much longer period.

He speaks of relapses in his remarks on the management of convalescence. He attributes them to errors in diet, to the influence of exhalations from the soil, and vicissitudes of temperature or of the weather. (Vol. ii., p. 561.)

While Annesley's cases of typhoid fever can be readily diagnosed, his cases of relapsing fever are somewhat anomalous. The following appear to be relapsing fever: cases 216, 219, 220, 224.

Twining published his "Clinical Illustrations of the more Important Diseases of Bengal," at Calcutta, in 1832, and a second and improved edition was issued in 1835. The references made here are to the second edition. This author made a distinction between the forms of non-intermittent fevers prevalent in Calcutta, which corresponds with the classification of Jenner and Murchison, although some important details were omitted. The "congestive fever of the cold season" is the modern typhoid fever, and the "remittent fever of the Bengal rainy season" is the

modern relapsing fever. The latter he ranked among the most formidable diseases of India. He thus describes it: "The commencement of remittent fever is generally marked by languor, oppression at the præcordia, debility, and that peculiar combination of weariness, pain, anxiety, and weakness, affecting the head and back of the neck, which Dr. Curry used to describe under the name of *febrile anguish.*

"There is much diversity in the symptoms in different cases. In persons of delicate constitution, who have been long suffering from fatigue, privations, and the inclemencies of the weather, while they have been indifferently fed, and much exposed to the influence of malaria, and in whom the disease has been preceded for several days by debility and indisposition not distinctly febrile, we often find a weak and rapid pulse; the tongue is moist, and but little loaded with grey mucus; occasionally it is quite pale and glazed; the conjunctivæ are pale, and the face sometimes assumes a lurid cadaverous colour; the gums are livid; the head and chest, though hot at the time of the exacerbation, become soon covered with a cold perspiration; and the extremities remain cold for several hours at the termination of the paroxysm. The evacuations from the bowels are scanty and watery, often of a pale grey colour; but in some cases nearly black. The whole belly is often doughy and inelastic, and there is generally some tension and fulness at the epigastrium. The urine is usually pale.

"In other patients of robust habit, who have suffered less from fatigue, privations, and exposure, and in whom the disease is developed more rapidly, excessive reaction appears at the commencement of the paroxysm, there is intense morbid heat of the skin, flushed face, headache, and redness of the eyes during the exacerbation; and although these symptoms abate much at some periods of the day, there are many cases in which pyrexia is not entirely absent at any time during the twenty-four hours. The pulse is rapid and full; bilious vomiting often takes place, and there is pain and morbid sensibility on pressure over the epigastrium, which region and the hypochondria are tense, and the urine is high coloured. The evacuations from the intestines are scanty, watery, and dark-coloured; and active purgatives

often bring away considerable quantities of black films, like fragments of dried leaves that had been steeped in water. Before active purgatives are taken, in the inflammatory form of remittent, the tongue is usually dry and much loaded with brown or yellowish mucus. Vertigo is often a distressing symptom; and delirium frequently occurs, sometimes even at an early period of the disease. Intense yellowness of the body very frequently takes place in the worst cases" (vol. ii., pp. 291–293).

He was convinced that these fevers were connected with local congestions, which often run rapidly into inflammation, attended with much interstitial effusion. The seat of the local congestions is found principally in the stomach, intestines, cellular tissue about the duodenum, and at the root of the meso-colon; the principal disease is also found in the spleen, liver, brain, or lungs.

Twining's form of continued fever appears to have comprised simple and mild relapsing fevers. Intermittent fever included this variety of all the fevers.

The chief details omitted by this author are the specification of the duration of the fever and the relapses. In his description of the variety of relapsing fever called *nakra* by the Bengalees, both these omissions are supplied, and the occurrence of relapses is further mentioned by him in his fugitive writings, as already pointed out. Twining perceived the resemblance between *nakra* and the eruptive fever which was epidemic in Calcutta in 1824, and between both these diseases and the disease of North Carolina, which was popularly called "pleurisy in the head." Dr. Rush, who described it at the end of his "Account of the Bilious Remittent Yellow Fever of 1793 in Philadelphia: 1796," considered the disease to have been "an evanescent symptom of a bilious remitting fever" (vol. ii., p. 394). Twining is *silent* regarding the contagiousness of the remittent fever of the rains.

Twining was a firm believer in the efficiency of bleeding and purgation, which latter he called "the medical irritation of the bowels," in cutting short a fever. He found it apparently successful in the remittent fever of the rains, but unsuccessful in the congestive fever of the cold season.

He administered quinine in small doses of four or six grains, and disapproved of large doses, which were unnecessary, and caused annoyance.

Twining's faith in bleeding arose from the same circumstance which originated the practice of blood-letting in Europe, as clearly pointed out by Murchison in page 256 of his work. Twining found that this mode of treatment apparently reduced the mortality. In proof of its efficacy he refers to the great reduction of mortality in the remittent fever of 1833 (vol. ii., p. 398). He quotes Dr. French's statistics. In 1831, out of 120 cases of remittent fever, treated without blood-letting, the deaths were one in $4\frac{20}{25}$. In 1833, out of 309 cases of remittent fever treated by blood-letting, the proportion of deaths was only one in $17\frac{1}{6}$. The diseases compared were, however, not the same. The remittent fever of 1831 was the ordinary endemic of Calcutta, namely, typhoid fever, the usual mortality of which is one in five. The remittent fever of 1833, as will be seen on referring to the historical section, was relapsing fever, the mortality from which in the better classes of society is very small; and of such classes were Twining's patients in the General Hospital.

The following cases related by Twining in his second volume of the edition of 1835 are relapsing fever, but the diagnosis of some of them is doubtful. The alternative, however, is between simple and relapsing fever. In the section on intermittent fever, cases 143, 144, 145, 146, 147, 148, 149, 150; in the section on continued fever, cases 152, 154, 155, 157, 158, 159; in the section on remittent fever, cases 166, 167, 168, 169, 170, and 171.

Geddes' "Clinical Illustrations of the Diseases of India," 1846, is a work of considerable merit. To this gentleman is due the credit of introducing the use of quinine in the treatment of Indian fevers. The chapter on fevers is almost exclusively a description of relapsing fever; but simple fever, and perhaps also typhoid fever, are embraced in the same general account. He holds the doctrine of the identity of intermittent and remittent fevers; points out the remarkable tendency to relapse; gives statistical tables from which the duration of the primary attack, the inter-

mission, and relapse is seen to be the same as stated in the foregoing pages; mentions the complications, and various other important details. He appreciated the value of opium; and his views regarding quinine, which he used in doses of three grains, have already been quoted. Geddes is *silent* on the contagiousness of relapsing fever.

The first edition of Morehead's "Clinical Researches on Disease in India" was published in 1856; the second edition in 1860. Should a third edition be in preparation, it is earnestly hoped that the chapters on fevers and dysentery have been carefully revised. The references made here are to the second edition. This author states that relapsing fever is unknown in India. He, however, writes a fair description of the symptoms of this disease, in which some important details are wanting, in his account of "ardent continued fever;" one cause of which ailment he considered to be "excesses in eating." He quotes, in illustration, Arnott's account of the epidemic of relapsing fever in the 1st Bombay Fusiliers at Peshawur, in 1849 (which will be found in the historical section), but has omitted the three concluding lines regarding the relapses. Arnott's epidemic of relapsing fever was, moreover, of intermittent and not continued fever. The following cases related by this author are examples of relapsing fever; of the intermittent variety, cases 7 and 8; of the remittent, cases 15, 16, 18, 19, 20, 34, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 49, and Dr. Johnson's case in page 132. In cases 40, 41, 42, and 45, death occurred in the relapse. The account of the Sattara jail epidemic of relapsing fever in 1858–59 will be found in the footnote in page 63, and of Hormuzjee's Aden epidemic of 1856 in page 158. Morehead did not meet with any instance in which fever was communicated by contagion, but he admits that the disease might become contagious under mal-hygienic conditions. He does not state in his systematic work the average duration of any form of fever, nor does he make any mention of relapses. I have shown that he has suppressed Arnott's observation of this most remarkable feature of relapsing fever. The fugitive writings of this author are more accurate, and it is to be deeply regretted that he did not

embody in his large work the pathological facts which he has recorded in his article called "Notes on the Treatment and Pathology of Intermittent and Remittent Fever, as observed in the European General Hospital of Bombay, during the five years from July, 1838, to July, 1843," contributed to the "Transactions of the Medical and Physical Society of Bombay," No. vi. for 1843. In this paper he mentions the phenomenon of relapses of fever, and fixes the average duration of "remittent fever in its most common and most tractable form" at six and a half days.

"The Principles and Practice of Medicine; designed chiefly for Students of Indian Medical Colleges," by John Peet, M.D., was published at Bombay, in 1864. This author reproduces Morehead's "ardent continued fever;" assigns it a duration of from two to four days; attributes it to high temperature, but is undecided whether it has any connection with malaria. At its commencement, blood-letting is requisite, and so on. He has a fair description of the eruptive fever, which he calls *dengue* and *scarlatina rheumatica*, after Aitken and Copeland. He disposes of relapsing fever in a footnote in page 516, thus: "Relapsing fever, being for the most part of local prevalence, and quite unknown in the tropics, is not considered." His knowledge of the fact of the occurrence of relapses in intermittent fever has already been referred to.

APPENDICES.

APPENDIX I.

A Letter from J. Z. Holwell, Esq., *to* Wm. Davis, Esq., *from on board the* Syren *Sloop, the 28th of September*, 1757.

Dear Sir,—The confusion which the late capture of the East India Company's settlements in Bengal must necessarily excite in the city of London will, I fear, be not a little heightened by the miserable deaths of the greatest part of those gentlemen who were reduced to the sad necessity of surrendering themselves prisoners at discretion in Fort William.

By narratives made public you will only know that of 146 prisoners, 123 were smothered in the Black-Hole Prison in the night of the 20th June, 1756. Few survived capable of giving any detail of the manner in which it happened, and of these I believe none have attempted it. For my part, I have often sat down with this resolution, and as often relinquished the melancholy task, not only from the disturbance and affliction it raised afresh in my remembrance, but from the consideration of the impossibility of finding language capable of raising an adequate idea of the horrors of the scene I essayed to draw. But as I believe the annals of the world cannot produce an incident like it in any degree or proportion to all the dismal circumstances attending it, and as my own health of body and peace of mind are once again, in a great measure, recovered from the injuries they suffered from that fatal night, I cannot allow it to be buried in oblivion; still conscious, that however high the colouring my retentive memory may supply, it will fall infinitely short of the horrors accompanying this scene. These defects must, and I doubt not will, be assisted by your own humane and benevolent imagination, in the exercise of which I never knew you deficient where unmerited distress was the object.

The sea-air has already had that salutary effect on my constitution I expected; and my mind enjoys a calm it has been many months a stranger to, strengthened by a clear, cheerful

sky and atmosphere, joined to an unusually pleasant gale, with which we are passing the equinoctial. I can now, therefore, look back with less agitation on the dreadful night I am going to describe, and with a grateful heart sincerely acknowledge and deeply revere that Providence, which alone could have preserved me through that and all my succeeding sufferings and hazards.

Before I conduct you into the Black-Hole, it is necessary you should be acquainted with a few introductory circumstances. The suba and his troops were in possession of the fort before six in the evening. I had in all three interviews with him, the last in durbar, before seven, when he repeated his assurances to me, on the word of a soldier, that no harm should come to us; and, indeed, I believe his orders were only general, that we should for that night be secured, and that what followed was the result of revenge and resentment in the breasts of the lower jemmautdaars, to whose custody we were delivered, for the number of their order killed during the siege. Be this as it may, as soon as it was dark, we were all, without distinction, directed by the guard over us to collect ourselves into one body, and sit down quietly under the arched verandah or piazza to the west of the Black-Hole Prison and the barracks to the left of the court of guard, and just over against the windows of the governor's easterly apartments. Besides the guard over us, another was placed at the foot of the stairs at the south end of this verandah, leading up to the south-east bastion, to prevent any of us escaping that way. On the parade (where you will remember the two twenty-four pounders stood) were also drawn up about four or five hundred gun-men with lighted matches.

At this time the factory was in flames to the right and left of us: to the right, the armoury and laboratory; to the left, the carpenter's yard, though at this time we imagined it was the cotton warehouses. Various were our conjectures on this appearance; the fire advanced with rapidity on both sides, and it was the prevailing opinion that they intended suffocating us between the two fires. And this notion was confirmed by the appearance, about half an hour past seven, of some officers and people with lighted torches in their hand, who went into all the apartments under the easterly curtain to the right of us, to which we apprehended they were setting fire to expedite the scheme of burning us. On this, we presently came to a resolution of rushing on the guard, seizing their scymitars, and attacking the troops upon the parade, rather than be thus tamely roasted to death. But to be satisfied of their inten-

tions, I advanced, at the request of Messrs. Baillie, Jinks, and Revely, to see if they were really setting fire to the apartments, and found the contrary; for, in fact, as it appeared afterwards, they were only searching for a place to confine us in, the last they examined being the barracks of the court of guard behind us.

Here I must detain you a little to do honour to the memory of a man, to whom I had in many instances been a friend, and who, on this occasion, demonstrated his sensibility of it in a degree worthy of a much higher rank. His name was Leech, the Company's smith, as well as clerk of the parish. This man had made his escape when the Moors entered the fort, and returned just as it was dark, to tell me he had provided a boat, and would ensure my escape if I would follow him through a passage few were acquainted with, and by which he had then entered. This might easily have been accomplished, as the guard put over us took but very little notice of us. I thanked him in the best terms I was able, but told him it was a step I could not prevail on myself to take, as I should thereby very ill repay the attachment the gentlemen and the garrison had shown to me, and that I was resolved to share their fate, be it what it would, but pressed him to secure his own escape without loss of time; to which he gallantly replied, that "then he was resolved to share mine, and would not leave me."

To myself and the world I should surely have been excused in embracing the overture above-mentioned, could I have conceived what immediately followed; for I had scarce time to make him an answer, before we observed part of the guard drawn up on the parade, advance to us with the officers who had been viewing the rooms. They ordered us all to rise and go into the barracks to the left of the court of guard. The barracks, you may remember, have a large wooden platform for the soldiers to sleep on, and are open to the west by arches and a small parapet-wall, corresponding to the arches of the verandah without. In we went most readily, and were pleasing ourselves with the prospect of passing a comfortable night on the platform, little dreaming of the infernal apartment in reserve for us; for we were no sooner all within the barracks, than the guard advanced to the inner arches and parapet-wall, and, with their muskets presented, ordered us to go into the room at the southernmost end of the barracks, commonly called the Black-Hole Prison; whilst others from the court of guard, with clubs and drawn scymitars, pressed upon those of us next to them. This stroke was so sudden, so unexpected, and the throng and pressure so great upon us next the

door of the Black-Hole Prison, there was no resisting it; but like one agitated wave impelling another, we were obliged to give way and enter. The rest followed like a torrent, few amongst us, the soldiers excepted, having the least idea of the dimensions or nature of a place we had never seen; for if we had, we should at all events have rushed upon the guard, and been, as the lesser evil, by our own choice cut to pieces.

Amongst the first that entered were myself, Messrs. Baillie, Jenks, Cooke, T. Coles, Ensign Scot, Revely, Law, Buchanan, etc. I got possession of the window nearest the door, and took Messrs. Coles and Scot into the window with me, they being both wounded (the first I believe mortally). The rest of the above-mentioned gentlemen were close round me. It was now about eight o'clock.

Figure to yourself, my friend, if possible, the situation of 146 wretches, exhausted by continual fatigue and action, thus crammed together in a cube of about eighteen feet, in a close sultry night, in Bengal, shut up to the eastward and southward (the only quarters from whence air could reach us) by dead walls, and by a wall and door on the north; open only to the westward by two windows, strongly barred with iron, from which we could receive scarce any the least circulation of fresh air.

What must ensue appeared to me in lively and dreadful colours the instant I cast my eyes round and saw the size and situation of the room. Many unsuccessful attempts were made to force the door; for having nothing but our hands to work with, and the door opening inward, all endeavours were in vain and fruitless.

Observing every one giving way to the violence of passion, which I foresaw must be fatal to them, I requested silence might be preserved whilst I spoke to them, and in the most pathetic and moving terms which occurred, "I begged and entreated, that as they had paid a ready obedience to me in the day, they would now for their own sakes and the sakes of those who were dear to them, and were interested in the preservation of their lives, regard the advice I had to give them. I assured them the return of the day would give us air and liberty; urged to them that the only chance we had left for sustaining this misfortune and surviving the night, was the preserving a calm mind and quiet resignation to our fate; intreating them to curb as much as possible every agitation of mind and body, as raving and giving a loose to their passions could answer no purpose but that of hastening their destruction."

This remonstration produced a short interval of peace, and

gave me a few minutes for reflection; though even this pause was not a little disturbed by the cries and groans of the many wounded, and more particularly of my two companions in the window. Death, attended with the most cruel train of circumstances, I plainly perceived must prove our inevitable destiny. I had seen this common migration in too many shapes, and accustomed myself to think on the subject with too much propriety to be alarmed at the prospect, and indeed felt much more for my wretched companions than for myself.

Amongst the guard posted at the windows I observed an old jemmautdaar near me who seemed to carry some compassion for us in his countenance; and indeed he was the only one of the many in his station who discovered the least trace of humanity. I called him to me, and in the most persuasive terms I was capable of, urged him to commiserate the sufferings he was a witness to, and pressed him to endeavour to get us separated, half in one place and half in another, and that he should in the morning receive a thousand rupees for this act of tenderness. He promised be would attempt it, and withdrew; but in a few minutes returned and told me it was impossible. I then thought I had been deficient in my offer, and promised him two thousand. He withdrew a second time, but returned soon, and (with much real pity and concern) told me, it was not practicable; that it could not be done but by the suba's order, and that no one dare awake him.

During this interval, though their passions were less violent, their uneasiness increased. We had been but few minutes confined before every one fell into a perspiration so profuse, you can form no idea of it. This consequently brought on a raging thirst, which still increased in proportion as the body was drained of its moisture.

Various expedients were thought of to give more room and air. To obtain the former, it was moved to put off their clothes. This was approved as a happy motion, and in a few minutes I believe every man was stripped (myself, Mr. Court, and the two wounded young gentlemen by me, excepted). For a little time they flattered themselves with having gained a mighty advantage; every hat was put into motion to produce a circulation of air, and Mr. Baillie proposed that every man should sit down on his hams. As they were truly in the situation of drowning wretches, no wonder they caught at everything that bore a flattering appearance of saving them. This expedient was several times put in practice, and at each time many of the poor creatures, whose natural strength was less than others, or had been more exhausted, and could not

immediately recover their legs as others did, when the word was given to RISE, fell to rise no more, for they were instantly trod to death or suffocated. When the whole body sat down they were so closely wedged together that they were obliged to use many efforts before they could put themselves in motion to get up again.

Before nine o'clock every man's thirst grew intolerable, and respiration difficult. Our situation was much more wretched than that of so many miserable animals in an exhausted receiver: no circulation of fresh air sufficient to continue life, nor yet enough divested of its vivifying particles to put a speedy period to it.

Efforts were made to force the door, but in vain. Many insults were used to the guard to provoke them to fire in upon us (which, as I learned afterwards, were carried to much greater lengths, when I was no more sensible of what was transacted). For my own part, I hitherto felt little pain or uneasiness, but what resulted from my anxiety for the sufferings of those within. By keeping my face between two of the bars I obtained air enough to give my lungs easy play, though my perspiration was excessive and thirst commencing. At this period, so strong an urinous volatile effluvia came from the prison, that I was not able to turn my head that way for more than a few seconds of time.

Now everybody, excepting those situated in and near the windows, began to grow outrageous, and many delirious: *Water, Water,* became the general cry. And the old jemmautdaar before mentioned, taking pity on us, ordered the people to bring some skins of water, little dreaming, I believe, of its fatal effects. This was what I dreaded. I foresaw it would prove the ruin of the small chance left us, and essayed many times to speak to him privately to forbid its being brought, but the clamour was so loud it became impossible. The water appeared. Words cannot paint to you the universal agitation and raving the sight of it threw us into. I had flattered myself that some, by preserving an equal temper of mind, might outlive the night; but now the reflection which gave me the greatest pain was, that I saw no possibility of one escaping to tell the dismal tale.

Until the water came I had myself not suffered much from thirst, which instantly grew excessive. We had no means of conveying it into the prison but by hats forced through the bars, and thus myself and Messrs. Coles and Scot (notwithstanding the pain they suffered from their wounds) supplied them as fast as possible. But those who have experienced

intense thirst, or are acquainted with the cause and nature of this appetite, will be sufficiently sensible it could receive no more than a momentary alleviation; the cause still subsisted. Though we brought full hats within the bars, there ensued such violent struggles and frequent contests to get at it, that before it reached the lips of any one there would be scarcely a small tea-cupful in them. These supplies, like sprinkling water on fire, only served to feed and raise the flame.

Oh, my dear sir, how shall I give you a conception of what I felt at the cries and ravings of those in the remoter parts of the prison, who could not entertain a probable hope of obtaining a drop, yet could not divest themselves of expectation, however unavailing, and others calling on me by the tender considerations of friendship and affection, and who knew they were really dear to me! Think, if possible, what my heart must have suffered at seeing and hearing their distress, without having it in my power to relieve them, for the confusion now became general and horrid. Several quitted the other window (the only chance they had for life) to force their way to the water, and the throng and press upon the window was beyond bearing; many forcing their passage from the further part of the room, pressed down those in their way who had less strength, and trampled them to death.

Can it gain belief that this scene of misery provided entertainment to the brutal wretches without? But so it was; and they took care to keep us supplied with water that they might have the satisfaction of seeing us fight for it as they phrased it, and held up lights to the bars that they might lose no part of the inhuman diversion.

From about nine to near eleven I sustained this cruel scene and painful situation, still supplying them with water, though my legs were almost broken with the weight against them. By this time I myself was very near pressed to death and my two companions, with Mr. William Parker (who had forced himself into the window), were really so.

For a great while they preserved a respect and regard to me, more than indeed I could well expect, our circumstances considered; but now all distinction was lost. My friend Baillie, Messrs. Jenks, Revely, Law, Buchanan, Simson, and several others, for whom I had a real esteem and affection, had for some time been dead at my feet and were now trampled upon by every corporal or common soldier, who by the help of more robust constitutions had forced their way to the window and held fast by the bars over me, till at last I became so pressed and wedged up, I was deprived of all motion.

Determined now to give everything up, I called to them, and begged, as the last instance of their regard, they would remove the pressure upon me, and permit me to retire out of the window, to die in quiet. They gave way, and with much difficulty I forced a passage into the centre of the prison, where the throng was less by the many dead (then I believe amounting to one-third,) and the number who flocked to the windows, for by this time they had water also at the other window.

In the Black-Hole there is a platform, corresponding with that in the barracks. I travelled over the dead, and repaired to the further end of it, just opposite the other window, and seated myself on the platform between Mr. Dumbleton and Captain Stevenson, the former just then expiring. I was still happy in the same calmness of mind I had preserved the whole time. Death I expected as unavoidable, and only lamented its slow approach, though the moment I quitted the window, my breathing grew short and painful.

Here my poor friend, Mr. Edward Eyre, came staggering over the dead to me with his usual coolness and good-nature, and asked me how I did, but fell and expired before I had time to make him a reply. I laid myself down on some of the dead behind me on the platform, and recommending myself to Heaven, had the comfort of thinking my sufferings could have no long duration.

My thirst grew now insupportable, difficulty of breathing much increased, and I had not remained in this situation, I believe, ten minutes, when I was seized with a pain in my breast and palpitation of my heart, both to the most exquisite degree. These roused and obliged me to get up again; but still the pain, palpitation, thirst, and difficulty of breathing increased. I retained my senses, notwithstanding, and had the grief to see death not so near me as I hoped, but could no longer bear the pains I suffered without attempting a relief, which I knew fresh air would and could only give me. I instantly determined to push for the window opposite to me, and by an effort of double the strength I ever before possessed, gained the third rank at it, with one hand seized a bar, and by that means gained the second, though I think there were at least six or seven ranks between me and the window.

In a few moments my pain, palpitation and difficulty of breathing ceased; but my thirst continued intolerable. I called aloud for "WATER, FOR GOD'S SAKE:" I had been concluded dead; but as soon as they heard me amongst them, they had still the respect and tenderness for me, to cry out, "GIVE HIM WATER:

GIVE HIM WATER!" nor would one of them at the window attempt to touch it until I had drunk. But from the water I found no relief; my thirst was rather increased by it, so I determined to drink no more, but patiently wait the event, and keep my mouth moist from time to time by sucking the perspiration out of my shirt-sleeves, and catching the drops as they fell, like heavy rain from my head and face. You can hardly imagine how unhappy I was if any of them escaped my mouth.

I came into the prison without coat or waistcoat; the season was too hot to bear the former, and the latter tempted the avarice of one of the guard, who robbed me of it when we were under the verandah. Whilst I was at this second window, I was observed by one of my miserable companions on the right of me, in the expedient of allaying my thirst by sucking my shirt-sleeves. He took the hint, and robbed me from time to time of a considerable part of my store; though after I detected him I had ever the address to begin on that sleeve first, when I thought my reservoirs were sufficiently replenished, and our mouths and noses often met in the contest. This plunderer, I found afterwards, was a worthy young gentleman in the service, Mr. Lushington, one of the few who escaped from death, and since paid me the compliment of assuring me he believed he owed his life to the many comfortable draughts he had from my sleeves. I mention this incident, as I think nothing can give you a more lively idea of the melancholy state and distress we were reduced to. Before I hit upon this happy expedient, I had, in an ungovernable fit of thirst, attempted drinking my urine; but it was so intensely bitter, there was no enduring a second taste, whereas no Bristol water could be more soft or pleasant than what arose from perspiration.

By half an hour past eleven, the much greater number of those living were in an outrageous delirium, and the others quite ungovernable; few retaining any calmness but the ranks next the windows. By what I had felt myself, I was fully sensible what those within suffered; but had only pity to bestow upon them, not then thinking how soon I should myself become a greater object of it.

They all now found that water, instead of relieving, rather heightened their uneasiness; and, "AIR, AIR," was the general cry. Every insult that could be devised against the guard, all the opprobrious names and abuse that the suba, Monickchund, etc., could be loaded with, were repeated to provoke the guard to fire upon us, every man that could, rushing tumultuously

towards the windows with eager hopes of meeting the first shot. Then a general prayer to heaven, to hasten the approach of the flames to the right and left of us, and put a period to our misery. But these failing, they whose strength and spirits were quite exhausted, laid themselves down and expired quietly upon their fellows. Others who had yet some strength and vigour left, made a last effort for the windows, and several succeeded by leaping and scrambling over the back and heads of those in the first ranks, and got hold of the bars, from which there was no removing them. Many to the right and left sank with the violent pressure, and were soon suffocated; for now a steam arose from the living and the dead which affected us in all its circumstances, as if we were forcibly held with our heads over a bowl full of strong volatile spirits of hartshorn until suffocated; nor could the effluvia of the one be distinguished from the other, and frequently, when I was forced by the load upon my head and shoulders, to hold my face down, I was obliged, near as I was to the window, instantly to raise it again to escape suffocation.

I need not, my dear friend, ask your commiseration, when I tell you, that in this plight, from half an hour past eleven till near two in the morning, I sustained the weight of a heavy man with his knees in my back, and the pressure of his whole body on my head. A Dutch serjeant, who had taken his seat upon my shoulder, and a Topaz,* bearing on my right, all which nothing could have enabled me long to support, but the props and pressure equally sustaining me all around. The two latter I frequently dislodged, by shifting my hold on the bars, and driving my knuckles into their ribs; but my friend above stuck fast, and as he held by two bars was immoveable.

When I had bore this conflict above an hour with a train of wretched reflection, and seeing no glimpse of hope on which to found a prospect of relief, my spirits, resolution, and every sentiment of religion gave way. I found I was unable much longer to support this trial, and could not bear the dreadful thought of retiring into the inner part of the prison, where I had before suffered so much. Some infernal spirit, taking the advantage of this period, brought to my remembrance my having a small clasp-penknife in my pocket, with which I determined instantly to open my arteries, and finish a system no longer to be borne. I had got it out when Heaven interposed, and restored me to fresh spirits and resolution with an abhorrence of the act of cowardice I was just going to commit.

* A black Christian soldier, usually termed subjects of Portugal.

I exerted anew my strength and fortitude, but the repeated trials and efforts I made to dislodge the insufferable incumbrances upon me at last quite exhausted me, and towards two o'clock, finding I must quit the window, or sink where I was, I resolved on the former, having borne, truly for the sake of others, infinitely more for life then the best of it is worth.

In the rank close behind me was an officer of one of the ships, whose name was Carey, who had behaved with much bravery during the siege (his wife, a fine woman, though country-born, would not quit him, but accompanied him into the prison, and was one who survived). This poor wretch had been long raving for water and air. I told him I was determined to give up life, and recommended his gaining my station. On my quitting, he made a fruitless attempt to get my place, but the Dutch serjeant who sat on my shoulder supplanted him.

Poor Carey expressed his thankfulness, and said he would give up life too; but it was with the utmost labour we forced our way from the window (several in the inner ranks appearing to me dead standing, unable to fall by the throng, and equal pressure around). He laid himself down to die; and his death, I believe, was very sudden, for he was a short, full sanguine man; his strength was great, and I imagine, had he not retired with me, I should have never been able to have forced my way.

I was at this time sensible of no pain and little uneasiness. I can give you no better idea of my situation than by repeating my simile of the bowl of spirit of hartshorn. I found a stupor coming on apace, and laid myself down by that gallant old man, the Reverend Mr. Jervas Bellamy, who lay dead with his son, the lieutenant, hand-in-hand, near the southernmost wall of the prison.

When I had lain there some little time, I still had reflection enough to suffer some uneasiness in the thought that I should be trampled upon when dead, as I myself had done to others. With some difficulty I raised myself, and gained the platform a second time, where I presently lost all sensation; the last trace of sensibility that I have been able to recollect after my lying down was my sash being uneasy about my waist, which I untied and threw from me.

Of what passed in this interval to the time of my resurrection from this hole of horrors, I can give you no account; and indeed the particulars mentioned by some of the gentlemen who survived (solely by the number of those dead, by which they gained a freer accession of air and approach to the

windows) were so excessively absurd and contradictory as to convince me very few of them retained their senses; or, at least, lost them soon after they came into the open air, by the fever they carried out with them.

In my own escape from absolute death the hand of Heaven was manifestly exerted; the manner take as follows. When the day broke, and the gentlemen found that no entreaties could prevail to get the door opened, it occurred to one of them (I think to Mr. Secretary Cooke) to make a search for me, in hopes I might have influence enough to gain a release from this scene of misery. Accordingly, Messrs. Lushington and Walcot undertook the search, and by my shirt discovered me under the dead upon the platform. They took me from thence; and imagining I had some signs of life, brought me towards the window I had first possession of.

But as life was equally dear to every man (and the stench arising from the dead bodies was grown intolerable), no one would give up his station in or near the window; so they were obliged to carry me back again. But soon after Captain Mills (now captain of the Company's yacht), who was in possession of a seat in the window, had the humanity to offer to resign it. I was again brought by the same gentlemen, and placed in the window.

At this juncture the suba, who had received an account of the havock death had made amongst us, sent one of his jemmautdaars, to inquire if the chief survived. They showed me to him; told him I had appearance of life remaining, and believed I might recover if the door was opened very soon. This answer being returned to the suba, an order came immediately for our release, it being then near six in the morning.

The fresh air at the window soon brought me to life, and a few minutes after the departure of the jemmautdaar, I was restored to my sight and senses. But oh! sir, what words shall I adopt to tell you the whole that my soul suffered at reviewing the dreadful destruction round me? I will not attempt it; and indeed, tears (a tribute I believe I shall ever pay to the remembrance of this scene, and to the memory of those brave and valuable men) stop my pen.

The little strength remaining amongst the most robust who survived made it a difficult task to remove the dead piled up against the door, so that I believe it was more than twenty minutes before we obtained a passage out for one at a time.

I had soon reason to be convinced the particular inquiry made after me did not result from any dictate of favour, humanity, or contrition. When I came out, I found myself in a

high putrid fever, and not being able to stand, threw myself on the wet grass without the verandah, when a message was brought me signifying I must immediately attend the suba. Not being capable of walking, they were obliged to support me under each arm; and on the way, one of the jemmautdaars told me, as a friend, to make a full confession where the treasure was buried in the fort, or that in half an hour I should be shot off from the mouth of a cannon. The intimation gave me no manner of concern; for at that juncture I should have esteemed death the greatest favour the tyrant could have bestowed upon me.

Being brought into his presence, he soon observed the wretched plight I was in, and ordered a large folio volume, which lay on a heap of plunder, to be brought for me to sit on, I endeavoured two or three times to speak, but my tongue was dry and without motion. He ordered me water. As soon as I got speech, I began to recount the dismal catastrophe of my miserable companions. But he stopped me short with telling me, he was well informed of great treasure being buried or secreted in the fort, and that I was privy to it; and if I expected favour, must discover it.

I urged everything I could to convince him there was no truth in the information, or that, if any such thing had been done, it was without my knowledge. I reminded him of his repeated assurance to me the day before; but he resumed the subject of the treasure, and all I could say seemed to gain no credit with him. I was ordered prisoner under Mhir Muddon, general of the household troops.

Amongst the guard which carried me from the suba, one bore a large Moratter battle-axe, which gave rise, I imagine, to Mr. Secretary Cooke's belief and report to the fleet that he saw me carried out, with the edge of the axe towards me, to have my head struck off. This, I believe, is the only account you will have of me, until I bring you a letter myself. But to resume my subject: I was ordered to the camp of Mhir Muddon's quarters, within the outward ditch, something short of Omychund's garden (which, you know is above three miles from the fort), and with me Messieurs Court, Walcot, and Burdet. The rest who survived the fatal night gained liberty, except Mrs. Carey, who was too young and handsome. The dead bodies were promiscuously thrown into the ditch of our unfinished ravelin, and covered with the earth.

My being treated with this severity, I have sufficient reason to affirm, proceeded from the following causes: The suba's resentment for my defending the fort after the governor, etc.,

had abandoned it; his prepossession touching the treasure and, thirdly, the instigation of Omychund in resentment for my not releasing him out of prison as soon as I had the command of the fort—a circumstance which, in the heat and hurry of action, never once occurred to me, or I had certainly done it, because I thought his imprisonment unjust. But that the hard treatment I met with may truly be attributed in a great measure to his suggestion and insinuation, I am well assured, from the whole of his subsequent conduct; and this further confirmed to me, in the three gentlemen selected to be my companions, against each of whom he had conceived particular resentment, and you know Omychund can never forgive.

We were conveyed in a hackery* to the camp, the 21st of June, in the morning, and soon loaded with fetters, and stowed, all four, in a sepoy's tent, about four feet long, three wide, and about three high; so that we were half in, half out. All night it rained severely. Dismal as this was, it appeared a paradise compared with our lodging the preceding night. Here I became covered from head to foot with large painful boils, the first symptom of my recovery; for until these appeared, my fever did not leave me.

On the morning of the 22nd they marched us to town in our fetters, under the scorching beams of an intense hot sun, and lodged us at the dock-head in the open small veranda, fronting the river, where we had a strong guard over us, commanded by Bundo Sing Hazary, an officer under Mhir Muddon. Here the other gentlemen broke out likewise in boils all over their bodies (a happy circumstance, which, as I afterwards learned, attended every one who came out of the Black Hole).

On our arrival at this place, we soon were given to understand we should be embarked for Muxadabad, where I think you have never been; and since I have brought you thus far, you may as well take this trip with us likewise. I have much leisure on my hands at present, and you know you may choose your leisure for perusal.

We set out on our travels from the Dock-head the 24th, in the afternoon, and were embarked on a large wollack,† containing part of Bundo Sing's plunder, etc. She bulged ashore a little after we set off, and broke one of her floor timbers; however they pushed on, though she made so much water she could hardly swim. Our bedstead and bedding were a platform of loose, unequal bamboos laid on the bottom timbers; so that when they had been negligent in bailing, we frequently waked

* A coach drawn by oxen.

† A large boat.

with half of us in the water. We had hardly any clothes to our bodies, and nothing but a bit of mat, and a bit or two of old gunny-bags, which we begged at the Dock-head, to defend us from the sun, rains, and dews. Our food only rice and the water along-side, which, you know, is neither very clean nor very palateable in the rains; but there was enough of it without scrambling.

In short, sir, though our distress in this situation, covered with tormenting boils, and loaded with iron, will be thought, and doubtless was very deplorable, yet the grateful consideration of our being so providentially a remnant of the saved made everything appear light to us. Our rice and water diet, designed as a grievance to us, was certainly our preservation; for, could we (circumstanced as were) have indulged in flesh and wine, we had died beyond all doubt.

When we arrived at Hougly fort, I wrote a short letter to Governor Bisdom (by means of a pencil and blank leaf of a volume of Archbishop Tillotson's sermons, given us by one of our guard, part of his plunder), advising him of our miserable plight. He had the humanity to despatch three several boats after us, with fresh provisions, liquors, clothes, and money, neither of which reached us. But, "Whatever is, is right." Our rice and water were more salutary and proper for us.

Matters ridiculous and droll abundantly occurred in the course of our trip. But these I will postpone for a personal recital that I may laugh with you, and will only mention that MY hands alone being free from imposthumes, I was obliged for some time to turn nurse and feed my poor distressed companions.

When we came opposite to Santipore, they found the wollack would not be able to proceed farther, for want of water in the river, and one of the guard was sent ashore to demand of the zemindar of that district light boats to carry prisoners of state under their charge to Muxadabad. The zemindar, giving no credit to the fellow, mustered his guard of pikes, beat him, and drove him away.

This, on the return of the burkandass, raised a most furious combustion. Our jemmautdaar ordered his people to arms, and the resolution was to take the zemindar and carry him bound a prisoner to Muxadabad. Accordingly they landed with their firearms, swords, and targets; when it occurred to one mischievous mortal amongst them, that the taking me with them would be a proof of their commission, and the high offence the zemindar had committed.

Being immediately lugged ashore, I urged the impossibility

of my walking, covered as my legs were with boils, and several of them in the way of my fetters; and entreated, if I must go, that they would for the time take off my irons, as it was not in my power to escape from them, for they saw I was hardly able to stand. But I might as well have petitioned tigers, or made supplication to the wind. I was obliged to crawl. They signified to me, it was now my business to obey, and that I should remember, I was not then in the Kella of Allynâgore.* Thus was I marched in a scorching sun, near noon, for more than a mile and a half; my legs running a stream of blood from the irritation of my irons, and myself ready to drop every step with excessive faintness and unspeakable pain.

When we came near the cutcherry of the district, the zemindar with his pikes were drawn up ready to receive us; but as soon as they presented me to him as a prisoner of state, estimated and valued to them at four-lack of rupees, he confessed himself sensible of his mistake, and made no further show of resistance. The jemmautdaar seized him, and gave orders to have him bound and sent to the boat; but on his making further submission, and promising to get boats from Santipore to send after us, and agreeing to pay them for the trouble he had caused, he was released and matters accommodated.

I was become so very low and weak by this cruel travel, that it was some time before they would venture to march me back; and the "hard-hearted villains," for their own sakes, were at last obliged to carry me part of the way, and support me the rest, covering me from the sun with their shields. A poor fellow, one of our under-gomastaus of Santipore, seeing me at the cutcherry, knew me, and, with tears in his eyes, presented me with a bunch of plantains, the half of which my guard plundered by the way.

We departed from hence directly, in expectation of boats following, but they never came; and the next day (I think the last of June) they pressed a small, open fishing-dingy, and embarked us on that with two of our guard only; for, in fact, any more would have sunk her. Here we had a bed of bamboos, something softer, I think, than those of the great boat; that is, they were something smoother, but we were so distressed for room, that we could not stir without our fetters bruising our own or each others' boils, and were in woeful distress indeed, not arriving at Muxadabad until the 27th of July, in the afternoon. We were all this while exposed to one regular succession of heavy rain, intense sunshine, and nothing to defend us from either.

* The name given to Calcutta, by the suba, after the capture.

But then don't let me forget our blessings; for by the good-nature of one of our guards, Shaike Bodul, we now and then latterly got a few plantains, onions, parched rice, with jaggree,* and the bitter green, called curella; all which were to us luxurious indulgences, and made the rice go down deliciously.

On the 7th of July, early in the morning, we came in sight of the French factory. I had a letter for Mr. Law, the chief, and prevailed with my friend Bodul, to put to there. On the receipt of my letter, Mr. Law, with much politeness and humanity, came down to the water-side, and remained near an hour with us. He gave the shaike a genteel present for his civilities, and offered him a comfortable reward and security if he would permit us to land for an hour's refreshment; but he replied, his head would pay for the indulgence. After Mr. Law had given us a supply of clothes, linen, provisions, liquors, and cash, we left his factory with grateful hearts and compliments.

We could not, as you may imagine, long resist touching our stock of provisions; but however temperate we thought ourselves, we were all disordered more or less by this first indulgence. A few hours after I was seized with a painful inflammation in my right leg and thigh.

Passing by our fort and factory at Cossimbuzar raised some melancholy reflections amongst us. About four in the afternoon we landed at Muxadabad, and were conducted to, and deposited in, an open stable, not far from the suba's palace in the city.

This march, I will freely confess to you, drew tears of disdain and anguish of heart from me, thus to be led like a felon, a spectacle to the inhabitants of this populous city! My soul could not support itself with any degree of patience; the pain, too, arising from my boils and inflammation of my leg, added not a little, I believe, to the depression of my spirits.

Here we had a guard of Moors placed on one side of us, and a guard of Gentoos on the other; and being destined to remain in this place of purgatory until the suba returned to the city, I can give you no idea of our sufferings. The immense crowd of spectators, who came from all quarters of the city to satisfy their curiosity, so blocked us up from morning till night that I may truly say we narrowly escaped a second suffocation, the weather proving exceeding sultry.

The first night after our arrival in the stable, I was attacked with fever; and that night and next day the inflammation of

* Molasses.

my leg and thigh greatly increased; but all terminated the second night in a regular fit of the gout in my right foot and ankle, the first and last fit of this kind I ever had. How my irons agreed with this new visitor I leave you to judge; for I could not by any entreaty obtain liberty for so much as that poor leg.

During our residence here we expected every act of humanity and friendship from Mons. Law and Mynheer Vernet, the French and Dutch chiefs of Cossimbuzar, who left no means unessayed to procure our release. Our provisions were regularly sent us from the Dutch Tanksal* in Coriemabad; and we were daily visited by Messrs. Ross and Ekstone, the chief and second there, and indeed received such instances of commiseration and affection from Mynheer Ross, as will ever claim my most grateful remembrance.

The whole body of Armenian merchants too, were most kind and friendly to us, particularly Aga Manuel Satoor. We were not a little indebted to the obliging good-natured behaviour of Messrs. Hastings and Chambers, who gave us as much of their company as they could. They had obtained their liberty by the French and Dutch chief becoming bail for their appearance. This security was often tendered for us, but without effect.

The 11th of July the suba arrived in the city, and with him Bundoo Sing, to whose house we were removed that afternoon in a hackery, for I was not able to put my foot to the ground. Here we were confirmed in a report which had before reached us that the suba, on his return to Houghly, made inquiry for us when he released Messieurs Watts and Collett, etc., with intention to release us also; and, that he had expressed some resentment at Mhir Muddon for having so hastily sent us up to Muxadabad. This proved a very pleasing piece of intelligence to us, and gave reason to hope the issue would be more favourable to us than we expected.

Though we were here lodged in an open bungulo only, yet we found ourselves relieved from the crowd of people which had stifled us at the stable, and once more breathed the fresh air. We were treated with much kindness and respect by Bundoo Sing, who generally passed some time or other of the day with us, and feasted us with hopes of being soon released.

The 15th we were conducted in a hackery to the kella, in order to have an audience of the suba, and know our fate. We were kept above an hour in the sun, opposite the gate. Whilst

* The Dutch mint near Muxadabad.

here we saw several of his ministers brought out disgraced, in the custody of sootapurdars, and dismissed from their employs, who but a few minutes before we had seen enter the kella in the utmost pomp and magnificence.

Receiving advice, that we should have no audience or admittance to the suba that day, we were deposited again at our former lodgings, the stables, to be at hand, and had the mortification of passing another night there.

The 16th, in the morning, an old female attendant on Allyverdy Cawn's Begum* paid a visit to our Shaike, and discussed half-an-hour with him. Overhearing part of the conversation to be favourable to us, I obtained the whole from him, and learned, that at a feast the preceding night, the begum had solicited our liberty, and that the suba had promised he would release us on the morrow. This, you will believe, gave us no small spirits; but at noon all our hopes were dashed by a piece of intelligence from Bundoo Sing, implying that an order was prepared, and ready to pass the seal, for returning us in irons to Rajah Monickchund, governor of Allynâgore, the name the suba had given to Calcutta.

I need not tell you what a thunderclap this proved to us in the very height of our flattering expectations, for I was, as to myself, well convinced I should never have got alive out of the hands of that rapacious harpy, who is a genuine Hindoo, in the very worst acceptation of the word; therefore, from that moment, gave up every hope of liberty.

Men in this state of mind are generally pretty easy; it is hope which gives anxiety. We dined and laid ourselves down to sleep, and for my own part, I never enjoyed a sounder afternoon's nap.

Towards five the shaike waked me with notice that the suba would presently pass by to his palace, Mooteejeel. We roused, and desired the guard would keep the view clear for us. When the suba came in sight, we made him the usual salaam; and when he came abreast of us he ordered his litter to stop, and us to be called to him. We advanced, and I addressed him in a short speech, setting forth our sufferings, and petitioned for our liberty. The wretched spectacle we made must, I think, have made an impression on a breast most brutal; and if he is capable of pity or contrition, his heart felt it then. I think it appeared in spite of him in his countenance. He gave me no reply, but ordered a sootapurdar and chubdar immediately to see our irons cut off, and to conduct us wherever we chose

* The dowager princess, grandmother of Surajud Dowla.

to go, and to take care we received no trouble nor insult; and having repeated this order distinctly, directed his retinue to go on. As soon as our legs were free we took boat, and proceeded to the Tanksall, where we were received and entertained with real joy and humanity.

Thus, my worthy friend, you see us restored to liberty, at a time when we could entertain no probable hope of ever obtaining it. The foundation of the alarm at noon was this:— Moneloll, the suba's dewan, and some others, had in the morning taken no small pains to convince the suba, "that, notwithstanding my losses at Allynâgore, I was still possessed of enough to pay a considerable sum for my freedom, and advised the sending me to Monickchund, who would be better able to trace out the remainder of my effects." To this I was afterwards informed the suba replied: "It may be; if he has anything left, let him keep it; his sufferings have been great, he shall have his liberty." Whether this was the result of his own sentiments, or the consequence of his promise the night before to the old begum, I cannot say; but believe we owe our freedom partly to both,

Being myself once again at liberty, it is time I should release you, sir, also from the unpleasing travel I have led you, in this narrative of our distresses, from our entrance into that fatal Black-Hole. And, shall it after all be said, or even thought, that I can possibly have arraigned or commented too severely on a conduct which alone plunged us into these unequalled sufferings? I hope not. I am, dear sir,

Your most faithful and obedient humble servant,

J. Z. HOLWELL.

The allusion in the concluding paragraph, is to the defection of the Governor and others: "to wit the Governor, Messrs. Manningham, Frankland, Macket, the principal officers, and a considerable part of the colony, abandoning your fort, effects, and garrison, with the ships and vessels, whereby the retreat of those who remained, was to all intents and purposes cut off, to the number of 170 persons, and left a sacrifice to an exasperated and merciless enemy. . . . Mr. Pearke's waving his right to seniority, he, and the gentlemen in council, with the unanimous approval of the gentlemen in the service, the garrison, and inhabitants, elected me their Governor and Administrator of your affairs during the troubles, and suspended your President, and Messrs. Manningham, Frankland, and Macket from your service, for their breach of trust; as also the military officers who accompanied them." Letter of Mr. Holwell to the Court of Directors, dated Fulta, Nov. 30th, 1756.

APPENDIX II.

The experiment of the Judges of the Court of Nizamut Adawlut, on the prisoners in the Jails of the North Western Provinces, in the year 1842.

(Extracted from *The India Journal of Medical and Physical Science*. New series, vol. i., 1843, p. 202.)

No. 456.

To A. Lang, Esq., Sessions Judge of Allahabad.

N. A. N. W. P. Present B. Taylor and F. Currie, Judges, and H. Thomas, Offy. Judge.

Sir,—I am directed to acknowledge the receipt of your letter, No. 15, dated 29th ultimo, with its inclosure, reporting the existence of a severe mortality amongst the prisoners in the Allahabad jail, and the measures adopted by the magistrate in communication with the medical officer, and with your sanction, to check this calamitous visitation, with their result.

2nd. This mortality which is stated to have occurred principally among the convicts employed in hard road labour, and exposed to the sun, is referred by the civil surgeon to the inadequate quantity of food supplied to them, under the system of reduced diet allowance sanctioned by circular order of the Nizamut Adawlut, dated 2nd, and published in the *Government Gazette* of 20th July, 1841, viz., three quarters of a seer of meal per diem. To this opinion, as stated generally by Mr. Beattie from the commencement of the experiment, neither yourself nor the magistrate, Mr. Montgomery, were disposed to incline; recent inquiry and observation have, however, suggested to you a modification of the view at first taken, in so far as relates to the prisoners compelled to hard labour and exposure, whose adequate nourishment from the present scale of ration you are disposed to doubt.

3rd. I am directed to express the court's approval of the various measures of remedy and prevention so promptly taken to arrest the evil, such as the removal of the prisoners from jail to a different location, their exemption from all labour and exposure to the sun, etc.; the step taken by the magistrate of increasing the ration by a quarter of a seer, as a temporary arrangement, is likewise under the circumstances approved of, for where the court observe even a possibility exists of Mr.

Beattie's view of the inadequacy of the supply being correct and well-founded, it would be wrong to refuse concession to it as a trial, at least on an occasion of so formidable a nature, in which human life and the safety of so many suffering beings are concerned. The court at the same time concur with you in deeming the extension of the increase of ration to prisoners of other classes, such as female prisoners exempt from, or kept to light labour, and youths, unnecessary and inexpedient.

4th. I am directed to forward for your information copy of a circular this day sent to the *Agra Government Gazette*, according a discretionary sanction to Magistrates generally to proceed, on clear exigency shown to the same extent as has been done here, in increasing the daily ration up to one seer.

5th. It will be interesting and important to watch the effects of this increase of food; and whether any improvement in the sanitary state of the prisoners, which the court are glad to learn has already taken place, can be clearly traced to it, without risking the ascription to the measure in question of a result which may have proceeded from other causes; and on this point the court wish to receive an early report.

6th. The shortness of the period during which the reduced diet has been in use, hitherto deterred the court from gathering opinions regarding its operation, especially since complaints on the health of the prisoners have been unheard of save from one or two quarters.

I have, etc.,
(Signed) M. SMITH,
Registrar.

Allahabad, May 4th, 1842.

No. 580 (*Circular*).

To the Magisterial Authorities in the North Western Provinces.

N. A. N. W. P. Present B. Taylor and F. Currie, Judges, and H. H. Thomas, Offy. Judge.

The Court having received some statements that give reason to doubt how far the reduced allowance of daily ration to prisoners, viz., twelve chittacks of meal, prescribed by Circular Order, dated 2nd, and published in the *Government Gazette* of the 20th July last, is quite adequate for the maintenance in a state of strength and fitness for hard labour, of those convicts among the inmates of the jails, who are sub-

jected to hard work on the roads, and exposed to the ardour of the sun, deem it proper, while they as yet see no grounds for any general modification of the order above quoted on the plea of the scale of diet sanctioned by it, being too low in respect to any other classes of prisoners; at the same time to accord a conditional discretion to magistrates in communication with the civil surgeon, and with the assent of that officer, to increase the daily allowance of three-quarters of a seer, whenever there is good reason to conclude that failure of health and strength in such prisoners, is connected with the insufficient quantity of food allowed them.

2nd. This discretion should be exercised with caution, and only in manifest cases of exigency, and its effects watched that means may be afforded for judging whether improvement in the sanitary state of the prisoners to whom the indulgence is extended, is the consequence.

(Signed) M. SMITH,
Registrar.

Allahabad, May 4th, 1842.

The result of the experiment of the judges will be found in the Historical Section, at page 53.

APPENDIX III.

Relapsing Fever in Lower Bengal. By R. T. Lyons, *Assistant Surgeon.* (*Originally published in the* Indian Medical Gazette, *for October and November*, 1871.)

Within recent years several epidemics of fever, of a most destructive nature, have occurred in various districts of Lower Bengal. It would appear from Dr. Elliot's report, published as a supplement in the *Calcutta Gazette*, for June, 1863, that, since 1824, fever has periodically broken out as an epidemic in the Jessore, Baraset, and Hooghly districts. In 1862 a terrible epidemic appeared in the Hooghly, Nuddea, and Baraset districts; and the Government of Bengal appointed a commission, of which Dr. Elliot was a member, to inquire into the causes of the fever, and to propose measures for its prevention in future years. From Dr. D. B. Smith's first annual report for 1868, of the sanitary administration of Lower Bengal, I have obtained the following particulars. In 1846 an epidemic occurred at Jessore. The amount of fever was perfectly ap-

palling, and the mortality most excessive. In the city of Jessore, with population of about 6000 people, 10 deaths occurred daily. No other epidemic, it is stated, occurred in the city up to 1865, in which year there was a great outbreak in all the adjoining districts, which was believed to have originated in Jessore. It appears that the inhabitants consider an outbreak of fever in September, October, and November of each year a normal occurrence, and only exceptional outbreaks, such as those of 1846 and 1868, occasion alarm. In May and June, 1868, an epidemic occurred in a large village called Dhamptee, in Tipperah: out of a population of 3000, 300 were attacked, and 40 died within one week. At Rampore Bauleah, or Rajshahye, a "bad form of fever" prevailed in and near Dooteah at the end of the rainy season. It is said to have been "something like an epidemic," and many persons died. In July, 1868, a "very bad form of fever" prevailed all over the district of Rajshahye. Europeans and natives were equally affected, and "a good many" died of it. In 1865, the 11th Regiment Native Infantry, lost 250 men at Patlakowah, in the Julpigoree district, and "suffered greatly in its march through the terai." At the close of 1866, Burdwan was affected with an epidemic. The disease spread from the Hooghly and Nuddea districts to a large number of villages near Mymarree and Culna. The predisposing cause was the famine of 1866, during which the poorer classes suffered very severely, and of these classes the village population is almost entirely composed. The mortality was very considerable, and resulted rather from the sequelæ than from the first attack of the fever. About three-fourths of the people of a village would suffer from the epidemic, and the mortality amounted to 6 per cent. In the Selimabad division of Burdwan, consisting of 123 villages, containing 51,925 persons, 884 deaths occurred from the "epidemic fever," or 17 per thousand. In the Gungooria division, containing 38 villages, with a population of 27,221 persons, 1259 deaths, or 46·1 per thousand. This heavy mortality resulted in three or four months. In 1865, severe "epidemic fever" broke out at Rajmahal. In Dr. Smith's annual report for 1869, allusions are made to a "terrible visitation of fever" at Burdwan and Serampore, in the 24 Pergunnahs and the Hooghly district, but details are not given. It would also appear that "epidemic fever" has visited many other places besides those above mentioned.

Regarding the nature of the fever which has been so widespread and destructive, the reporters have not given any definite explanation. The majority have contented themselves

with calling it a "malarious fever," the symptoms of which are "those of malarious fevers generally," but more violent. While the predisposing causes were privation and famine, as already stated, the exciting cause, we are told, was "a malarious atmospheric wave gradually spreading in a north-west direction." It would appear, however, that the above cause has been affirmed in a mood of desperation, for no other manifest reason than because it is difficult to assign any other than malaria for "this highly malarious fever" (page 230 of Dr. Smith's report for 1868). The perusal of reports containing a semeiology and etiology of the above nature, has compelled Dr. Smith, the sanitary commissioner, to form, not unreasonably, the conclusion that the "epidemic fever" of Lower Bengal is not relapsing fever, but "a typical malarious epidemic fever, due to local causes, such as want of drainage, partial or complete stagnation of water courses, and saturation of the soil with moisture. It is not characterised by a relapse or a crisis, and it is not contagious. . . . The study of masses of recorded facts proves this beyond doubt" (page 534 of the report for 1868). Reasoning upon the same data, Mr. W. J. Moore, of Rajpootana, in an article called "Sanitary Reform in India," which appeared in the *Calcutta Review*, and was noticed in the *Medico-Chirugical Review*, thus writes regarding these epidemics:—"The fever may be best described as of a mixed type, *typho-malarial*, and it appears probable that the typhoid condition is dependent on the want of sanitation generally apparent, the basis of the fever (if we may use such an expression) being malarious."

Although, as I have above remarked, the conclusions arrived at by these two well-known writers are deductions from the *recorded* facts and opinions of the reporters, it might be permitted me to indulge the conjecture that all the phenomena connected with the fever have not been recorded—that some have been overlooked, and that the facts actually recorded have been incorrectly collocated, and not viewed in the light of modern pathology. The accounts of these epidemics are unintelligible. It is singular that fever of the character attributed to the village disease is not to be met with in Calcutta, nor have the systematic writers described any form of fever which answers to these accounts of the "epidemic fever" of Lower Bengal. Writing in 1864, Dr. Chuckerbutty expressed his inability to understand from the written descriptions the "epidemic fever," which had for the two previous years "been ravaging the villages of Lower Bengal." He says,—"nor can I make out its exact pathology and symptoms

from the reports submitted to Government by Dr. Elliot and the Epidemic Commission," etc. (*Indian Annals*, no. xviii., page 126). The same difficulty is felt by all who have, in this country, accepted the pathology of fevers established by Jenner and Murchison, and have endeavoured to ascertain the nature of the destructive epidemics of Lower Bengal.

Opposed to the conclusion arrived at by Drs. Smith and Moore, was the view taken of the nature of the disease by Dr. Green, the Inspector-General of the Indian Medical Department, who, in the report of the Charitable Dispensaries in Bengal for the year 1867, expressed the following opinion:— "The fever has been a malarious one, of an intensely poisonous and depressing character. It has also borne the features of the relapsing contagious fever. . . . It is to be feared that it becomes contagious in the crowded and wretched huts and dwellings of the poor." In the report for the previous year, 1866, Dr. Green thus wrote regarding the Burdwan epidemic.— "The disease may be designated relapsing fever; many were jaundiced; . . . relapses occurred," etc., and he referred to Dr. Sutherland, as an officer of great experience, who considered the disease to have been "relapsing or famine bilious remittent fever" of a contagious character.

Even in the face of the very imperfect accounts of these epidemics, I am disposed to believe that the fragmentary evidence is in favour of the view taken of the disease by the head of the Medical Department. In the accounts submitted to Dr. Smith, jaundice is a symptom that has been noted by nearly all the observers, who have avoided in their reports the employment of merely general expressions, and who have mentioned a few of the symptoms and complications that were observed by them. Now, jaundice is peculiarly a feature of relapsing fever. In epidemics recently recorded in this country, it has been a prominent symptom. In typhus and enteric fever, on the other hand, it is very rare and exceptional. Jenner never met with it in typhus; and only a few instances, altogether, are on record; but as typhus is a rare disease apparently in Lower Bengal, practically it need not be considered. Typhoid fever, however, is a common disease in Calcutta, and might be supposed to be equally common in the villages of Lower Bengal. Jenner never met with jaundice in enteric fever, and Murchison, with his large opportunities of observation, says the same in his treatise on the continued fevers published in 1862; but the latter author has since met with two cases of this symptom in enteric fever which he refers to in his work on Diseases of the Liver published in

1868. Though jaundice is rare in enteric fever in Great Britain, it is apparently not uncommon in France, for Trousseau describes a bilious form of dothinenteria, of which a jaundiced condition of the skin is a characteristic. It is not unlikely that as typhoid fever unquestionably acquires certain peculiarities in various localities and climates, that some of the jaundiced cases in the Bengal epidemics might have been enteric fever. This disease, as it has been observed in India, does indeed exhibit at least two peculiarities which are not uncommon in France, but are rare in England, according to Murchison's account:—These are the occurrence of distinct intermissions and remissions at the beginning, in the course of, or at the termination of the fever; and of anatomical lesions of the great intestines. It is, however, to be observed that no case of enteric fever with jaundice has yet been recorded in this country; and in searching the works of the systematic Indian authors, I have not yet encountered a case of fever with jaundice, which, I have had reason to believe, was not relapsing fever, except one doubtful case recorded by Morehead, as "remittent fever complicated with jaundice," which might have been typhoid fever; nor have I met with this symptom in enteric fever as it occurs in Calcutta. Parkes and Murchison assert that jaundice often supervenes in the course of remittent fever caused by malaria. The reality of fever dependent on this cause is doubtful, and has been even denied by some writers.* It is to be observed that the eminent gentlemen above named formed their opinions regarding Indian fevers when they were very young men, at a time of life, and at a period of pathological history, when it might be supposed, without disrespect, that they had not accepted or fully understood the advanced views regarding the nature and causes of the specific fevers, of which they are now the distinguished exponents. They naturally took up the empirical doctrines expounded by Annesley, Twining, and Morehead, which were dominant at the time they were in India, some twenty or thirty years ago, when these fevers were hardly understood even in Europe. They have not since had the opportunity of correcting their early impressions; but should they return to this country, it is not unlikely—I will even venture to say, that it is certain—that they will find ample

* Amongst others by Dr. Maclagan, the Professor of Medicine at Edinburgh, in a recent paper on typhoid fever in the *Edinburgh Medical Journal*.

reasons for thoroughly modifying their opinions. Malaria is an unsubstantial vapour—some sort of metaphysical phantom not belonging to this material world—a quasi-scientific invention or device of the schoolmen in the dark ages of medicine: but the remittent fever which it was supposed to produce is resolvable in the light of modern knowledge into some one or other of the forms of fever described by Jenner and Murchison.

The occurrence of relapses is another feature that is noticeable in the late epidemics. Some of the accounts published in Dr. Smith's sanitary report for 1868, contain statements regarding the recurrence of the fever. Dr. Mantell, for instance, writing of the Burdwan epidemic, states that the recurrence of the fever was very common at the breaking up of the monsoon and during the greater part of the cold season. The sub-assistant-surgeon of Midnapore also reported three cases of relapsing fever. Dr. Hugh Clark observed seventeen cases of relapsing fever at Buxar and Karunthadee, from March to June, 1868. Dr. Smith also refers to the epidemic which occurred in 1866 in the Mauritius, as being identical in nature with the "epidemic fever" of Lower Bengal. The lengthy dissertation on the Mauritius epidemic published in the *Gazette of India*, contains no statement regarding relapses nor any other important character. In the Army Medical Department Blue Book for 1866, is another account conjointly written by two army medical officers; and although these gentlemen maintain with some warmth and much repetition that the fever was malarious, the facts stated by them are conclusive that it was relapsing fever—although there also occurred several cases of enteric fever, a disease which is probably endemic in the Mauritius, as all along the seaboard of India. Further, the circumstance that the reports submitted by medical officers to Dr. Green, the head of the medical department, contained statements regarding relapses and the contagious character of the fever, and the opinion of Dr. Sutherland, a Deputy Inspector-General, formed after personal observation of the epidemics, are surely of weight, and not to be lightly thrown out of consideration. It can be readily understood how easily the relapse might escape observation. A patient might go away on the cessation of the primary fever; or he might come under observation during the intermission of the relapse, or during the convalesence, which is tedious, and attended with debility and the remains of several distressing symptoms, or with serious complications; and not unfrequently there is no relapse in a case, or it is so moderate

that it is liable to be overlooked. Then, again, there is the difficulty derived from non-familiarity with the disease, for relapsing fever is rare in Europe, especially in England, and has been extinct at times for many years together; so that it is not improbable that several medical officers have not had the opportunity of seeing the disease as students. This is also the case with regard to small-pox, which is practically extinct in Ireland, and I believe also in Belgium, so that gentlemen educated in these countries rarely have the opportunity of observing that disease. This is, doubtless, the predicament with regard to relapsing fever of several medical officers in India.

In the absence of evidence regarding other important characters, such as the duration of the fever, the anatomical lesions, etc., the two bare facts of the presence of jaundice and the occurrence of relapses indicate that the Bengal epidemics were either enteric or relapsing fever. Both these forms of fever probably occurred together, enteric fever being endemic and always present, and relapsing fever periodically epidemic. The manner, compared to the diffusion of a wave, in which the fever is said to have overspread large districts, adjoining each other, is not consonant with the character of a typhoid epidemic, which is circumscribed or limited to one locality or body, a school or regiment, a prison or a village, and rarely goes beyond, except that a few isolated cases occasionally occur outside the local range of the epidemic, being carried, but not originated there. But an epidemic of relapsing fever —the disease being eminently contagious, and its cause widespread — attains very considerable proportions, and usually covers a large area, extending in all directions far beyond the locality in which it first appeared. Relapses are common to both diseases, but they are comparatively rare in typhoid fever, and consecutive relapses are still more rare. This disease, however, may have local peculiarities in Lower Bengal, as in France, in which country relapses are apparently not infrequent, and Trousseau has observed even second and third relapses. I have met with one case in Calcutta in which a second relapse took place, which was of greater severity than the first attack, and was attended with much delirium. The "predisposing cause" assigned, viz., privation or famine, and the circumstance that the poorest classes were the chief sufferers, are in favour of the view that the epidemic consisted in greater part of relapsing fever: because typhoid fever rarely attacks all classes, and in this country it appears to select the better classes, as the majority of the recorded epidemics and

cases have occurred amongst Europeans—a class in comfortable circumstances.

The excessive mortality from these epidemics might suggest the idea that relapsing fever formed no part of them, for this disease in Europe is of a mild nature as regards mortality, which hardly exceeds 4 per cent. But the experience gained in the dreadful epidemics in the jails of the Punjab and North-West Provinces, has taught us, in this country, that relapsing fever, under certain circumstances, is a terrible scourge. In European epidemics, the sick are removed to comfortable hospitals, whore they are fed and carefully nursed, and the great majority recover; but in Indian epidemics, as fever hospitals are altogether wanting, the wretched sufferers obtain no help, but have to shift for themselves, crowded in their miserable huts, and deprived of care and even food. The utmost assistance, apparently, that is rendered to them is the distribution of quinine and bazaar medicine by magistrates, police officers, and native doctors! Under these circumstances, relapsing fever is inevitably mortal.

The period is not remote when a universal belief prevailed that the fevers of this country were different from the same class of diseases in Europe. The researches of Scriven and Edward Goodeve in Calcutta, and of Ewart, Cornish, Ranking, Hugh Clark, Dymock, D. B. Smith, and Munro, and a host of other observers, have definitely settled the fact that typhoid fever exists in India; and the writings of Curtis, Annesley and Allan Webb afford proofs that it existed in their day. Typhus has also recently been conclusively proved to occur in this country. As to relapsing fever, a very long series of the most destructive epidemics has, within the last dozen years, happened in the North-West and Punjab. The idea, however, still prevails that the two latter forms of fever, though prevalent in Northern India, are non-existent in Lower Bengal, and the mistake is encouraged by the parochial views, regarding the fevers of India, promulgated in the present day by Dr. Morehead in his work on the diseases of India. With regard to these forms of fever, Dr. Chuckerbutty states in his writings that he has met with some cases of typhus at the Medical College Hospital, and a few cases of this disease have also recently been observed at the General Hospital; and at the same institution at least one unmistakeable case of relapsing fever was admitted this year. The perusal of the fever literature to be found in the public and private medical libraries in Calcutta, but not attainable up-country, has convinced me that relapsing fever has over and over again

occurred epidemically in Calcutta; and if in the metropolis, why not in the districts of Lower Bengal? I can only very cursorily enter upon this subject in this place, but the references that I shall make will enable gentlemen who are sceptical to investigate the matter for themselves. A great epidemic of relapsing fever occurred in Calcutta in the months of June, July, and August, 1824; it was described by Twining in vol. ii., for 1826, of the Transactions of the Medical and Physical Society of Calcutta, and also by Cavel and Mellis in vol. i., for the same year. In 1833, another occurred, and was also described by Twining in vol. vii., for 1835, of the Transactions; and again another in 1834, in Howrah, described by Duncan Stewart in the same volume. Another occurred in 1844, described by Henry Goodeve in vol. ix. of the Transactions. Another in 1853, described by Edward Goodeve, in the *Indian Annals*, No. 1, for October, 1853. Another in 1864, described under the name of typhus, by Chuckerbutty, in no. xviii. of the same periodical. The emigrant coolies at Calcutta also suffered from the disease in 1864 and 1865. There are other accounts, such as the epidemic of 1825, described by Mouat, but the above will suffice. In most of these epidemics a scarlet eruption occurred, and this peculiarity had apparently led to the disease having been mistaken. Copeland in his Dictionary calls Twining's epidemic of 1824 *scarlatina rheumatica*, and Aitken in his work on the Science and Practice of Medicine, refers to it under the name of dengue. An eruption has also been met with in European epidemics. It was observed in a few cases in the Scotch epidemics, and in the great Silesian epidemic of relapsing fever in 1841, a copious scarlet eruption was common. (See page 330 of Murchison's treatise on the continued fevers of Great Britain.) The eruptive epidemic of the emigrant coolies was pronounced by the editor of the *Indian Medical Gazette* to have been relapsing fever (see his remarks in the number for December, 1867), and Dr. D. B. Smith admits that it might have been that disease (see his Sanitary Report for 1868).

I believe that no one who is familiar with the symptoms and general features of the fevers of Calcutta, will fail to perceive that Twining's "remittent fever of the Bengal rainy season" was relapsing fever. The salient points of his description are the following:—"A peculiar combination of weariness, pain, anxiety and weakness; . . . febrile anguish; . . . the face sometimes assumes a lurid cadaverous colour; . . . the evacuations are scanty and watery, often of a pale grey colour, in some cases nearly black; . . . in other cases, flushed

face, headache, and redness of the eyes; . . . bilious vomiting often takes place; . . . pain and morbid sensibility over the epigastrium, which region, as well as the hypochondria, is tense; . . . the evacuations from the intestines are scanty, watery and dark-coloured; and active purgatives often bring away considerable quantities of black films, like fragments of dry leaves; . . . vertigo is often a distressing symptom; and delirium occasionally occurs even at an early period of the disease. Intense yellowness of the whole body generally takes place in the worst cases." (Pages 619-621 of edition of 1832.) This is a combination of symptoms found in relapsing fever, and is now rarely met with in the General Hospital, the scene of Twining's observations. The description is incomplete, for Twining has not mentioned the duration of the fever, nor the relapses, nor its contagiousness (in which quality, however, he did not believe), nor even the scarlet eruption, nor epistaxis, etc. But he has accidentally, as it were, supplied most of these omissions in his fugitive writings contributed to the transactions of the Calcutta Medical Society, especially in his descriptions of the epidemics of 1824 and 1833, which occurred in the rainy season. It is, however, to be observed that Twining clearly perceived that the remittent fever of the rains was met with amongst persons "indifferently fed," and who had suffered from fatigue, privation and exposure—the very class of persons who are most liable to be attacked by relapsing fever.*

The accounts of the recent epidemics of Lower Bengal are too imperfect to justify a positive diagnosis. But this much might be affirmed without hesitation, that it will be inconsistent with the history of fever in Europe, if these epidemics were not of typhus or relapsing fever, or of both together; and not consonant with the history of fever in this country if they were not of relapsing fever. It is to be understood, however, that as typhoid fever is probably endemic in the province, some cases, or even limited epidemics of that disease, might have also concurrently occurred.

1*st August*, 1871.

* The form of fever, which endures from three to five days, with relapses once a fortnight for three or four months in some cases, called *nakra* or *nasa* by the Bengalees, is relapsing fever. A description of it will be found in page 701 of Twining's work, Ed. 1832. The painful and tumid condition of the Schneiderian membrane is a local peculiarity of the disease which is not met with in Northern India. *Biggar* is probably the same disease attended with cerebral symptoms; but Twining does not describe this form.

APPENDIX IV.

SIR WM. MUIR *on the Famine in the Lullutpur District, from the* PIONEER, *of 10th February*, 1872. *Minute by* HIS HONOUR THE LIEUTENANT-GOVERNOR, *North-Western Provinces, on the effects of the Famine in the Lullutpur District. Balances in Lullutpur District.*

MY tour through this district has forcibly brought to my notice the injury sustained by it from the disastrous seasons of 1868 and 1869. The large expenditure in Government works* no doubt saved great masses of the people from starvation or disease, and prevented the entire desertion of large tracts which would otherwise have taken place. But, notwithstanding, there was extensive emigration; only a portion of the emigrants have returned; and even of the population which survived the famine, great numbers eventually succumbed to fever and cholera,—the attacks of which their emaciated frames could ill withstand.

2. There was also a vast loss of cattle,† which died in great numbers everywhere in these parts from the absence of fodder.

3. From these causes the country has suffered in its agricultural resources, the cultivated area has been very generally reduced, and the prospect of recovery is distant; for both hands and cattle are wanting, and it will take time to replace what has been lost. The consequence is that in many places the proprietors are represented as unable to discharge the revenue assessed on their estates, much less to pay up the large arrears of revenue and *tuccavi* outstanding against them.

4. I have had the opportunity of looking cursorily over the reports which have reached the Board of the Revenue Settlement of this district. Without anticipating the Board's report on the settlement, it may be here said that the demand is shown to have been fixed at a very moderate standard with reference to the assets existing at the time of assessment.

5. But the effects of the drought have since crippled many estates to such an extent, that they are unable now to pay what they formerly could easily have paid. Several instances were shown to me in which the rental had so fallen from land being thrown out of cultivation, as hardly to equal the revenue demand, and in some cases as actually to fall short of it.

* Over two lacs of rupees,

† 95,543, or 41 per cent. of the cattle in the district, died (Famine Report, page 77).

6. Add to this that the people, both ryots and proprietors, are for the most part miserably poor, and often heavily indebted. Colonel Davidson represented that he had pressed them harder for last year's revenue than he would have done had he been as well aware as he now is of the impoverished state of the agricultural population generally.

7. Under these circumstances, it is both just and politic that, wherever the present demand is so heavy, as compared with the fairly calculated assets of an estate, as not to leave a margin sufficient for its successful management, a reduction should be made in the demand. Colonel Davidson is of opinion that this may probably be found to be the case in about one-tenth of the estates in the district.

8. The subject was carefully considered at a conference held in the Lullutpur district with Mr. H. S. Reid, the Commissioner, and the Deputy Commissioner. After some discussion, it was agreed that the best mode of effecting the object above stated would be to maintain in every case the settlement demand (since this was in no instance originally severe, and ought in any case to be worked up to again), but to grant a temporary reduction. The amount should be fixed in reference to the special circumstances of each estate,—and, as a general principle, it may be said that the demand should not exceed 80 per cent. of the fairly calculated present assets. The period for which this concession will be given should, if possible, be determined at the same time, since it is expedient to give the people as much certainty as possible for the future, in order to stimulate exertions for the recovery of the country. It will be fixed with reference to the means and facilities for such recovery, but, as a rule, it should not exceed three years; and excepting for very special reasons, the amount should not be *russuddi*, or progressive. If in any instance an estate may be found not to have recovered at the close of the term now fixed for the re-imposition of the settlement demand, it will be for consideration what further concession should then be made.

9. There are heavy outstanding balances from 1868, amounting in all to about Rs. 70,000. I understand that these have been reported on by the Deputy Commissioner and Mr. Edwards. Their proposals will be liberally considered. It is important that the present measures of relief should not be neutralized by the demand for these balances; and, moreover, that, even in cases where no reduction of revenue is deemed necessary, there should be no pressing demand for balances in any instance in which it may reasonably be expected to be injurious, or to be repressive of agricultural prosperity.

10. There are also very heavy balances of *tuccavi*, amounting in all to about Rs. 84,000: above Rs. 24,000 of this money was advanced from the one per cent. income-tax reserve. For the most part it is represented that this *tuccavi* was given to enable the zemindars to feed their ryots, and employ them on small village works; in such case, the expenditure was, in point of fact, a famine relief given under another form; and the Government has its return in the prevention of the utter depopulation, and consequent loss of revenue that would otherwise have ensued. It will be for the local authorities to discriminate any instances in which such remunerative works were carried out, as would render it equitable to demand repayment; and to propose the demand of repayment in whole or in part, where in such case it would not injuriously affect the estate or the resources of the proprietors. On good cause being shown, the Government will be prepared to relax the demand and remit the balance.

11. To accomplish the work here sketched will require the undivided attention of the Deputy Commissioner for some months. It will also be necessary for him to make local inspections and inquiries into the extent of cultivation, the number and means of the agricultural population, their cattle, the facilities of irrigation, and generally the prospects of early recovery or otherwise; and the Commissioner will be requested to make arrangements for the deputation of an Assistant Commissioner to relieve the Deputy Commissioner as much as possible of the current duties of his district.

12. Colonel Davidson has now acquired a considerable knowledge of the district and its people, and I have every confidence that he will complete this somewhat difficult and delicate task with care and judgment.

W. MUIR.

LIEUTENANT-GOVERNOR'S CAMP, TALBEHUT,
22nd January, 1872.

APPENDIX V.

Extract from a "Report on the Question of Temporary and Permanent Settlement as applied to the District of Cawnpore," by W. S. HALSEY, C.S., *Collector and Magistrate of Cawnpore*, 1872, *from the* INDIAN OBSERVER, *of 25th May*, 1872.

I ASSERT that the abject poverty of the average cultivator of this district is beyond the belief of any one who has not seen

it. He is simply a slave to the soil, to the zemindar, to the usurer, and to Government. The only wonder is any one can be found to lend money to such an impecunious individual. It may be asked why, when things are so bad, he does not run away and try a new country. The answer to this is, there is no profession below agriculture; he believes, rightly or wrongly, his *status* would be no better in any other village, and with this drawback, in times of bad seasons, no one would help him. He knows by staying in his own village it will be to the interest of the zemindar and money-lender to leave him sufficient to keep himself and family alive (they all have families); when asked why he does not go, he helplessly ejaculates "*Kahan jaega?*"—"Where shall I go?" and finally, there is that extraordinary love of home which, though prevalent in other nations, is a sort of mania in a Hindoo. So he goes on from birth to death in the same hopeless, insolvent state, happy if he can only get a little tobacco for himself and a pewter bangle for his wife.

I have said he finds men to lend him money, and for the true exposition of his existence it will be as well to explain who these lenders of money to insolvents are, and how it is they are able to extract blood from a stone.

There are a class of usurers spread broadcast over the country, who lend money on a system called *ugai*, and make a very handsome profit out of it. It consists in advancing a man ten rupees on condition of his repaying the loan in twelve monthly instalments of one rupee each. When seven or eight months have elapsed, the unfortunate is encouraged to borrow another ten rupees on the same terms, but from this is deducted the balance of the first loan, and he finds himself involved for another twelve months with only the difference in cash, *i.e.*, seven or eight rupees. From this date he may be said to be hopelessly in the hands of the money-lender; before harvest time a further loan, subject to deductions as before, is taken, and the fruits of his labour go partly to meet his loan, partly to pay his rent, and partly to repay seed; the balance, if any, to keep body and soul together. I have inspected books belonging to these usurers, and have seen as many as six hundred separate accounts of this kind in one man's ledger.

In addition to this, and as I have referred to it above, I may as well mention the terms on which he gets seed. He obtains this generally from his zemindars, whose terms are not quite so usurious as those of the money-lender. The cultivator has to repay the original loan at harvest time, with 25 per cent.

more, and not unfrequently is bound to dispose of his whole crop to the zemindar at rates favourable to the latter.

I may add he lives entirely on the coarsest grains, one of which, *kesari*, is known to be actively deleterious, producing loin palsy, cases of which are very prevalent in the southern pergunnahs of this district. He rarely, if ever, tastes wheat in any form.

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