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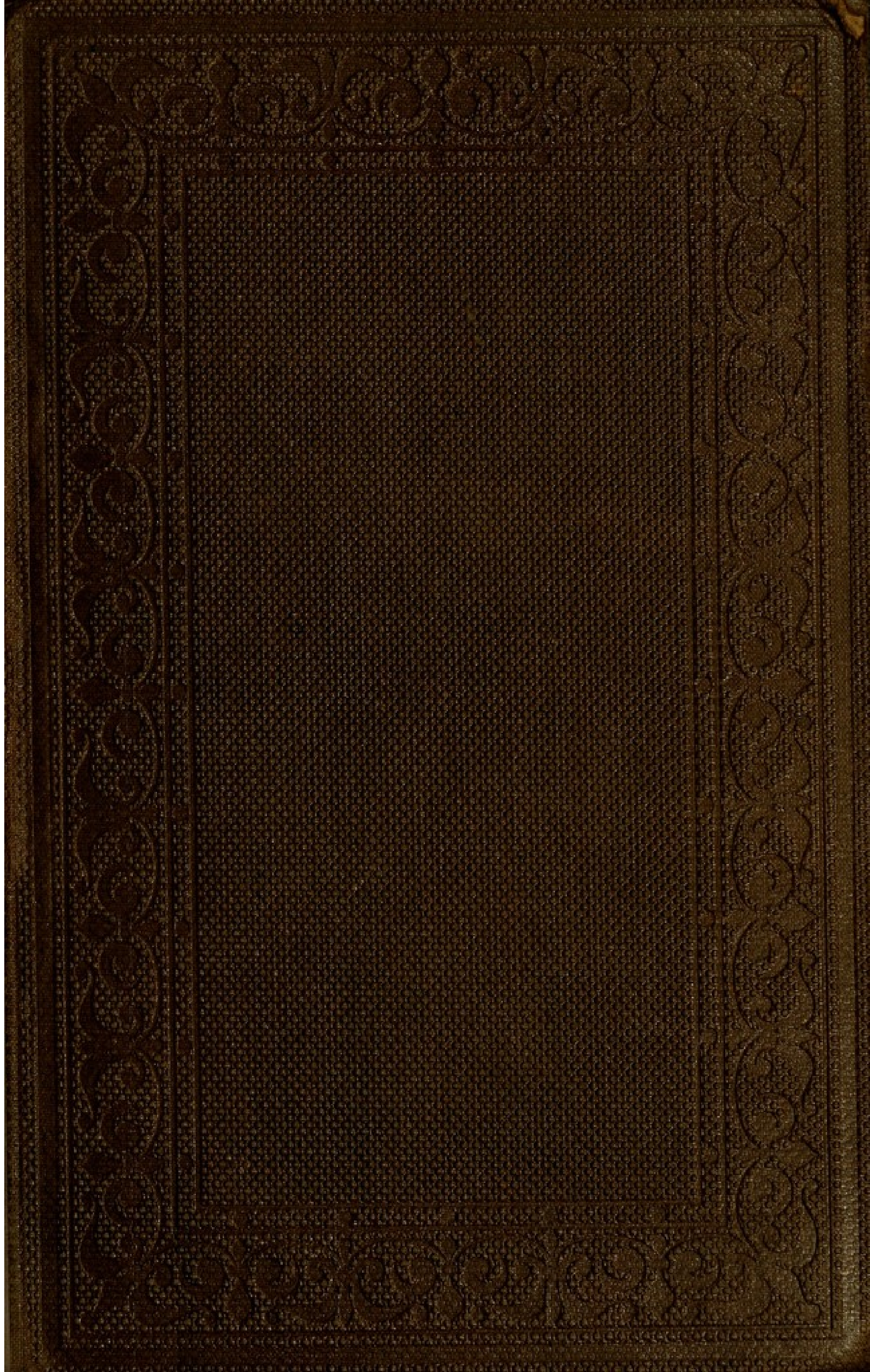

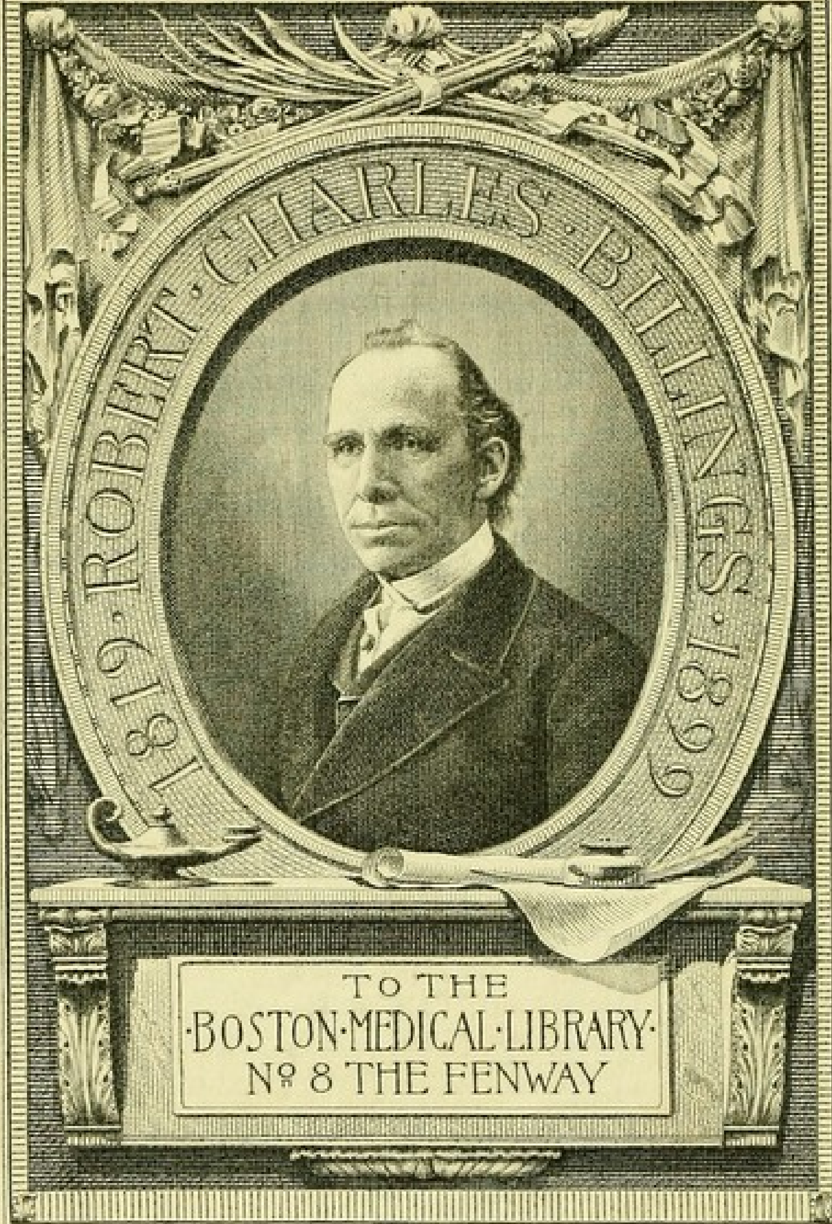
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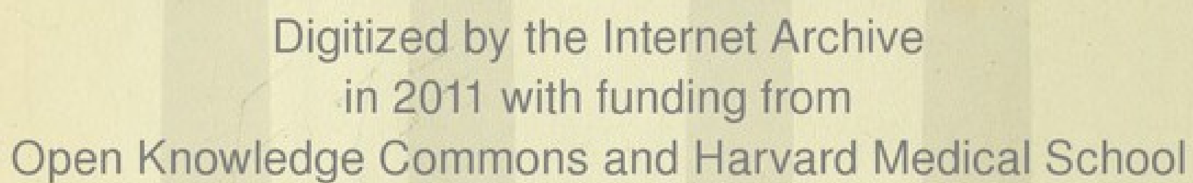
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A DIGEST

OF THE

VITAL STATISTICS

OF THE

EUROPEAN AND NATIVE ARMIES IN INDIA;

INTERSPERSED WITH SUGGESTIONS

FOR THE

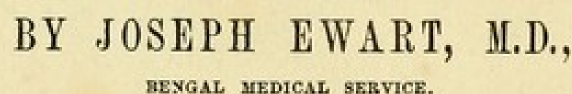
ERADICATION AND MITIGATION OF THE PREVENTIBLE AND AVOIDABLE CAUSES OF

SICKNESS AND MORTALITY

AMONGST IMPORTED AND INDIGENOUS TROOPS.

BY JOSEPH EWART, M.D.,

BENGAL MEDICAL SERVICE.



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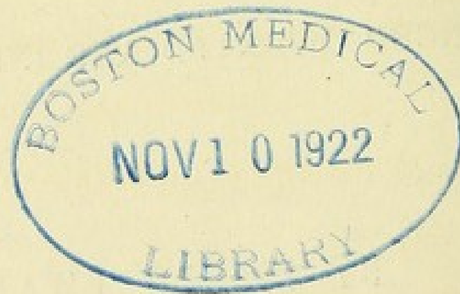

TO

THOMAS ADDISON, ESQ., M.D.,

LATE SENIOR PHYSICIAN TO, AND LECTURER ON THE PRACTICE OF MEDICINE AT, GUY'S HOSPITAL, LONDON,

THE DISCOVERER OF ADDISON'S DISEASE OF THE SUPRA RENAL CAPSULES,

ONE OF THE MOST TRIUMPHANT VICTORIES

OF PROLONGED CLINICAL OBSERVATION, UNWEARIED ZEAL, AND

INDEFATIGABLE DEVOTION TO PATHOLOGY ON RECORD,

These Pages

ON THE

VITAL STATISTICS OF THE EUROPEAN AND NATIVE ARMIES IN INDIA

ARE RESPECTFULLY DEDICATED

BY HIS ARDENT ADMIRER AND LATE PUPIL,

THE AUTHOR.

PREFACE.

THE necessity for a comprehensive digest of the Vital Medical Statistics of the Indian Forces suggested itself to the Author immediately after the Mutiny of the Bengal Native army in 1857. When he first began to record and arrange the results of his investigations, and to subject them to the process of analysis, his intention was only to prepare a concise paper, for publication in one of the scientific periodicals of the day. But as his researches advanced to maturity, the great importance of the facts elicited, the wide range of their application to different classes of our own, and to a large section of the Asiatic race, together with the unavoidable bulk of the production, have induced him to hope that it might not be unacceptable to his professional brethren even in its present unfinished and unembellished state.

The skeleton of the work has been chiefly constructed from the Bombay,* Bengal,† and Madras ‡

* "Indian Annals of Medical Science," No. V. (April, 1856).

† *Ibid*, No. VII. (October, 1856).

‡ "Bombay Med. and Phys. Soc. Transactions," Vol. I. (1838).

statistical returns, Mr. Edward John Waring's * and Mr. Hugh Macpherson's † contributions, Mr. Webb's paper,‡ and Dr. Charles Morehead's great work § on the diseases of India; and from other duly acknowledged sources.

With such a rich supply of scattered and disconnected information bearing most intimately upon the past and present condition of the European and native troops in India, the author has only had to undergo the labour of collecting an important series of data, and of arranging them in such a manner as to unite comprehensiveness with simplicity and uniformity of design. In endeavouring to accomplish these objects, he ventures to hope that, though he may not have contributed anything positively original, he has nevertheless furnished an accessible and tangible desideratum to the medico-statistical literature of the East Indies.

In presenting the results of his inquiries to his professional brethren, the Author is not unconscious of the possibility of many minute errors having crept into such a vast tissue of mathematical calculations; and on this score, he has to solicit some

* "Indian Annals of Medical Science," Nos. V. and VI. (1855 and 1856).

† *Ibid*, Nos. VIII. and IX. (1857 and 1858).

‡ "Bombay Med. and Phys. Soc. Transactions," No. I., New Series (1851–52).

§ "Researches on Disease in India," Vols. I. and II. (1856.)

indulgence. When he states that all the computations embodied in the numerous tables and figured statements which clothe the subsequent pages have been gone over twice by himself, unaided, during leisure hours liable to much interruption, he trusts that this solicitation will not have been made in vain—more especially as he is deeply impressed with the conviction that none of these imperfections will be found to be of sufficient magnitude to render nugatory or inapplicable any of the deductions, inferences, and conclusions at which he has arrived.

KHERWARRAH, *Sept. 8th*, 1858.

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“ In quest of sites, avoid the mournful plain
Where osiers thrive, and trees that love the lake;
Where many lazy muddy rivers flow:
Nor for the wealth that all the Indies roll
Fix near the marshy margin of the main.
Fly, if you can, these violent extremes
Of air, the wholesome is nor moist nor dry.
But as the power of choosing is denied
To half mankind, a further task ensues;

* * * * *

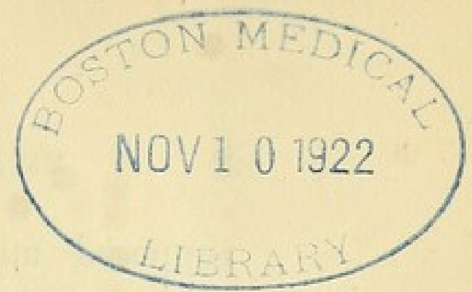
But if the raw and oozy heaven offend,
Correct the soil, and dry the sources up
Of watery exhalations; wide and deep
Conduct your trenches through the quaking bog;
Solicitous, with all your winding arts,
Betray the unwilling lake into the stream;
And weed the forest, and invoke the winds
To break the toils where strangled vapours lie;
Or through the thickets send the crackling flames.”

John Armstrong, M.D.

" Sanus homo, qui et bene valet, et suæ spontis est, nullis obligare se legibus debet; ac neque medico, neque iatralipta egere. Hunc oportet varium habere vitæ genus: modo ruri esse, modo in urbe, sæpiusque in agro; navigare, venari, quiescere interdum, sed frequentius se exercere: siquidem ignavia corpus hebetat, labor firmat; illa maturam senectutem, hic longam adolescentiam reddit. Prodest etiam interdum balneo, interdum aquis frigidis uti; modo ungi, modo idipsum negligere; nullum cibi genus fugere, quo populus utatur; interdum in convictu esse, interdum ab eo se retrahere; modo plus justo, modo non amplius assumere; bis die potius quam semel cibum capere, et semper quam plurimum, dummodo hunc concoquat. Sed ut hujus generis exercitationes cibique necessarii sunt; sic athletici supervacui."—A. C. CELSI *Medicina*, Liber Primus.

" *Dimidium* facti, qui cœpit, habet, sapere aude:
Incipe, vivendi qui recte prorogat horam,
Rusticus expectat dum defluat amnis: at ille
Labitur et labetur in omne volubilis ævum."

Q. HORATII FLACCI *Epistolarum* Liber Primus,
Epistola II. Ad Lollium.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A DIGEST

OF THE

VITAL STATISTICS OF THE EUROPEAN

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INTRODUCTION.

The prime objects contemplated in the compilation of this treatise have been to portray, with unadorned simplicity, the past medico-statistical condition of the European troops who have served in India—not merely in one presidency, but in all the three dependencies—and to demonstrate the pressing necessity that exists for the introduction into our military stations of a well-regulated, beneficent, and responsible system of sanatory reform, with a view to effect a diminution in the sickness and mortality amongst 75,000 Christian soldiers: this number being the

supposed minimum strength which will, in future, be imperatively necessary to enable the Government to maintain our restored prestige unsullied, and our power undisputed, internally or externally, from Ceylon to the Khyber, and from the eastern confines of Pegu to the seaboard of Western India.

2. That it is possible to increase the healthiness and prolong the lives of our English soldiers, has been fully proved, no less by a comparison of the sick and mortality bills amongst them with those amongst officers, than by a systematic contrast of the vital statistics of the former with those of the three native armies. The remarkable comparative immunity from disease and death enjoyed by the officers, and the still greater immunity which prevails amongst covenanted civilians, as contrasted with the high ratios of sickness and mortality amongst the constituent members of the ranks, place beyond question or doubt, not only the possibility, but the facile practicability, of greatly improving the health of the latter, and of expanding the present abnormally contracted or narrowed span of their lives.

3. The disadvantages of the soldiers—disadvantages, be it religiously remembered, for the existence of which they themselves cannot be held accountable—as compared with the other classes mentioned, are so great, that in order to do full justice to the cause I am advocating, I cannot refrain from illustrating them in their true colours, in the subjoined tabular arrangement :—

BENGAL.

Classes.	Percentage of Admissions to Strength from all Diseases.	Percentage of Deaths to Strength from all Diseases.	Percentage of Deaths to Treated from all Diseases.
Soldiers *	199·70	5·58	2·79
Officers†	132·25	2·11	1·60
Civilians‡	...	2·00	—
Sepoys‖	100·84	1·19	1·11

* *Vide* Table III. † *Vide* page 21.
‡ Kenneth Mackinnon, M.D., on Public Health. ‖ *Vide* Table IX.

Now, taking the health of the officers as the standard which it is desirable to approach, the proportion of admissions to strength, amongst our soldiers, is capable of reduction to the extent of 67·45 per cent.; the deaths to strength, of 3·47 per cent.; and the deaths to treated, of 1·19 per cent. To make our Europeans equal, in point of health, to the sepoys, 98·86 per cent. of the present sickness, and 4·39 per cent. of the mortality, must be prevented. But as neither officers, civilians, nor sepoys, can be said to have attained the highest standard of health which is possible—owing to the defective application of sanatory principles to the eradication of malaria, and to the removal of the causes of preventable disease, in every station, whether civil or military—the minimum ratios of sickness and mortality (in sepoys) demonstrated in the columns of the above comparative statement, cannot be viewed as the highest state of health approachable by our fellow Christians in arms.

4. The means to be employed for the purpose of diminishing the abundance of disease, and of lessening the loss of lives consequent upon the destructive ravages of its severer forms, have been pointed out in the body of the work; and an endeavour has occasionally been made to shew that money *judiciously* expended by the State, for the preservation of the lives of our European soldiers, would, in the long run, be the truest economy. Whether the saving of lives be viewed in connection with the concomitant saving of money, or with the resultant augmentation of military efficiency and improvement in the health and comfort of the women and children, as well as of the soldiers, one thing is certain, the Government would be the gainer by the wide extension of sanatory science in practice; which will, I am persuaded, go further to economize the lives of our soldiers and their families than all the resources of curative medicine put together. In making this observation, I have no wish or intention to underrate the acknowledged value of medical treatment. On the contrary, a perusal of the entire work will convince the most sceptical that it is principally owing to the advancement of therapeutical science, that the mortality caused, directly or indirectly, by malaria, has manifested a considerable diminution in modern times. But whilst conceding all this, we must not forget that "prevention is better than cure" in regard to disease, as it is in reference to other evils.

5. That I have not exaggerated the immense importance of prophylaxis, in the preceding paragraph,

is abundantly evident from the following calculations. By taking the lowest ratios of mortality to strength that have been reached, in each of the three presidencies, as demonstrated in Tables II. and III., and by adding to these the ratios of invaliding, as set forth (for Bengal) in Table VI., and (for the other presidencies), as assumed at page 15, it will be found that, down to about 1853, the annual loss to strength, exclusive of casualties in war, &c., amounted to 8·01 per cent. in Bengal, 4·86 per cent. in Bombay,* and 5·2 per cent. in Madras. But as covenanted civilians died at the rate of 2 per cent. when Mackinnon wrote his book on "Public Health," which at the present time, perhaps, includes deaths and invaliding too, it follows, in the most conclusive manner possible, that 6·01 per cent. of the annual loss in Bengal, 2·86 in Bombay, and 3·2 in Madras, occurred from causes which were removable—took place, in truth, from preventable disease!

6. If a similar state of things is permitted to continue, the future *yearly loss to strength by deaths and invaliding* arising from avoidable disease, will amount to 2,404 men, out of a given strength of 40,000, in Bengal; to 429, out of 15,000, in Bombay; and to 640, out of 20,000, in Madras; or to a round total of 3,473 trained, disciplined, and effective soldiers, composed of the best material to be had in Christen-

* This lower percentage in Bombay than in Madras is probably owing to a larger number of the Europeans in the former having been located in more healthy stations in recent times than appears to have been the custom in former days. *Vide* following pages.

dom—British bone and muscle, British blood, and British pluck. The annual damage in money amounts to 347,300*l.*: that is, valuing each man at 100*l.* But this is a poor estimate. Frequent sickness, consequent muscular debility, impaired efficiency, and inward discontent and unhappiness—which soldiers in India must more or less feel, disguise or conceal the fact as we may (for how can we expect them to be happy and contented, so long as 94 per cent. of them disappear from the ranks before they have arrived at the prime of life, or 35 ?*)—must also be included on the loss side of the account.

7. The sanatory measures which are required to secure the removal or mitigation of our direst foe, *malaria*, from the interior, and neighbourhood of our military (and other) stations, have been detailed at some length ; as has also the remarkable decrement in the sickness and mortality which would be consequent on its eradication. But, in addition—and more especially if the suggestions embodied in the following pages should unfortunately be disregarded in the cantonments and camps situated on the plains of India, where, for reasons of policy, the location of a certain portion of our European troops is considered unavoidable—*the employment of the most healthy hill climates as permanent abodes for our reserves and sick, particularly in times of peace, now becomes an imperative state necessity.*

8. I here quote the following passages from the *suggestions* of Mr. James Ranald Martin, who has

* *Vide* Table IV. *et seq.*

always been foremost in the exercise of his pen, guided by a powerful and vigorous mind, to impress upon the authorities charged with the government of this country the inestimable value of practical sanatory reform, instituted for the purpose of removing the sources or causes of preventable diseases, which have hitherto silently, but unsparingly and significantly, decimated our Indo-European armies :—

"12. The experiences of the Himalayah positions, of those of the Neilgherry mountains, and of those of Ceylon, as sanitary stations, prove that by residence on their respective elevations the European is removed greatly above the range of the malarious fevers of India. But while this great and valuable fact is admitted, it is undoubtedly true that he is, in too many instances, carried into the range of another class of diseases—namely, that of bowel complaints. This circumstance has been found in various of our mountain positions to constitute a serious drawback from the otherwise great benefits derived from a residence in them.

"13. Another disadvantage of the hill stations hitherto occupied by us in the East Indies, was noticed by me when serving in Bengal—namely, that while the hill climates are permanently serviceable against the malarious fevers of the country, their influence in conducing to the cure of these and other diseases is limited in extent ; the soldier being troubled with relapses of his disorders on descending into the plains, unless kept in the hills for a long time. The mountain-ranges, therefore, which have hitherto been occupied by Europeans, stand forth as possessing climates *preservative against fevers*, and, as such, we must improve them, and use them whenever required.

"14. When, on the other hand, we find the British soldier lingering under chronic or structural diseases contracted on the plains, a removal to the seaboard, or to an insular sanatarium, or, still better, to England, will be found the only effective means of restoration ; and this last resource of medicine should never be denied to him, for the climate of the mountains, invaluable in prevention, will not cure disease.

"15. Referring to what has been stated in paragraph 12, how are we to escape from the admitted evils hitherto experienced in the very high positions occupied by us ? Where and how are we

to obtain that amount of elevation which, while it removes the European from out of the range of malarious fevers, may not place him in that of an exhausting and dangerous diarrhœa? This is the great desideratum—one hitherto unascertained, because unsought for; yet no examinations which may fall short of ascertaining this desired medium elevation can be deemed satisfactory to our sanatory wants.

"16. In the climates of yellow fever, an elevation of 2,500 feet is found sufficient to remove the European from the locality of pestilence, without placing him in that of bowel disorders; and in the mountain stations of Jamaica, the mortality amongst British soldiers is found to exceed but little, if at all, that of the same class of men in the United Kingdom.

"17. Let us then have a series of careful and scientific examinations, by competent persons, of the lower and medium ranges of hills throughout India, in order that the great sanatory problem may be solved in a conclusive manner—namely, the providing a place of resort for our European troops which shall be alike free from malarious fevers and from disorders of the bowels. That such procurable localities are to be found in the East, as they have been in the West, is my firm belief; and let them be perseveringly sought for.

"18. Let the solitary hills—those islands on the plains—be sought for, and carefully examined; they give sanatory excellences peculiar to themselves." *

9. But we must not yet condemn the Himalayan Sanataria; to the prophylactic and curative merits of which a fair trial has never been awarded. For it must be remembered that malaria, though not nearly so abundant in these as on the luxuriant plains through which innumerable lazy rivers flow, is generated in sufficient quantity to produce even primary attacks of intermittent fever. It is undoubtedly the "*malarious taint*," aided by the lowness of the temperature compared with that of the plains, from which our soldiers

* "Suggestions for Promoting the Health and Efficiency of the British Troops serving in the East Indies." By JAMES RANALD MARTIN, F.R.S., *Lancet*, February 13th, 1858.

have hitherto been suddenly transferred, after having been in entire regiments prostrated—almost placed, in fact, *hors de combat* by fevers and their consequences—that interferes with convalescence;—that, though not powerful enough in the majority of instances to produce fevers by which the hill climates have gained the reputation of being preservative against them, is still strong enough to prevent rapid recovery, and to invite the invasion of bowel disorders under the influence of external cold, damp, and great vicissitudes.

10. So long as the sanatory state of the hill stations is neglected—so long as proper measures are not carried out with a view to annihilate or mitigate this malarious taint, pointed out by Mr. Grant, by destroying the fountains of supply—so long will the benefits derivable from a residence thereupon be limited, partial, incomplete. Mr. Grant tells us, however, that at Mussoorie, Nainee Tal, Murree, and Darjeeling, in the Himalayan chain, the Neilgherries in Southern, and Mahableshwur* in Western India, the fevers of the plains are not replaced by bowel complaints amongst the European residents. Let us, then, set our "shoulders to the wheel" unitedly, and in harmonious concert; make every reasonable effort to remove the malaria from those hill stations in which its existence diminishes their prophylactic and curative virtues. My own opinion,

* But, if I am not mistaken, Mahableshwur is to be classified in the same category, as regards malarious taint and bowel disorders, as Simla, Kussowlie, Subathoo, and Dugshai in the sub-Himalayahs.

derived from experience and a careful analysis of the statistics of the Indian armies, imported and indigenous, is, as hinted elsewhere in this treatise, that the temperature of the climate, the heats and vicissitudes of the East Indies, would sink into comparative insignificance as causes of abdominal and febrile disease, were this gigantic enemy to human life, malaria, compelled to vanish before increased population, the reclamation of all waste and marsh land, refined agriculture, a high state of civilization, and a wide-spread application of the principles of sanatory science to the removal of avoidable sources of disease.

11. It may, indeed, be this very monster, which at certain seasons of the year throws forth his lethal emanations from millions of sources, that has always rendered every attempt at colonization, in the Canadian acceptation of the term, nugatory in this country. And it may be possible that when these uncountable sources are dried up, when the demands of animal life and the supply of vegetable growth are so nicely balanced as to leave no large collections of either unutilised, that our race may be able to occupy India on a completely different footing from the present. In the mean time, however, even with all the undoubted advantages of the hill climates—especially in the absence of effective sanatory improvements—the removal to the mother-country of those Europeans whose constitutions have been shattered by prolonged residence in unhealthy situations, by "chronic or structural disease," will stand forth as a curative measure of paramount importance—a boon which should never be denied to the British soldier.

12. Every sanatory reformer will give his most hearty concurrence, I am sure, to Mr. Martin's suggestion referring to the necessity of having those "solitary hills—those islands on the plains which give sanatory excellences peculiar to themselves," thoroughly investigated, according to the scientific rules which, in his communication to the Court of Directors, he has laid down, and which are quoted in the Appendix.

13. Even if the present hill sanataria could be rendered colonizable, or if they could be so improved as to allow the Anglo-Saxon to continue his species pure, unadulterated, and undeteriorated, we should still be, in a great measure, dependent upon the isolated hills and knuckles in the plains, wherever they can be found possessed of the necessary advantages of accessibility, broadness, or expanse, and capacity of summit and water supply, &c., for sanataria, which might, where political considerations do not interfere, be occupied as military posts. Hence, the pressing necessity of instituting scientific inquiries with all practicable speed, for the purpose of ascertaining their respective adaptibilities for the residence of Europeans. About this there can only be one opinion.

14. I again recur to Mr. Martin's *suggestions.* He says—"Let there be appointed for the sanatory duties of the army, at each of the Indian presidencies, a medical officer of health—an officer of scientific attainments and of rank, who shall be attached to the Quartermaster-General's department; we shall thus add to the department of military topography

that of medical topography. The medical officer of health should preserve in his office, for the use of the scientific persons concerned, plans and models of the best barracks and hospitals which may be from time to time approved by the military powers of Europe, in order that the most recent improvements may be rendered available wherever buildings of the nature indicated may be found necessary. The duties of the medical officer should be, in peace, to examine and report on all sites, and on the condition of camps, temporary military stations and cantonments, on the convalescent stations and sanatoria, on mountain ranges suitable for troops, and on solitary mountains and their capabilities, on the plans and structure of barracks and hospitals, and on everything relating to the health and comfort of the soldier. In war, he should be attached to the Quartermaster-General, so as to master the medical topography of the scene of action; and, where military reasons of imperative necessity do not overrule sanatory considerations, the advice and opinion of the medical officer of health should be received on the sites of camps, whether temporary or permanent, and on all matters having reference to the sanatory condition of the camp."

15. It was for the want of a medical officer of health that, according to Sir Alexander Tulloch, "amongst British officers and soldiers of the Queen's and Company's armies serving in the East Indies, there occurred, from 1815 to 1855 inclusive, a total mortality, exclusive of casualties, of about 100,000 men, 'the greater portion of whose lives might have been saved had better localities been selected for

military occupation in that country.'" Valuing each life as usual at 100*l.*, we have here sustained a loss of 10,000,000*l.*, two-thirds of which might have been saved. It was for the want of an officer of this description, vested with full powers—for without these he *must always be powerless for good, and consequently perfectly irresponsible*—that 17,000,000*l.* sterling were expended upon the Berhampore barracks and hospitals for European troops in Bengal, since 1757, which had to be abandoned in 1835 on account of the unhealthiness of the situation.* It was owing to absence of the counsel of a scientific officer of health that untold sums all over India have been expended in the construction of costly public buildings, which, from defects and disadvantages of position, &c., should never have been built at all—except at economical rates for temporary occupation. The exercise of a wise forethought by the sanatory philosopher, possessed of the necessary powers for making his voice and opinions heard in the Councils of the State, would at once have suggested the inadvisability of squandering away millions of public money on fine costly buildings, the ultimate abandonment of which, he would have foreseen, as an absolute necessity, looming in the no very distant future. "Looking to these enormous sums, often absolutely worse than wasted," every one, who has the comfort and happiness of our European soldiers really at heart, will readily appreciate the feelings of Mr. Martin when he exclaims—"Of what account in the comparison has been the cost of the medical establishments of India?

* MARTIN'S *Influence of Tropical Climates*, p. 424.

how truly saving of the public revenues must be a well-ordered, a well-directed, and a well-contented medical corps! In truth, the importance of an efficient medical establishment is so great that we cannot put a money value on it."

16. The appointment of a medical officer of health with sufficient powers and responsibility, is, at this moment, rendered all the more imperative because there must always, in future, be maintained a large force of Europeans in India; and, in the absence of such an officer, what guarantee have the tax-payers of India that a similar needless and extravagant expenditure of public money and of valuable lives will not be continued? No vested interests can here be pleaded in extenuation, or as interfering with the recommendations of the sanatory reformer. The Government, if I am rightly informed, are absolute in our military stations, and represent the great proprietary interest in them. It is the Government, therefore, that sustains the loss occasioned by a bad selection of sites for public buildings, as it is the Government that reaps the reward by the converse practice.

17. The vital importance of increasing the salubrity of our present stations, and of finding out localities which are more salubrious than any yet discovered for Europeans, cannot well be overrated. For it may be laid down as a law that our military power in this country will increase in the direct ratio of the increase of the available European population. And that this will increase with the greater salubrity of our stations, and the country generally, is clear.

18. One method of lessening the mortality amongst European troops consists simply in congregating them as much as possible in the healthiest stations. That a very considerable saving of lives can be effected in this manner, is evident from the subjoined tabular statement, which shows the ratios of sickness and mortality at the different stations noted therein, amongst Queen's and Company's European troops :—

BENGAL.*

Stations.	Periods of Observation.	Treated per 100 of Strength.	Deaths per 100 of Strength.
	Years.		
Rawul Pindee	6, ending 1854–55	182·00	2·76
Jullunder	9, „ 1854–55†	163·77	2·86
Dugshai	5, „ 1854–55	177·28	2·98
Kussowlie	11, „ 1854–55†	165·86	4·12
Meerut	9, „ 1852–53	207·59	4·12
Benares	9, „ 1852–53	222·00	4·22
Agra	9, „ 1852–53†	210·38	5·04
Chinsurah	1826–7, and 7, ending 1837‡	141·29	5·08
Dum-Dum	9, „ 1852–53†	202·34	5·40
Subathoo	11, „ 1854–55†	178·86	5·91
Umballah	11, „ 1855†	195·12	6·07
Dinapore	9, „ 1852–53†	189·00	6·20
Ferozepore	11, „ 1854–55†	217·51	6·34
Peshawur	6, „ 1854–55†	351·92	6·51
Berhampore	1823, and 9, ending 1834‡	200·01	6·88
Fort William	9, „ 1852–3	187·50	7·00
Lahore	9, „ 1854–55	273·79	7·54
Cawnpore	9, „ 1852–53	267·95	7·82

* *Vide* Mr. Hugh Macpherson's "Analysis," &c., "Indian Annals," No. IX. p. 222.

† The year 1849–50 not included.

‡ Col. Tulloch, quoted by Martin, on "Tropical Climates," p. 73.

BOMBAY.*

Stations.	Periods of Observation.	Treated per 100 of Strength.	Deaths per 100 of Strength.
Kolapore	20 yrs., ending 1849	300·34	2·05
Sholapore	" "	226·95	2·22
Kirkee	" "	177·34	2·64
Belgaum	" "	172·74	2·75
Punjaub Army	" "	197·82	2·89
Aden	" "	137·98	2·99
Deesa	" "	171·82	3·40
Ahmednuggur	" "	233·15	3·45
Bhooj	" "	209·99	3·83
Poona	" "	230·33	4·11
Kanark	" "	100·07	4·37
Mhow	" "	182·54	4·97
Indus Army	" "	155·56	7·36
Kurrachee	" "	208·43	9·02
Bombay and Colaba	" "	254·16	10·92
Hydrabad in Scinde	" "	369·48	23·52

* Bombay Medical and Physical Society's Transactions, No. II., New Series, p. 263.

19. These figures are sufficient to show how many valuable lives may be saved by selecting the healthiest stations. But they must not be viewed as revealing the whole truth, and nothing but the truth. For instance, at Subathoo, 4,000 feet above the sea level, the mortality is set down as having been higher than it was at Dum Dum, and Chinsurah near Calcutta, and at Agra and Meerut in the plains of the North-West Provinces. Mr. Grant, I think, gives in part the reason of this in the following words, written in 1853: "The barracks" (at Subathoo) "were *at first unsuitable temporary buildings*, but latterly they have been greatly improved and added to, and each man,

both here and at Kussowlie, is allowed space equal to 1,000 cubic feet of air; the water is good and abundant, and the supplies are excellent; the beef being varied occasionally by mutton." Doubtless, with the improvement mentioned after the words which have been italicised, the salubrity of the place has increased. Dugshai, 6,000 feet above the sea level, and Kussowlie, 6,400 feet, are represented by a higher ratio of mortality to strength than they would have been had corps formerly been sent up thither in a tolerably healthy state, or had there been fitting barrack accommodation provided for their reception. I think the *hand* and *head* of the Marquis of Dalhousie may be recognised in the improvement of the barracks and the conservancy of the military stations of the hills; which latter, Mr. Grant says, "is now excellently administered." The statistical elucidation, on a large scale, of the relative salubrity of all our stations throughout India, over a long series of years, both for European and Native troops,* is a great desideratum. The means of supplying this information must be contained in the records of the three late medical boards.

20. Information of this kind would enable the Government to perceive at a glance those sites which are most favourable for the residence of Europeans. And if due attention were paid to the facts thus revealed by the ruling authorities, the Anglo-Saxon soldier's life would be prolonged to *twice*, or even

* This has been done, for native troops, in the Bombay Presidency: *Vide* Appendix.

thrice, its present limited and unnatural duration. Compare the mortality of Rawul Pindee with that of Cawnpore, in the Bengal portion of the above statement; and that of Kolapore with that of Bombay or Hydrabad in Scinde; and then the reader will be fully prepared to acknowledge that *site* is all-important, and that no effort should be spared by the authorities to ascertain, with mathematical precision, the relative merits of the different stations occupied, or likely to be occupied, by our soldiers.

Finally, in venturing to place the results of my labours before the profession, I have not altogether forgotten the maxim, οὐδεὶς ἀνθρώπων αὐτὸς ἅπαντα σοφὸς; and when I have trespassed on the province of the political economorbist, unusual caution has been observed. If the arguments adduced should have the effect of arousing the attention of the Indian Government to a sense of the vast importance of practical sanatory reform, and, by consequence, of placing the European soldiers—who must always, from this time henceforth, constitute the most powerful portion of our military strength in this country—on a healthier footing than they have been heretofore, or are at present, the great end I have had in view in undertaking the labour and expense of bringing these pages through the press will have been in great part secured: it will never be fully realised until the English soldier's health and chances of life are equal to those of his officer, or of the covenanted civilians who direct the civil administration of the Indian Empire.

CHAPTER I.

ON THE VITAL STATISTICS OF THE EUROPEAN AND NATIVE TROOPS IN INDIA: CONSIDERED, INDIVIDUALLY, WITH REGARD TO THE AVERAGE RATES OF SICKNESS AND MORTALITY IN EACH PRESIDENCY IN EACH DESCRIPTION OF TROOPS; AND COMPARATIVELY, WITH A VIEW TO ILLUSTRATE THE RELATIVE PROPORTION OF SICKNESS AND MORTALITY AMONGST EUROPEAN AND NATIVE TROOPS.

SECTION I.—*On the General Statistics of European Soldiers.*

1. THE AVERAGE RATES OF SICKNESS AND MORTALITY AMONGST EUROPEAN SOLDIERS IN INDIA.

TABLE I.—*Exhibiting the Average Rates of Sickness and Mortality from all Diseases amongst European Troops in India.*

Presidency.	Periods.	Strength	Admissions.	Deaths.	Percentage of Admissions to Strength.	Percentage of Deaths to Strength.	Percentage of Deaths to Admissions.
Bengal......	1812 to 1853–54	543,768	1,129,583	37,764	207·73	6·94	3·34
Bombay ...	1803–4 to 1853–54	306,978	627,369	16,954	204·36	5·52	2·70
Madras......	1829 to 1851–52*	213,587	363,870	8,301	170·36	3·88	2·28

* Exclusive of the years 1839, 1840, and 1841. It may here be mentioned, once for all, that the initial and terminal years in all the periods of observation throughout this treatise are invariably inclusive.

From these figures it appears—1st. That the ratio of admissions to strength in the Bengal and Bombay Presidencies very nearly corresponds, amounting to 207·73 per cent. in the former, and to 204·36 in the latter; whilst in the Madras Presidency it only amounts to 170·36, which is 37·37 per cent. less than that which obtains in Bengal, and 34 than that which holds good in Bombay. 2ndly. That the percentage of deaths to strength has reached 6·94 and 5·52 in Bengal and Bombay, or an annual mortality of about *one-fourteenth* of the total strength in the former, and *one-eighteenth* in the latter Presidency; whilst that of Madras has descended to 3·88, or the *five-and-twentieth* part of the whole force. 3rdly. That the proportion of deaths per hundred admissions reached 3·34 in Bengal, 2·70 in Bombay, and fell to 2·56 in Madras.

Dr. Hugh Macpherson has shown that the annual average percentage to strength of invalids, amongst the European troops serving in Bengal, amounted to 2·63 during the eight years ending 1853-54. And, perhaps, I am understating the annual average in Bombay and Madras by setting it down at 2 per cent. By adding the loss consequent on invaliding to that which is caused by deaths, I find that the

European army has hitherto *disappeared*

In Bengal	in about every	10½	years.
In Bombay	,,	13¼	,,
In Madras	,,	17	,,
In all India	,,	13½	,,

The most melancholy circumstance connected with

the past extraordinary expenditure of human life and money is the indisputable fact, that the greatest portion of the evil was capable of considerable mitigation, or of being prevented. This assertion is clearly confirmed by the following authentic statement,* exhibiting the sickness and mortality amongst the officers attached to European regiments in Bengal for eight years:—

Presidency.	Periods.	Strength	Admissions.	Deaths.	Percentage of Admissions to Strength.	Percentage of Deaths to Strength.	Percentage of Deaths to Admissions.
Bengal	1846–47 to 1853–54	5,708	7,549	121	132·25	2·11	1·60

Thus, according to these figures, the general accuracy of which cannot be called in question, 75·48 per cent. of the sickness, and 4·83 per cent. of the deaths to strength, might have been prevented by the liberal introduction (into our European army) of comprehensive hygienic and sanatory improvements. But this statement does not embody the whole truth, for Mackinnon states that 2 per cent. is the average annual mortality amongst Bengal civilians. Not less than 4·94 per cent., therefore, of our European soldiers have annually fallen victims to disease which was either removable, avoidable, preventable, or mitigable to a very large extent indeed.

Though the above averages are gloomy enough, when taken as a whole, it is pleasing to be able not

* "Indian Annals of Medical Science," No. VIII., p. 593 and 594. Mr. Hugh Macpherson's "Statistical Paper" (1857).

only to chronicle but to demonstrate a decided decrement in the mortality of our European troops of late years; which, however, is, according to my interpretation of the returns, more attributable to improved medical treatment than to any wide-spread sanatory reform.

2. Evidence of the Decrease of Mortality amongst European Troops in India.

Table II.—*Exhibiting the Decrease of Mortality arising from all Diseases amongst European Troops in India.*

Presidency.	Periods.	Strength	Admissions.	Deaths.	Percentage of Admissions to Strength.	Percentage of Deaths to Strength.	Percentage of Deaths to Admissions.
Bengal ...	1812 to 1831	199,616	436,111	15,166	218·47	7·59	3·47
	1832 to 1851–52	301,782	601,599	19,346	199·34	6·41	3·21
Bombay ..	1803–4 to 1827–38	116,218	222,844	7,634	191·74	6·56	3·42
	1828–29 to 1852–53	182,462	388,468	9,155	212·35	5·07	2·35
Madras ...	1829 to 1838	103,431	186,865	4,725	180·60	4·50	2·52
	1842 to 1851–52	110,156	177,005	3,576	160·60	3·20	2·02

With reference to the results contained in this comprehensive table, the following points are deemed worthy of especial notice. 1st. The amount of sickness in Bengal, during the twenty years intervening between 1812 and 1831 inclusive, was 19·13 per cent. in excess of that which obtained during the next period of similar duration, extending from 1832 to 1851-52; the ratio percentage of deaths to strength and to admissions was 1·18, and 26 higher during the former than the latter. 2ndly. In Bombay the percentage of sickness to strength amounted to 191·74 during the twenty-five years commencing

from 1803-4 and ending 1827-28; whilst it increased to 212·35 (thus showing an increment of 20·61 per cent.) during the next twenty-five years beginning from 1828-29 and terminating 1852-53. But, notwithstanding this occurrence, the percentage of deaths to strength and to treated has sunk from 6·56 to 5·07, and from 3·42 to 2·35 respectively (thus exhibiting a decrement of 1·49 and 1·07 in favour of the last, or most recent period of observation). 3rdly. In Madras the annual average percentage of sickness to strength has declined from 180·6 during the first ten years to 160·6 during the last ending 1852, or to the extent of 20; the mortality to strength has been reduced from 4·5 to 3·2 per cent., or 1·3; and the proportion of deaths to admissions has diminished at the rate of 50 out of 10,000 patients. These important facts will, perhaps, be more intelligible if presented to the reader in the following condensed tabular statement:—

Presidency.	Increase of Sickness in 10,000 Strength.	Decrease of Sickness in 10,000 Strength.	Decrease of Deaths to 10,000 Strength.	Decrease of Deaths to 10,000 Treated.
Bengal	...	1,913	118	26
Bombay	2,061	...	149	107
Madras	...	2,000	130	50

The reduction of sickness and mortality is palpable both in Bengal and Madras: the former is undoubtedly to be credited to the improved sanatory condition of the soldier, whilst the latter must be credited

partly to this account and partly to the improved system of combating disease, as indicated by the diminution of deaths to cases admitted into our hospitals. There is no evidence of the advance of sanatory science in the Western Presidency: on the contrary, prophylaxis is non-existent there, so far as these figures are concerned in enabling us to arrive at a correct conclusion. Still, notwithstanding the fact that the sickness had increased during the second period to the extent of 2,061 in 10,000 men over that which held good during the first or more remote period, the victory of an enlightened method in the application of therapeutics to the management of disease is manifested in the diminution of deaths, at the rate of 149 and 107 in every 10,000 of strength and 10,000 admissions. But even these favourable results do not give a full idea of the actual decrease of mortality which has been accomplished, as will be seen on examination of the last quinquennial periods of the subjoined table.

TABLE III.—*Exhibiting the Fluctuations of Sickness and Mortality amongst the European Troops in two Presidencies (arranged in quinquennial Periods).*

Presidency.	Periods.	Strength	Admissions.	Deaths.	Percentage of Admissions to Strength.	Percentage of Deaths to Strength.	Percentage of Deaths to Admissions.
Bengal ...	1812 to 1816	36,168	86,491	3,686	226·6	9·65	4·26
	1817 to 1821	47,361	98,259	3,628	207·4	7·87	3·69
	1822 to 1826	52,152	120,315	3,923	237·0	7·52	3·26
	1827 to 1831	61,935	131,046	3,929	211·5	6·34	2·99
	1832 to 1836	58,018	96,730	2,996	166·7	5·16	3·09
	1837 to 1841	62,451	123,715	4,015	198·09	6·42	3·24
	1842 to 1846–47	86,553	191,922	7,041	221·7	8·13	3·66
	1847–48 to 1851–2	94,760	189,232	5,294	199·7	5·58	2·79

TABLE III.—*Continued.*

Presidency.	Periods.	Strength	Admissions.	Deaths.	Percentage of Admissions to Strength.	Percentage of Deaths to Strength.	Percentage of Deaths to Admissions.
Bombay ..	1803 to 1807–8	3,619	3,636	130	100·46	3·59	3·57
	1808–9 to 1812–13	26,311	42,776	1,463	162·54	5·48	3·42
	1813–14 to 1817–8	30,860	65,721	1,802	212·96	5·83	2·72
	1818–19 to 1822–3	31,593	55,651	2,530	176·45	8·00	4·54
	1823–24 to 1827–8	23,835	55,060	1,709	231·00	7·17	3·10
	1828–29 to 1832–3	28,825	53,318	1,019	188·82	3·53	1·53
	1833–34 to 1837–8	27,575	53,420	1,059	193·72	3·84	1·98
	1838–39 to 1842–3	32,709	78,992	2,458	241·49	7·51	3·11
	1843–44 to 1847–8	44,775	108,628	3,225	242·60	7·20	2·96
	1848–9 to 1852–3*	48,578	94,110	1,394	193·73	2·86	1·47

* Dr. Coles has shown that in the Bombay Presidency the ratio of sickness to strength was 181·6 ; of deaths to strength, 1·0 ; and of deaths to treated, 9 per cent. : but this is only for one year, viz., 1855-56.—" Medical Transactions of Bombay," No. III., New Series, page 194 (1857).

Let the reader now compare mortality during the last quinquennial periods in this, with that which obtained in the remote periods in the preceding table. He will now find that the decrement of mortality in Bengal, during the five years ending 1851-52, amounted to 201 in 10,000 of strength, and to 68 in 10,000 admissions; and in Bombay, during the five years ending 1852-53, to 372 in 10,000 strength, and 196 in 10,000 admissions. This saving of valuable lives is very gratifying, because it clearly shows that the happiness and efficiency of the soldiers have proportionately increased, and that the chances of life for them are now comparatively greater than they used to be in former days. That this economy of life is consistent with the truest

economy to the coffers of the State is manifest, from the circumstance that these 573 lives which have been preserved in one year out of 20,000 men, are tantamount to a saving of 57,300*l.* It costs that sum to replace them.

It might be supposed, at first sight, that most of this decrease of mortality had been effected by the practical application of broad sanatory measures. But the facts that the diminution of actual sickness is trivial, and that the admissions are almost equal to twice the strength (which latter would make the diminution of mortality to strength effected by treatment really double that which is exhibited in the tables), tend to show that more than *one half* of the decrement of mortality in Bengal is assignable to greater modern success in opposing, by the use of appropriate remedies, the inroads of disease.

That the whole of the diminished mortality in Bombay must be credited to the account of an improved method of meeting and curing disease is evident, because whilst disease in general has been on the increase the deaths to strengths have manifested a not inconsiderable diminution, which has been solely effected through a decrease of the number of deaths to cases treated. Only a minute fraction of the decreased mortality in the Indian army can be ascribed to the introduction of sanatory reform.

The above calculations afford some room for consolation; which, however, is not unmixed with alloy.

For there was, down to the latest period to which our figures carry us, a balance of mortality amounting to nearly 3½ per cent. against the common soldier in Bengal, which is dependent upon the "various circumstances wherein he differs from the civil servant." In reference to this subject, Dr. Kenneth Mackinnon, in his Treatise on Public Health, states as follows:—"He (the soldier) is more reckless and disregardful of his own health, and pays no attention to the means which are at his disposal for its preservation; he exposes himself to the sun, endangers his brain, disturbs the circulation, gets heated, and perspires freely, without taking any precaution, such as changing his dress, or avoiding draughts and cold air, while the skin is in this state of increased action, and consequently so liable to external impression. In diet, too, the soldier is careless, especially in the use of half ripe and acid fruits; but the great bane of his life and comfort is the use of spirits. This is so well known as the source of sickness and crime, that the notice of it would seem idle, unless we had something to suggest as a remedy; nor can we expect to be original on a subject that is at present engaging much public attention. The great heat of the climate, and the thirst and lassitude produced by it, appear to be the great causes of drunkenness; but the confinement within doors, the want of bodily or mental occupation, and the absence or distant prospect of reward for merit and good conduct, enhance their effect. The two last causes hinted at are removable, and I have no doubt that, when this is

done (the limited service seems to me to be in itself a boon and a reward), much improvement will be the consequence. Raise the soldier in self-respect, and in his prospects, then he will regard his life as worth preserving. The evil effect of crowding human beings together, is now being fully appreciated. In this respect, and the character of their accommodation, there is a vast difference between the civilian and the soldier, and on this no doubt a good deal of the mortality depends." 'During healthy respiration, the atmospheric air that supplies the lungs is constantly being changed. If this renewal of the air is not provided for, but the same air is breathed over again, the circumstances attending respiration are changed.' "And, again," 'in the same proportion, for example, as the oxygenous contents of the air diminish, and the carbonaceous contents increase, less and less oxygen is absorbed, less and less carbonic acid is evolved, and when the air comes to have a certain proportion of carbonic acid mixed with it, which, from the experiments of Allen and Pepys, appears to be 10 per cent., no more carbonic acid is formed, and the elastic fluid no longer suffices for respiration, although it still contains something like 10 per cent. of oxygen. A little oxygen indeed continues to disappear, but the respiration becomes laborious, and cannot be carried on without imminent risk of suffocation to any of the higher animals.' "Below this point of approaching suffocation, much mischief may and does happen by bad ventilation; we may not always be able to keep the atmosphere clear of

vegetable impurities, but the vitiation, which is the effect of bad ventilation, is within our control. In most of the barracks (those recently built are somewhat better) the men are much overcrowded, so that what they gain by non-exposure is more than lost by bad ventilation."

It may be incompatible with the resources of the Indian Exchequer to confer on our fellow-Christians in arms the same privileges as their superiors enjoy in regard to emoluments, house accommodation, indulgence-leave for short periods to neighbouring stations, to the hill sanataria, or to sea, and, with respect to furloughs, to Europe, Australia, or the Cape of Good Hope. These boons at present may be viewed as Utopian in the extreme. But surely their health and power of resisting disease and death might be much improved, if greater attention (than it has hitherto been the rule to bestow) were paid to the proper construction of their barracks and hospitals. The utmost care should be observed in the selection of sites for the erection of these costly buildings. The front of every barrack and hospital should face the prevailing wind. The doors should be as high as possible, and ventilatory perforations should always be made in the side walls, and as high up as consistent with their proper communication with the external air. The room, or rooms, should, even when provided with the most thorough means for securing the constant renewal of fresh air, never contain a larger number of souls than is consistent

with an allowance of 1,000 or 1,500 cubic feet of space to each inmate. The barrack should be so planned and regulated as to be a healthy habitation, and the hospital as to afford the best accommodation for those prostrated by disease.

To have the full benefits of prophylactic science, the full development of all those means of purification which are intended to prevent disease should be insisted upon. And the dietetic wants of the men should be carefully attended to: that is to say, *responsible supervision* should be supplied to see that the meat and vegetables consumed are of the very best quality, and properly prepared or cooked.

In every large cantonment there are Medical Officers whose education and preliminary training have well fitted them instinctively to detect the sources of disease, as also to suggest the necessary remedies for their eradication. But the *Government have, up to this moment, always committed the great mistake of confining the labours of their Medical Officers to the cure of disease—not to its prevention.*

Now it has frequently struck me during my brief sojourn in India that, if administrative Medical Officers were *actually* and *solely responsible*, by virtue of their possessing executive as well as recommendatory or initiatory functions, for the sanatory care of our military Stations, much benefit would be the result to the health of our European troops. It has

also often occurred to me that, if a sanatory corps of scavengers were raised in each Presidency to be distributed amongst Superintending Surgeons for the sole purpose of enabling them to execute their own sanatory plans, or such as may have been suggested to them, a large proportion of sickness and mortality would be averted. This corps, if properly handled, would be reproductive, inasmuch as it would greatly lessen the expenditure of human life which costs the Government so much.

Further, can nothing be done to dispel the dreadful *ennui* which preys upon the very vitals of the soldier? Would not the well organised institution of industrial laboratories in our Stations be effectual in removing the mental and nervous depression which harrow the soldier's feelings during the greater part of his life, and which are consequent upon the absence of physical occupation? Libraries are undoubtedly useful; but the brain cannot always be strained with intellectual exercise. Nor can the eye continue the monotonous labour during prolonged reading. Gymnastics of various kinds are excellent antidotes, so far as they go, to idleness and its consequences. These, however, cannot do more than partially ameliorate the private's condition. In short, some fixed occupation, in addition to purely military duties, libraries, gymnastics, &c., seems to be absolutely essential to confer on him the power of successfully resisting his two greatest foes—DISEASE and the ENEMY.

3. Ages of European Soldiers in Bengal compared with various other Situations.

Table IV.*—*Exhibiting the Proportion of European Soldiers, at certain Ages, in Bengal, for Four Years, ending* 1853–54; *and at various other Stations.*

Ages.	Bengal.	Infantry of Line, United Kingdom.	Bengal.	Infantry of Line, United Kingdom.	Canada and Nova Scotia.	Mediterranean Stations.
	Strength.	Strength.	Percentage to Total Strength at each Age.	Percentage to Total Strength at each Age.	Percentage to Total Strength at each Age.	Percentage to Total Strength at each Age.
Under 20 years ...	7,599	33,463	9·03	21·15	5·54	6·11
20, and under 25...	27,341	57,291	32·49	36·21	33·33	38·06
25, „ 30...	29,158	27,861	35·65	17·61	27·65	30·12
30, „ 35...	14,390	22,323	17·10	14·11	22·22	17·42
35, and upwards ...	5,596	17,261	6·65	10·91	11·21	8·28
Unknown............	59	...	0·07	—	—	—
Total	84,143	158,200	—	—	—	—

* Compiled from Tables II. a. and XV. in Mr. Hugh Macpherson's "Analysis of the later Medical Returns of European Troops in Bengal Presidency," I. A., Nos. VIII and IX.

It appears, therefore, that upwards of an *eleventh* of the soldiers serving in Bengal, an *eighteenth* in Canada and Nova Scotia, and a *sixteenth* in the Mediterranean stations, are under the age of 20, whilst in the United Kingdom more than a fifth of the infantry of the line are under that age. Between 20 and 25, there is a remarkable degree of uniformity in all the commands; but between 25 and 30, though a

similar uniformity holds good with respect to the three first-named situations, the proportion in Great Britain and Ireland is just *a half* of that which obtains in Bengal, and much less than in the other stations. To come more to particulars, 77 per cent. of the European troops in Bengal are under 30; and 23 per cent. above that age. To be still more explicit, 94 per cent. are under 35; the remaining 6 above that age.

4. EVIDENCE OF ADVANCE OF AGE INCREASING, IN A MOST REMARKABLE MANNER, THE TENDENCY TO DEATH AMONGST EUROPEAN SOLDIERS SERVING IN INDIA.

TABLE V.*—*Exhibiting the Influence of Age upon the Mortality amongst European Soldiers in Bengal, during the Four Years ending* 1853–4, *compared with the Infantry of the Line, United Kingdom.*

Ages.	European Soldiers in Bengal.			Infantry of the United Kingdom.		
	Strength.	Deaths.	Percentage of Deaths to Strength.	Strength.	Deaths.	Percentage of Deaths to Strength.
Under 20 years .	7,599	152	2·	33,463	440	1·31
20, and under 25	27,341	1,201	4·39	57,291	1,019	1·78
25, „ 30	29,158	1,727	5·92	27,861	552	1·98
30, „ 35	14,390	825	5·73	22,323	442	1·98
35, and upwards	5,596	333	5·94	17,261	370	2·14
Unknown......	59	16	—	—	—	—
Total	84,143	4,254	5·05	158,200	2,823	1·78

* Op. cit., p. 224.

The minimum percentage of mortality in India, as in England, is under 20; the maximum at 35 and upwards. In both countries, the augmentation of deaths to strength with increasing age (so far as this table enables us to judge) is fully illustrated. It is true that in this country the quinquennial period between 30 and 35 furnishes a triflingly smaller ratio of deaths than that which immediately precedes it. This does not, however, affect the operation of the general law in reality; for it is during this period (and afterwards) that such large numbers become transferred from the effective list of the army to the invalids—very large, indeed, in proportion to the real strength. In the high ratio of mortality which prevails in Bengal, rising still higher as the young men in the army grow prematurely older, we have in part the rationale of the comparatively small proportion of men living in the ranks whose ages exceed 35 years; and in the absolute necessity for early invaliding, we have the remainder of the explanation revealed in very intelligible characters: as will be gleaned from a careful perusal of the subjoined table, for the materials composing which I am again indebted to Mr. Macpherson's able analysis.

5. Remarkable Influence of increasing Age in increasing the necessity for Invaliding European Troops in India.

TABLE VI.—*Exhibiting the Influence of Age on Invaliding amongst the European Troops in Bengal, during the Four Years ending* 1853–54.

Ages.	Strength at each Age.	Number of Men Invalided at each Age.	Percentage of Men Invalided at each Age to Strength.	Proportion of Invalids to Total Invalided.
Under 20 years	7,599	27	·35	1·33
20, and under 25......	27,341	373	1·36	18·17
25, „ 30......	29,158	546	1·87	26·60
30, „ 35......	14,390	459	3·18	22·36
35, „ 40......	5,655	429	11·44	20·90
40, „ 45......		192		9·35
From 45, and upwards		23		1·12
Unknown		3		—
Total	84,143	2,052	2·43	—

The minimum percentage of invalids to strength is thus shown to occur under the age of 20, when it amounts to 35 ; the maximum, after ·35, when it reaches the high figure of 11·44. The mean annual average is 2·43, which is ·20 per cent. less than the annual average ratio for eight years ending 1853-54. The same combination of causes which produces the enormously high rate of mortality in this country, is operative in preparing a considerable proportion of our soldiers to be consigned to the invalids: were they not so disposed of, the present high ratio would undoubtedly rise still higher—especially during the later periods of their remarkably short lives. The augmentation in the percentage of invalids to strength with advancing years is strikingly manifested here. If anything could add to the

force of this and the preceding table, perhaps it might be the following statement, demonstrating the loss which is sustained from deaths and invalids *per hundred of strength at each age mentioned* :—

Under 20 years	2·35	per cent. loss.
20 and under 25 "	5·75	"
25 " 30 "	7·79	"
30 " 35 "	8·91	"
35 and upwards	17·38	"

These figures speak emphatically enough for themselves.

SECTION II.—*On the General Statistics of the Native Soldiers.*

1. THE AVERAGE RATES OF SICKNESS AND MORTALITY AMONGST NATIVE TROOPS.

TABLE VII.—*Exhibiting the Average Rates of Sickness and Mortality from all Diseases amongst Native Troops.*

Presidency.	Periods.	Strength	Admissions.	Deaths.	Percentage of Admissions to Strength.	Percentage of Deaths to Strength.	Percentage of Deaths to Admissions.
Bengal	1826 to 1852–53	2,767,347	2,464,608	38,451	89·06	1·39	1·56
Bombay	1803–4 to 1853–54	1,451,166	1,295,039	22,960	89·24	1·58	1·77
Madras	1827 to 1851–52*	1,242,694	848,702	21,759	68·29	1·75	2·56

* Exclusive of 1836–37–38–39–40 and 1841.

Thus it appears that the relative order of salubrity of the three Presidencies for Natives, bears some

resemblance to that which was seen to obtain for Europeans; but, in all situations, the ratio of sickness stands much lower amongst indigenous troops, whilst the order of mortality is reversed, the highest percentages to strength and to treated occurring in Madras, the lowest in Bengal, Bombay occupying an intermediate position.

By a more particular comparison of the results contained in this, with those arrived at in table No. I., the following significant revelations are obtained: — 1st. That the *proportion of sickness* amongst Europeans as compared with that of the Native troops—

Is in Bengal	as	2·33	to	1
„ Bombay	„	2·29	„	1
„ Madras	„	2·49	„	1

2ndly. That the *mortality to strength* amongst Europeans as compared with that of the Native troops—

Is in Bengal	as	4·99	to	1
„ Bombay	„	3·49	„	1
„ Madras	„	2·21	„	1

3rdly. That the mortality to treated amongst Europeans as compared with that of the Native troops—

Is in Bengal	as	2·14	to	1·
„ Bombay	„	1·52	„	1·
„ Madras	„	1·	„	1·12

Ponder these facts as we may, we must arrive at the unavoidable conclusion, that the Indian service has hitherto proved remarkably inimical to the

HEALTH and LIVES of European soldiers—more especially residence in the Bengal Presidency.

2. EVIDENCE OF INCREASED SICKNESS AND MORTALITY AMONGST NATIVE TROOPS, AS ALSO SATISFACTORY PROOFS TO SHOW THAT THE PROPORTION OF DEATHS TO ADMISSIONS HAS DECREASED.

TABLE VIII.—*Exhibiting the Increase of Sickness and Mortality from all Diseases amongst the Native Troops, &c.*

Presidency.	Periods.	Strength	Admissions.	Deaths.	Percentage of Admissions to Strength.	Percentage of Deaths to Strength.	Percentage of Deaths to Treated.
Bengal ...	1826 to 1838–39	1,299,381	915,142	16,149	70·42	1·24	1·76
	1839–40 to 1852–3	1,467,966	1,549,465	22,301	105·55	1·51	1·43
Bombay ..	1803–4 to 1827–28	610,441	460,487	10,205	75·43	1·67	2·21
	1828–9 to 1852–3	807,196	801,003	12,363	99·23	1·53	1·54
Madras ...	1829 to 1838	568,403	347,327	9,121	61·1	1·6	2·6
	1842 to 1851–52	645,263	484,427	12,190	75·0	1·8	2·5

It may be inferred from these figures that the health of the three Native armies has deteriorated. This circumstance is probably attributable to the increased duties consequent on the rapid extension of the Honourable Company's territorial possessions; to exposure to atmospheric vicissitudes and malaria in foreign and newly-conquered countries; and to all those disadvantages which are invariably consequent upon the exigences of war—especially when carried on during insalubrious seasons in warm climates. If we except Bombay, there is also evidence of an increment in the ratio of casualties to strength; which is perhaps the test, after all, of the real state

of health of any large body of men. These two facts; viz., the increased ratio of sickness and of mortality to strength, plainly prove that, from whatever cause or congeries of causes, no advance has been made towards the sanatory improvement of the Sepoys, who, at this present moment, notwithstanding the revolting occurrences of 1857, compose such a large moiety of our military power.

But it is consolatory to perceive that there has been a diminution of deaths to treated, amounting to 330 in every 100,000 patients admitted into our hospitals in Bengal, during the thirteen and a half years from 1839-40 to 1852-53, as compared with the previous period of similar duration, from 1826 to 1838-39. Contrasting the two last periods of observation with the two first in Bombay (twenty-five years each) and in Madras (ten years each), it is found that in every 100,000 patients admitted, the decrement of mortality has amounted to 670 souls in the former, and 100 in the latter situation. It is owing to the diminution of the casualties to admissions that the mortality to strength stands so little higher during the second than during the first periods of review; and it may be said to be solely owing to this happy circumstance that Bombay constitutes an exception to the rule, as regards the increase of mortality to strength.

It was observed that apparently some sanatory advance had been made with respect to European soldiers; but it was also manifest from facts which, are detailed (*vide* Table II. *et seq.*), it is hoped, with

sufficient perspicuity to make them readily intelligible, that the largest portion of the reduction of mortality had been effected quite independently of this; because the decrease of deaths was found to be out of all proportion greater than could be accounted for by the slight lessening of the average sickness. With regard to Bombay, this train of inductive or inferential reasoning was not necessary to prove the position I had assumed; for there the deaths were seen to have undergone a considerable decrement in spite of a very perceptible augmentation of disease.

As, therefore, it was deemed consistent with justice and candour to credit the largest fraction of life saved amongst Europeans, for the reasons already assigned, to improvement in the management of their diseases in recent times; so is it considered just to credit the diminution of deaths to treated in conjunction with the small increment of deaths to strength (which is lower than it would have been had the mortality to treated increased *pari passu* with disease) to an improved system of treating the disorders met with amongst our Sepoys. But the real decrease of deaths to admissions which has been reached of late years, will appear more forcibly after reference to the last quinquennial periods in the following instructive table, and a comparison of the ratios contained therein with those filling the percentage columns of the preceding one.

TABLE IX.—*Exhibiting the Fluctuations of Sickness and Mortality amongst the Native Troops in two Presidencies (arranged in Quinquennial Periods).*

Presidency.	Periods.	Strength	Admissions.	Deaths.	Percentage of Admissions to Strength.	Percentage of Deaths to Strength.	Percentage of Deaths to Admissions.
Bengal ...	1826 to 1830	562,903	354,358	7,306	62·95	1·29	2·06
	1831 to 1835	450,890	311,958	4,624	69·18	1·02	1·04
	1836 to 1840	433,042	379,375	6,573	80·76	1·51	1·73
	1841 to 1845	519,654	569,468	10,014	109·58	1·09	1·75
	1846–47 to 1851–2	555,937	560,639	6,566	100·84	1·19	1·11
Bombay ..	1803–4 to 1807–8	18,866	18,880	487	100·07	2·05	2·05
	1808–9 to 1812–13	105,859	83,267	1,375	78·69	1·29	1·65
	1813–14 to 1817–8	139,695	95,433	1,955	68·31	1·39	2·04
	1818–19 to 1822–3	174,184	127,616	3,591	73·28	2·06	2·73
	1823–24 to 1827–8	171,837	135,291	2,797	78·73	1·62	2·06
	1828–29 to 1832–3	163,187	107,016	1,765	65·57	1·08	1·64
	1833–34 to 1837–8	127,557	112,096	2,115	87·87	1·65	1·88
	1838–39 to 1842–3	135,702	170,165	2,617	125·39	1·92	1·53
	1843–44 to 1847–8	200,308	218,395	3,995	109·00	1·99	1·82
	1848–49 to 1852–3	180,442	193,331	1,871	107·14	1·03	0·96

The further decrease in the mortality is here well marked; especially if it be borne in mind that it has never assumed a very high figure amongst natives compared with foreigners.

CHAPTER II.

On the Statistics of Fevers amongst European and Native Troops in India.

Section I.—*Statistics of Fevers amongst European Soldiers.*

1. Average Rates of Sickness and Mortality from Fevers amongst European Troops serving in India.

Table X.—*Exhibiting the Sickness and Mortality from Fevers amongst European Troops serving in India.*

Presidency.	Periods.	Strength	Admissions.	Deaths.	Percentage of Admissions to Strength.	Percentage of Deaths to Strength.	Percentage of Deaths to Admissions.
Bengal	1812 to 1853–54	543,768	394,983	10,837	72·64	1·99	2·74
Bombay	1803–4 to 1853–4	306,978	190,136	4,221	61·93	1·37	2·22
Madras	1829 to 1851*	213,587	67,543	808	31·62	0·37	1·19

* Exclusive of 1839–40 and 1841.

Fevers are therefore $2\frac{1}{3}$ times more frequent in Bengal, and nearly *twice* as prevalent in Bombay as in Madras. The proportion of mortality to strength is ·62 per cent. greater in Bengal than in Bombay, and five times as high as in Madras. The proportion

of mortality to admissions is ·32 per cent. greater in Bengal than in Bombay, and $2\frac{1}{3}$ higher than in Madras.

These facts go far to show that the causes of these febrile disorders, viz., *malarious exhalations*, are not only most abundant, but also most virulent, in the Gangetic Presidency; because fevers are more prevalent, more fatal in proportion to given strength, and to given treatment, in this than in either of the other Presidencies. Doubtless it is owing to similar reasons that they abound more, and are more mortal, in Bombay than in Madras. Here, then, is revealed the gigantic evil—the principal cause which raises the proportion of sickness and mortality resulting from all diseases so much higher in Bengal than in Bombay, and so much higher in both than in Madras.

If the reader will do me the honour to follow me throughout the subsequent pages of this treatise, he will discover that the remainder of the rationale exists in the abundance of bowel and hepatic complaints, which appear to prevail somewhat in the direct ratio of the abundance and concentration of malaria. For though attacks of malarious fevers may not, as some authorities believe, directly produce dysentery, diarrhœa, &c., it is pretty universally acknowledged that they are the most powerful predisposing causes to these diseases; each of which contributes its moiety to swell the gross sick and mortality bills of the Eastern and Western over those of the Southern regions of the Peninsula.

2. Evidence of the Decrease of Mortality from Fevers amongst European Troops in India.

Table XI.—*Exhibiting the Decrease of Mortality from Fevers amongst European Troops serving in India.*

Presidency.	Periods.	Strength	Admis-sions.	Deaths.	Percentage of Admissions to Strength.	Percentage of Deaths to Strength.	Percentage of Deaths to Admissions.
Bengal ...	1812 to 1832	211,993	156,349	6,298	73·75	2·97	4·02
	1833 to 1853–54	331,775	238,634	4,539	71·92	1·36	1·902
Bombay ..	1803–4 to 1827–28	116,218	67,905	2,265	58·42	1·08	3·33
	1828–29 to 1852–3	182,462	117,188	1,947	64·22	1·06	1·66
Madras ...	1829 to 1838	103,431	36,624	498	35·4	0·48	1·3
	1842 to 1851	110,156	30,919	310	28·1	0·28	1·0

The marked decrement of mortality, chiefly effected through a most remarkably well developed diminution in the ratio of deaths to admissions, is the predominating characteristic of this very instructive table. That this is attributable to the gradual relinquishment of doctrines, the wide promulgation of which in former days induced physicians to treat fevers as if they were treating inflammations; and to the substitution of a tonic, conservative, and antiperiodic system of therapeutical management, will, I think, be pretty universally acknowledged. For that it is owing to the steady displacement of the lancet and mercurialization by the liberal employment of cinchona, the disulphate and bisulphate of quinine, conjoined with promptitude in the administration of tonics, and generous diet during convalescence, is unquestionable.

Dr. John Macpherson, in his very able "Report on Quinine and Antiperiodics," published in the fifth number of the "Indian Annals of Medical Science," after pointing out, by figured statements, the reduction in the mortality from fevers, from 3·66 per cent. in 1830 to about 1 per cent. (1855?) (which, however, is still a higher ratio than exists in the Bombay Presidency, as will presently be seen; and is even much higher than has apparently ever existed in Madras), states that "it has been suggested that the decrease of mortality may be the result of the large number of not very fatal cases of fever which occur at some new Stations." He is, however, supported in his opinion by these figures, when he remarks, that "still, this is not enough to affect the general result materially."

To be consistent, those who hold that the decrease of death to strength is owing to the greater prevalence in recent times of "not very fatal cases," should be prepared to show how it happens that very mild forms of fevers have abounded to such an extent as to sufficiently account for a diminution of mortality in Bengal from 2·97 to 1·36, and in Bombay, from 1·08 to 1·06, in spite of an increase of the proportion of fevers by 5·8 per cent.; or, what is further illustrated in the following table, from 5·52 per cent. during the four years ending 1815 to 1·008 during the four years ending 1853-54 in the former, and from 1·47 per cent. during the four years 1814-15 to ·49 during a period of similar duration ending 1853-54 in the latter.

Table XII.—*Exhibiting the Decrease of Mortality from Fevers amongst European Troops, as manifested by a Comparison of the most recent with the most remote Periods, in each of the Three Presidencies.*

Presidency.	Periods.	Strength	Admissions.	Deaths.	Percentage of Admissions to Strength.	Percentage of Deaths to Strength.	Percentage of Deaths to Admissions.
Bengal ...	1812 to 1815	29,451	24,992	1,626	84·85	5·52	6·50
	1850 to 1853–54	84,143	84,357	849	100·25	1·008	1·006
Bombay ..	1811–12 to 1814–5	24,653	16,357	363	66·34	1·47	2·21
	1850–51 to 1853–4	37,516	23,707	186	63·19	0·49	0·78
Madras ...	1829 to 1832	44,706	13,201	160	29·52	0·35	1·21
	1848 to 1851	37,493	10,673	63	28·46	0·16	0·59

There is herein demonstrated a clear saving of human life, during the recent periods of observation, when contrasted with the remote periods. Out of 40,000 Europeans in Bengal, the annual saving of lives, exclusive of that consequent on the smaller proportion invalided, amounts to 1,800; out of 15,000 in Bombay, to 147; and out of 20,000 in Madras, to 38; and in all India, out of 75,000 European troops, to a total saving of 1,985 soldiers: or of two regiments, each mustering nearly 1,000 men. The total saving to the Exchequer, according to these data, is no less than 198,500*l.* sterling. It is scarcely fair, therefore, to consider a department, whose members have succeeded in economising so much life by an enlightened therapeutical and dietetic management of a single class of disease, as wholly non-reproductive. Even admitting that more expenditure will follow the augmented introduction of quinine to meet the wants of our increased Euro-

pean forces, I still find that a handsome balance remains.

The expenditure for cinchona bark and quinine amounted, in round numbers, to 11,686*l.* sterling,* for all India, in 1853-54. Now, granting that the demand for these important drugs will, in future, be quadrupled (or that there will be a demand for 46,744*l.* worth of them), and that all this will be supplied and expended, there will still remain a balance of about 151,756*l.*, clear annual gain to the Indian treasury. If, then, I am right in awarding the credit of this saving of life and money to the freer introduction and use of these antiperiodics, and to the gradual abolition of spoliative treatment, it is manifest that it is the truest economy for the Government to encourage, and to accord their cordial sanction to their liberal employment and extension in practice. Why, to reiterate the importance of this subject, from the lowest point of view in which it can be considered, for every 1,000*l.* spent in the purchase of quinine and cinchona bark, the Government receives an unfettered and immediate return profit of nearly 3,246*l.*—2,246*l.* sterling more than the original outlay, in European lives.

For the further saving of lives and money that may not improbably be effected by the universal administration of quinine, in minimum doses, as a prophylactic of malarious fevers and their destructive

* "On the Introduction of the Cinchona Trees into India." By Thomas Anderson, M.D., F.R.S.E. "Indian Annals," No. V., p. 267, 268 (1855).

consequences, the reader is referred to the observations and estimates which I have ventured to frame at page 96 of this volume.

I now propose to consider the results arrived at in the last table, from another point of view.

It will be observed that no actual diminution of any consequence, in the ratio of sickness from fevers, has taken place during the recent quatrennial periods. In Bombay and Madras, it is true, a very slight decrease is manifested, but this is more than neutralized by the augmentation in Bengal, from an average of 84·85 per cent., during 1812 to 1815 inclusive, to 100·25 per cent., during 1850-51 to 1853-54. The inference to be drawn from these statements is, that the noble science which contemplates the prevention of human suffering has not, from whatever reasons, kept pace with the equally noble one which professes to alleviate, mitigate, or cure disease when once it has become developed.

To accomplish the former most desirable object, it is absolutely necessary to strike at the roots of the cause or very fountains of supply. The hydra-headed monster must be assailed in his strongest holds, and there be completely annihilated. Malaria must no longer be permitted to be the greatest foe to our armies in quarters, as it is in the field; to our hearths and homes, and I fervently wish I could say to those of the 151,676,121 millions of inhabitants which people the 1,369,101 of square miles of this magnificent country. It is universally acknowledged that the production of malaria is essen-

tially connected with, or dependent upon, decomposing vegetable matter conjoined with the influence of high temperature and the presence of a limited quantity of moisture.

The remedies, or rather the weapons, to be employed for the annihilation of Indian fevers are, therefore, obvious enough. Whether this vegetable matter (and as some would have us add, animal, too,) in process of metamorphosis and decay, under circumstances of high temperature and moisture, be in the form of large accumulations spread over the surface of the ground, as is the case after the middle and about the close of the rainy season; or in the shape of marshes, exposed alluvial banks of rivers, lakes, and canals; or of cesspools, all of which near the end of, and after the monsoon, teem with organic matter, which, having subserved the purposes of vegetable and animal life, is being rapidly brought under the influence of chemical laws; it is capable of being rendered innocuous or of being destroyed: 1st, by effective drainage; 2ndly, by proper cultivation, and the thorough reclamation of waste and marsh lands; 3rdly, by the removal and destruction, to the last leaf or blade of grass, or morsel of all decaying vegetable and animal matter, or by their localization in some convenient spot sufficiently far removed from any human habitation; 4thly, by the levelling of all hollow places or inequalities which might become converted into cesspools; 5thly, by the complete filling up of all fissures existing in the earth, both in plains and ravines; 6thly, by the embank-

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ment of rivers (and canals) in proximity to our Stations; 7thly, by carrying these sanatory measures into execution not only within, but, if possible, over an area described by a radius of not less than from half a mile to two miles around every Cantonment; and lastly, by planting a belt of lofty growing trees around the circumference of this protecting circle, for the purpose of impeding the flight of, or of retaining, or absorbing, the malaria wafted towards the interior by prevailing winds.

Dr. Norman Chevers* includes intermittent fevers amongst those diseases which "being liable to occur on a vastly extended scale are essentially 'removable' only by enlarged systems, having their origin in the Government of the country in which they are found to prevail." That the practical development of sanatory measures, on a scale commensurate with the objects contemplated in the above brief summary of suggestions, is perfectly consistent with our pecuniary resources, cannot be doubted for a moment; particularly when the limited areas over which they are, at first, calculated to extend, and the consequent saving of lives and treasure that will follow, are borne in mind.

Dr. Chevers† reminds us "that in the time of Sydenham, intermittent fever destroyed from one to two thousand persons in London every year: the ordinary form of this malady has nearly disappeared as the process of draining has advanced." And Miss Strickland‡ informs us that "many thousands

* On "Public Health," p. 24. † Idem, p. 64.

‡ "Lives of the Queens of England," Vol. VI., p. 149.

had, in the autumn of 1558, fallen victims to a fever called a quotidian ague." Thirteen bishops died from it, and "so many labourers that the crops rotted in the fields."

Dr. Watson* tells us that "Dr. Craigie states that East Lothian, in Scotland, was at one time so productive of malaria, that for the reapers to be attacked with ague was quite a thing expected; but that now, in consequence of the perfect tillage and numerous tracts of wood with which the country is covered, the disorder is quite unknown there." And further, that "conversely, in regions which have been suffered to fall out of cultivation, intermittent and remittent fevers multiply. The more thoroughly any country is cultivated, the more fully, in general, is it *peopled* also; and in many places, the prevalence of these fevers has been observed to diminish and increase with the increase and diminution of the population."

Pimlico, Westminster, Lambeth, and Bermondsey, are built upon reclaimed marsh land, which, in the days of Queen Elizabeth, exhaled, during the autumnal season, a deadly poison, that spared neither prince, noble, nor peasant. What a contrast is presented at the present day! "The draining of the fen countries on the coast of England has banished a class of diseases which were most destructive in these districts. The fevers of Essex used to be inferior in virulence, but scarcely inferior in frequency, to those of the Pontine marshes." "The intermittents

* "Lectures on Practice of Medicine," p. 769.

which produced so much sickness, misery, and death in this country and in others, are now scarcely witnessed at all at the present day." This is owing to the draining, the reclamation of malaria-generating localities, and the substitution of pasture-fields or corn-growing soils in place of the original marshes.

From these observations, which might be multiplied *ad libitum*, it will be perceived that the removal of the causes which produce the fevers amongst our European troops, and occasion so much mortality and invaliding, is easily practicable. Now supposing that by the inauguration and adoption of a thorough system of sanatory reform into our Military Stations, the sources of malaria were dried up, and the fevers produced thereby successfully prevented, the annual gain to the State in lives, out of 75,000 men, distributed as before mentioned, would be no less than 507:* not to take into account the diminution of invalids and in deaths that would surely follow, from a decrease of those diseases of the bowels which, in their origin and frequency, are intimately associated with fevers.

But this is not all. If the reader will follow me in comparing the recent periods in the last table with the last quinquennial periods in No. III., he will find that in Bengal the sickness to strength would be decreased to the extent of 50 per cent.; in Bombay, of 32 per cent.; and in Madras, of 16 per cent. The latter is calculated on a comparison of the above table with that portion of No. I. which shows the

* Calculated from the recent periods in last table.

total sickness, &c., in Madras. If then so much sickness were prevented, it needs scarcely be remarked that the general health, happiness, and military efficiency of our European troops would be proportionately increased. Every hour a soldier is sick, is so much loss to his employers. Stoppages do not mitigate the evil; for these (so far as I know) are only designed to cover extra expenses incurred by the State whilst patients are in hospital.

The soldier, whether in hospital or not, receives, in one shape or another, the equivalent of his stipulated pay. But, in the former case, the Government are deprived of the *quid pro quo;* in fact, sustain a *bonâ fide* loss for every day or hour he may be rendered unfit for duty in consequence of sickness. It requires no very extended acquaintance with the laws of political economy to enable any one to understand the justice of this train of reasoning.

Those means which are intended to mitigate the prevalence of fevers may be enumerated as follows:—1st, the planting of belts of trees between cantonments and marshes; 2nd, the quartering of troops in upper-storied buildings; 3rd, the application of disinfectants, such as quicklime, charcoal, &c., to suspected unhealthy situations; 4thly, modifications of the measures above suggested; and, 5thly, improvement in the general health of the soldier.

Though the practicability of preventing the generation of malaria within our cantonments, and the advantages that will accrue from the attainment of such a desirable end, in the saving of valuable lives, and of money, and in augmenting the military efficiency

of our European troops, are unquestionable, I am far from conceding my belief to the extreme doctrine which holds that any Government can immediately accomplish so much for the swarming millions of people inhabiting an expanse of continent reaching in length from Cape Comorin to Peshawur, and in breadth from the eastern boundaries of Pegu to Bombay. With such a varied, superstitious, suspecting, and jealous population, tenacious to a degree of all ancient customs, rites, ceremonies, and hereditary traditions connected with *caste;* passively obstinate, and opposed to the speedy adoption of any new suggestions made for their own advancement; rude and antiquated in all that pertains to refined agriculture and civilization—it will, I feel convinced, be impossible to introduce any wide-spread system of sanatory reform, until improved architecture in the construction of domestic buildings, the extension of the spade and plough, increased population, increased wealth, higher intellectual cultivation, and the suggestions of the sanatory philosopher applied to districts, villages, towns, and cities, have all, working more or less in harmonious co-operation, reclaimed the greatest part of the millions of acres of marsh and waste lands which exist in such abundance in this country.

Still, admitting all this to be true; that malaria can only be eradicated on such a large scale by the progress of civilization, the extension of, and improvement in agriculture, increase of population and time, &c., it is, nevertheless, the duty of a humane Government to do its utmost to induce the people

to raise themselves in the scale of morality, religion, and intellectual enlightenment; to reclaim marshes; to replace jungles and waste lands by remunerative and productive soils; to improve the conservancy of their towns and villages; to build better, more capacious, and more substantial dwelling-houses; and to throw an efficient barrier of atmospheric air between their dwellings and those of the brute beasts of the field.

3. THE INFLUENCE OF SEX, CHILDHOOD, AND STATION OF LIFE, ON THE PREVALENCE OF, AND MORTALITY FROM, FEVERS AMONGST EUROPEANS IN INDIA.

TABLE XIII.—*Exhibiting the Prevalence of and Mortality from Fevers amongst European Privates and Officers, for Eight Years, ending* 1853–54; *and Women and Children, for Four Years, also ending* 1853–54, *in Bengal; and amongst all these Classes, for Ten Years, ending* 1838, *in the Madras Presidency.*

BENGAL.

Class.	Strength.	Admissions.	Deaths.	Percentage of Admissions to Strength.	Percentage of Deaths to Strength.	Percentage of Deaths to Admissions.
Privates	156,139	127,111	1,750	81·41	1·12	1·37
Officers	5,708	2,569	32	45·007	0·56	1·24
Women	7,941	5,066	87	63·79	1·09	1·71
Children ...	9,255	2,987	165	32·27	1·78	5·52

MADRAS.

Class.	Strength.	Admissions.	Deaths.	Percentage of Admissions to Strength.	Percentage of Deaths to Strength.	Percentage of Deaths to Admissions.
Privates	75,121	22,506	292	29·95	0·38	1·29
Officers......	2,319	902	21	38·89	0·905	2·32
Women	6,559	2,065	37	31·48	0·56	1·79
Children....	9,877	3,245	139	32·85	1·40	4·28

This table will serve our purpose for comparisons. It does not give the lowest rates of mortality (in privates) attained in recent times in Bengal, as shown by Table XII. We learn from it, 1st, that fevers are upwards of 36 per cent. more abundant amongst the privates in Bengal than amongst their officers, 17·62 than amongst women, and 49·14 than amongst children: 2ndly, that the ratio of deaths to strength is ·56 higher in privates than in officers, ·03 than in women, but lower, by ·66 per cent. than in children: 3rdly, the ratio of deaths to admissions is ·13 per cent. higher in privates than in officers, whilst it falls ·34 lower than in women, and 4·15 lower than in the juvenile members of our European force: 4thly, that in Madras (it will be observed that the table only carries us down to 1838), the officers suffered most frequently from fevers, then the children, next the women, and, strange to say, last of all the common soldier; but there is greater uniformity amongst all three classes in the prevalence of these disorders than in Bengal: 5thly, that the mortality was highest amongst children, then amongst officers, next amongst women, and lowest of all in the privates. It may be affirmed, therefore, that males suffer more frequently, and die in greater numbers, according to strength, than females; and that fevers are, as a general rule, less abundant amongst children than in either; but their strength sustains greater loss, from the comparatively greater numbers of casualties in proportion to cases treated.

During the four years ending 1853-54, 1·78 per

cent. of strength, and 5·52 of admissions of children suffering from fevers, died in Bengal, and 1·40 per cent. of strength, and 4·28 of admissions succumbed in Madras, up to 1838. These mortality rates, however, must be acknowledged to represent only a portion of the mortality which is more or less dependent or consequent upon the introduction into, and retention of, malaria in the systems of the infantile and juvenile members of the army. The deaths resulting from sequelæ and complications, and from those too often unmanageable maladies, invited and fostered by what every Indian physician recognises as the *malarious cachexia*, viz., cephalic and abdominal disorders, must be something enormous.

An attentive perusal of the "domestic occurrences" corners of the Indian journals, for any length of time, will show to what an extent even the children of officers and civilians are called upon to wage war (in an unequal contest) against the morbific agencies of this malarious climate; and, in the struggle, it is truly lamentable to see so many succumb. Here, however, the hand of death is often repelled by the wholesome practice of transporting children to Europe, the Cape, &c., when they have attained a certain age, or immediately they are beginning to droop or dwindle. This panacea, which is employed for the triple purpose of plucking many a child belonging to the wealthier or well-to-do classes from the very jaws of the grim destroyer, of securing the utmost possible restoration and subsequent conservation of the physical powers, and a moral and reli-

gious education, is not open to the offspring of our soldiers.

But are there no means available by which the unfortunate situation of the soldier's progeny may be ameliorated ? There are : these are at hand, and only require to be applied on an extensive scale. The *first* essential point is to amend the sanatory condition of the soldier's habitation ; to secure for him and his wife the purest air of heaven, the best water, the best beer, &c., and a sufficient supply of all, in order that their standard of health may be raised to a high pitch of perfection, and that their constitutions may be capable of resisting the germination of the seeds of transmissible disease or infirmity. For how can their children be expected to be the emblems or prototypes of robust health, so long as the fountain-heads of supply are poisoned, diseased, and enfeebled ? That the health of the soldier's children is capable of great improvement by increasing the staminal vigour of their progenitors, is well-known to every one who has studied the laws which regulate the continuation of idiosyncrasies, peculiarities, and certain diseases and moulds of constitution, from father to son.

The *second* essential point to be noticed consists in providing the children of the privates serving in India, at an early period of life, with the nearest possible approach to a temperate climate, with a view to confer upon them the advantages of a moral and religious education, and to develop their osseous and muscular systems. The attainment of these important objects

appears to have been the prime aim of the departed hero, statesman, and philanthropic Christian, the ever to be lamented Sir H. M. Lawrence, when the Asylum at Sunawur, near Kussowlee, and the School at Mount Aboo, were first inaugurated, and so munificently assisted by him from his own private resources.

We want much more. We require scholastic and rearing institutions, raised on a scale commensurate with the great ends to be accomplished: viz., the *liberal education of all the children of our soldiers, and the utmost conservation of their constitutional powers.* To obtain both these objects; to make mind and matter progress in harmonious order—*alterum alterius auxilio eget*—it needs not to be stated that the proposed system of *national schools* should be situated on the healthiest mountain-chains, after due inquiry and investigation. It is almost superfluous to add that the whole system should be under the direct management and control of the Indian Government.

With an ever-flowing tide of Anglo-Saxon blood from the productive marts of the West, to replenish the loss consequent on disease, and the inevitable, the certain, deterioration of our race—always, I fear, under present circumstances, tending to extinction in this country—and with large educational establishments located on our most temperate and salubrious mountain-chains, for the nurturing, the rearing, and instruction of the sons and daughters of our soldiers, the general health of the rising generation would be

much improved, the Christian population increased by a successful system of prophylaxis, and the hands of the Government materially strengthened.

4. Relative Prevalence of the Various Types of Fever.

Table XIV.—*Exhibiting the relative Frequency of the different Types of Fevers, and Mortality resulting from each, amongst the European Troops, in Bengal, for Twenty-two Years, ending* 1853–54; *and, in Madras, for Ten Years, ending* 1838.

Bengal—Strength, 344,152.

Types.	Admissions.	Deaths.	Percentage of Cases of each Type to Total Admissions with Fever.	Percentage of Admissions to Strength.	Percentage of Deaths to Strength.	Percentage of Deaths to Admissions.
Intermittent ...	111,687	854	45·63	32·45	0·24	0·76
Remittent......	40,895	1,617	16·71	11·88	0·47	3·95
Continued......	92,181	2,229	37·66	26·78	0·64	2·41

Madras—Strength, 103,431.

Types.	Admissions.	Deaths.	Percentage of Cases of each Type to Total Admissions with Fever.	Percentage of Admissions to Strength.	Percentage of Deaths to Strength.	Percentage of Deaths to Admissions.
Intermittent ...	13,264	134	36·21	12·82	0·12	1·01
Remittent......	4,336	153	11·83	4·19	0·14	3·52
Continued	16,829	203	45·95	16·27	0·19	1·20
Ephemeral	2,195	8	5·99	2·12	0·007	0·36

It thus appears that intermittents are most frequent in the Bengal Presidency, constituting, as they do, 45·63 per cent. of the admissions with fever. The next in point of frequency is the continued type, which contributes 37·66 per cent., the remaining

16·71 per cent. belonging to the remittent type. But in Madras, continued fever is most commonly met with, giving 45·95 per cent. of total admissions from all fevers; intermittents stand second, giving 36·21 per cent.; remittents third, giving 11·83; and ephemerals fourth, or last, giving 5·99 per cent. to admissions with fever into hospital.

Why the severe form of fever, the continued, should be most frequent in Madras, and so much more frequent than in Bengal, in proportion to the admissions with fever, in the face of the results contained in Table X., and the observations made at page 43, would be inexplicable, did we not possess the ratios of mortality to strength to show that the continued fever in the former is not nearly so fatal as the mildest form of fever—the intermittent—is in the latter Presidency. Exactly *twice* as many men die from intermittent, more than *three and a third* as many from remittent, and *three and a third* as many from continued fever, in proportion to given strength, in Bengal as in Madras. These facts are highly suggestive as regards treatment, and the propriety of locating as many of our European troops in the Madras Presidency as would be consistent with a due consideration of the necessities of the other Presidencies—more particularly in times of external and internal tranquillity.

5. The Influence of Sex, Station of Life, and Childhood, on the Prevalence and Mortality of the Different Types of Malarious Fever.

TABLE XV.—*Exhibiting the Comparative Rates of Sickness and Mortality, from three Types of Fever, amongst European Privates, Officers, Women, and Children, in the Bengal Presidency, for Four Years ending* 1853–54; *and at Seven of the largest Stations, in the Madras Presidency, for Ten Years ending* 1838.

Class.	Strength.	Intermittents.					Remittents.					Continued.				
		Admissions.	Deaths.	Percentage of Admissions to Strength.	Percentage of Deaths to Strength.	Percentage of Deaths to Admissions.	Admissions.	Deaths.	Percentage of Admissions to Strength.	Percentage of Deaths to Strength.	Percentage of Deaths to Admissions.	Admissions.	Deaths.	Percentage of Admissions to Strength.	Percentage of Deaths to Strength.	Percentage of Deaths to Admissions.
BENGAL :—																
Privates ...	84,143	57,458	201	68·2	·23	·34	4,378	195	5·2	·23	4·45	22,499	450	26·7	·53	2·00
Officers ...	2,970	552	1	18·5	·03	·18	218	8	7·3	·26	3·6	798	7	26·8	·23	·87
Women ...	7,941	2,400	13	30·2	·16	·54	605	23	7·6	·28	3·8	2,061	51	25·9	·64	2·47
Children ...	9,255	863	27	9·3	·29	3·12	372	42	4·0	·45	11·29	1,752	96	18·9	1·03	5·42
MADRAS :—																
Privates ...	75,121	6,104	57	8·1	·07	·9	2,670	73	3·5	·09	2·7	13,732	162	18·2	·21	1·1
Officers ...	2,319	98	...	4·2	...	...	114	6	4·9	·25	0·5	690	15	29·7	·64	2·1
Women ...	6,559	249	3	3·7	·04	1·2	199	11	3·0	·16	5·5	1,617	23	24·7	·35	1·4
Children ...	9,877	524	8	5·3	·08	1·5	383	40	3·8	·40	10·4	2,338	91	23·6	·92	3·8

I now proceed to consider, in detail, the interesting results contained in this table.

1st: *Intermittents* are much more frequent in Bengal amongst privates, than in any of the other classes; more frequent amongst women than officers; and amongst the latter than children: and they are most fatal to children; next to privates; then to women; and least so to officers. In Madras, they are observed to be most prevalent amongst privates; next amongst children; then amongst officers; and least so amongst women: and the mortality ratios correspond somewhat in degree, though not in quantity or intensity, to those which obtained in Bengal.

2ndly: *Remittents* in Bengal are most abundant amongst women (7·6 per cent.); next amongst officers (7·3); then amongst privates (5·2); and least so amongst children (4·0): are most fatal to children (·45 per cent. of whom succumb); next amongst women (·28 per cent. of whom die); then amongst officers, ·26 per cent. of whom die; and least fatal to privates, ·23 per cent. of whom fall victims. The order of mortality to treated is, in children, 11·29 per cent.; in privates, 4·45; in women, 3·8; and in officers, 3·6 per cent. In Madras, fever of this type is most commonly met with amongst officers; next amongst children; then amongst privates; and, lastly, least amongst women. The mortality to strength is highest amongst children; next

amongst officers; then amongst women; and lowest amongst privates. The highest ratio percentage of deaths to treated occurs amongst children (10·4 per cent.) and women (5·5); lowest amongst officers (0·5) and privates (2·7).

3rdly: *Continued Fevers* prevail with a great deal of uniformity amongst privates, officers, and women (26·7, 26·8, 25·9 per cent. being attacked respectively), whilst children are attacked in the proportion of 18·9 per cent. of strength. They are most fatal to children, 1·03 per cent. of strength dying, and 5·42 of treated; next to women, ·64 per cent. of strength, and 2·47 of treated, of whom die; then to privates, ·53 per cent. of strength, and 2 per cent. of treated, of whom die; and least mortal to officers, ·23 per cent. of strength, and ·87 of treated, of whom die. In Madras, there is a considerable degree of uniformity in the prevalence of continued fever amongst the three last classes. It is least frequent amongst privates. The mortality is highest amongst children; next amongst officers; then amongst women; and lowest amongst privates.

6. The Relative Frequency of the Types of Intermittent Fever in India and elsewhere.

TABLE XVI.—*Exhibiting the relative Frequency of the different Types of Intermittent Fever amongst Europeans in Bengal, for Eight Years ending* 1853–54 ; *amongst Natives in "various situations in India;" in the Maveruma of Tuscany, Algiers and Bona, and Canada.*

Climates	Bengal.*		Various Situations in India.†		Maveruma of Tuscany.†		Algiers and Bona.†		Canada.†	
Total Intermittents ...	69,795		2,574		51,659		3,114		2,575	
Types.	Admissions of each Type.	Percentage of each Type to Total Admissions.	Admissions of each Type.	Percentage of each Type to Total Admissions.	Admissions of each Type.	Percentage of each Type to Total Admissions.	Admissions of each Type.	Percentage of each Type to Total Admissions.	Admissions of each Type.	Percentage of each Type to Total Admissions.
Quotidian	59,617	85·41	1,822	70·7	39,923	77·4	2,181	70·0	809	31·0
Tertian	9,807	14·05	595	23·1	10,192	19·7	901	28·9	1,765	68·5
Quartan	371	0·53	29	1·1	1,544	2·9	32	1·0	1	0·03
Double Tertian ...	...	...	118	4·5	—	—	—	—	—	—
Irregular	...	...	10	0·4	—	—	—	—	—	—

* Compiled from Mr. Hugh Macpherson's Table No. XVIII., published in the "Indian Annals of Medical Science," Vol. IX., p. 227 (January, 1858).

† Compiled from Mr. Edward John Waring's "Statistical Notes on some of the Diseases of India,"—"Indian Annals," Vol. VI. (April, 1856).

Copland* states that the tertian is the most common form of intermittent, and that "it is considered the primary type;" and Watson† reiterates the same assertion in the following words:—"Of these principal types or species, the tertian is by much the most common; but the quotidian and quartan are neither of them infrequent wherever ague is rife." But Morehead‡ says, "that tertians are more common than quotidians is an observation altogether opposed to my experience, and, I believe, it may be added, to that of observers in India generally." In his 243 clinical cases§, 211, or 86·8 per cent., were quotidians; 27, or 11·11 per cent., tertians; and in the remaining 5 the particular type was not recorded. Dr. Day's‖ 164 cases of fever, observed in Europeans, consisted of 87, or 52·4 per cent., quotidians; 30, or 18·06 per cent., tertians; 4 quartans, 28 ephemerals, 2 remittents, and 13 continued: and his 248 cases of intermittent, witnessed amongst natives, consisted of 188, or 75·8 per cent., quotidians; 40, or 8·06 per cent., tertians; and 20 ephemerals. The above table shows most conclusively that, in all the hot countries embraced by it, the quotidian type is by far the most prevalent;

* "Medical Dictionary," Vol. I., p. 935,—Article, "Intermittent Fever."

† "Lectures on the Principles and Practice of Physic," Vol. I., p. 739.

‡ "Clinical Researches on Disease in India," Vol. I., p. 22.

§ Natives of Bombay.

‖ On the "Prevalent Fevers of Bellary and Mysore."—"Indian Annals," Vol. VI.

85·41 per cent. amongst Europeans in Bengal, 70·7 per cent. amongst natives situated in "various parts of India," 77·4 amongst the inhabitants of the Maveruma of Tuscany, and 70·0 per cent. amongst the French, in Algiers and Bona, of total intermittents met with, having belonged to this species; whereas, in the temperate and alternately very cold and very hot climate of Canada, the tertian is the leading type, amounting to 68·5 per cent. of total cases treated. The quotidian is second in point of frequency in Canada, the tertian occupies this position in the hot countries just mentioned. Quartans are rare in all situations.

The Bengal columns of our table present some difference of degree when compared with Mr. Waring's summary, extracted from the Medical Board's appendix to Mr. Hare's report on fever and dysentery, and exhibiting the relative frequency of the types of intermittent fever amongst European troops for twenty years ending 1850. This summary is substantially transcribed below :—

		Per Cent.
Quotidians	51,287	95·5
Tertians	2,097	3·9
Quartans	369	0·6
Total Intermittents	53,753	

This too high a percentage of the quotidian type, we learn from Mr. Hugh Macpherson's remarks and valuable researches, is to be attributed to "want of

care in making the entries, or in preparing the annual returns;" and to the fact that from 1829 to 1837 all intermittents were recorded in the returns as quotidians. Not only so, but it appears from his observations (and it must be recollected that he possessed the best of all opportunities to ascertain the truth—free and unrestricted access to archives of the Bengal Medical Board's Office) that quotidians are recorded as having constituted 99½ per cent. of total intermittents from 1837 to 1845; doubtless from the circumstance already mentioned: viz., the amalgamation of the largest quantity of all intermittents into the quotidian species.

7. The Influence of Season on the Prevalence of, and Mortality from, Fevers amongst European Troops in India.

Table XVII.—*Exhibiting the Influence of Season of the Year on the Mortality to Treated, from Fevers, amongst European Troops, in Five of the largest Stations in the Bombay Presidency.*

Stations.	Deaths to Treated per Cent.		
	Half-year from April to September.	Half-year from October to March.	For the Year.
Bombay	2·01	2·03	2·02
Poona	0·9	1·2	1·1
Belgaum	1·0	1·1	1·1
Deesa	1·8	2·7	2·2
Aden	1·6	1·5	1·6
Total	1·5	1·8	1·7

This table, for which I am indebted to Mr. H. Webb,* shows that the proportion of deaths to admissions is highest during that half of the year which comprises winter and spring, than during that which embraces the summer and autumn. As if no rule could possibly be established without an exception, and especially so in statistics, the ratio of mortality to treated, at Aden, was 1 in 1,000 patients higher during the hot and rainy season than during the winter and spring.

TABLE XVIII.—*Exhibiting the Admissions and Deaths from Intermittent Fever in the European General Hospital at Bombay (during each Month of the Year), for Fifteen Years, ending the 31st of December*, 1853.

—	Admissions.	Deaths.	Percentage of Deaths to Admissions.
Half-year from Dec. to May:			
15th December	184	4	2·17
15th January	196	4	2·04
15th February	137	2	1·45
15th March	142	2	1·40
15th April	147	3	2·04
15th May	257	1	0·38
Total	1,063	16	1·50
Half-year from June to Nov.:			
15th June	359	2	0·55
15th July	352	5	1·42
15th August	266	1	0·37
15th September	203	2	0·98
15th October	461	7	1·51
15th November	332	2	0·60
Total	1,973	19	0·96

* "Bombay Medical Transactions," New Series, p. 81 (1851–2).

This table shows that the aggregate number of admissions was much greater, and the deaths slightly greater, during the half year including a portion of the hot (June), the whole of the rainy, and a part of the cold, season (November), than during the remainder of the cold and hot season beginning December and ending May: the former may be regarded as that half of the year which is most favourable to the generation of malaria, as indicated by the greater prevalence of intermittents; but the mortality to treated is highest during the latter (1·50: 0·96), not because the efficient cause is more virulent, but because the disease is re-imposed upon constitutions already enfeebled and rendered cachectic by repeated attacks during the rainy and drying-up months. Indeed, December, January, February, March, April, and May, are, comparatively speaking, non-productive of malaria. How does it happen, then, in the face of this assertion, that so many cases of intermittent fever do occur during these months?

This interrogatory cannot be better answered than by citing the following quotations from Twining and Martin:—"Malaria has been generally acknowledged the efficient cause of intermittent fevers, and its existence is usually assumed, whenever intermittent fevers prevail in low, damp, and unhealthy situations; but it is abundantly evident to every medical man in Bengal, the very first year that he witnesses the results of the change of season and temperature between the 20th of October and 1st of December,

that intermittents are intimately connected with the diurnal changes of temperature which take place at the commencement of the cold season. At that time the evaporation is infinitely less than it had been for the six weeks previously; and the frequency of intermittents is augmented beyond all proportion, after the cold nights and foggy mornings commence, and when the heat of the days, though much decreased, is followed by a greater degree of depression of the thermometer during the night than happens at any other season of the year. . . . . The state of the human constitution induced in Bengal by the previous hot weather and rains, doubtless paves the way for the influence of the commencement of the cold weather, in the production of many diseases which then prevail. To these causes, and to disorders of internal organs, and principally to a disordered condition of the abdominal viscera, I ascribe the intermittent fevers, which occur more frequently in November and December than in all the rest of the year."*

"Many authors suppose, with Cullen, that in the climate of England, intermittent fever can alone be produced by exposure to marsh exhalations; and a remarkable instance is given in a recent very able memoir by Dr. John Forbes, on the Medical Topography of Land's End in Cornwall, wherein it is shewn" 'that neither impure air simply, nor wet, nor the alternations of cold and heat, nor all these

* "Diseases of Bengal," Vol. II., p. 207. (By William Twining.)

combined, can give rise to fevers of this type.' "I believe this to be true in respect to a *first seizure;* but, *after that*, and when a disposition to relapse is once established, such a combination as Dr. Forbes describes will certainly in most climates (and ours is one of them) prove an efficient cause; and even Cullen admits 'the concurrence of other exciting powers,' when the miasma is not 'strong enough to produce the disease.' "In support of this latter view, I quote a passage, important to all military surgeons, from Sir James Macgregor." 'After effluvia from marshes, or the exhalations raised by a powerful sun acting on a humid or luxuriant soil, we found that in those who were convalescent or lately recovered from agues, the causes next in power to reproduce the disease, were exposure to a shower of rain or wetting the feet, exposure to the direct solar rays or to cold, with intemperance and irregularity or great fatigue. Many other causes would excite the disease in the predisposed, but these never failed to do it. In marching troops in a country where this disease is endemic, particularly if they have been lately discharged from hospitals, the above causes should by all means be avoided; since the whole of our experience in the Peninsula shewed that relapsed cases seldom or never got completely well in the country in which they were contracted, under all the circumstances of a soldier's life. In making calculations of efficient force, this description of men could not be depended on for operations long con-

tinued in the field.' "The father of British military medicine, Sir John Pringle, writes to much the same effect." 'After the frosts in November, the intermittents never appeared, unless upon catching cold; and even then, such only as had been ill of them in autumn were seized in that manner.'" (Martin and Johnson on Tropical Climates.)

A preponderating majority of cases of intermittent fever occurring between December and May inclusive, are relapses or recurrent attacks; reproduced, not by an atmosphere highly impregnated with malaria, but by sudden transition, at first, from high, close, and oppressive tropical heat, as at the end of September and beginning of October, to the cold nights and temperate days of November, and afterwards the continuation of great diurnal range with greater disproportion between the temperature of the days and that of the nights during the cold months than in any other season of the year, undue exposure, and by defective clothing, &c.

Morehead observes, that "much of the mortality is not accurately recorded as directly proceeding from intermittent fever. It occurs from inflammations arising in malaria-tainted constitutions, and should be entered under the head of the inflammation, whatever it may be." There can, I think, be no doubt as to the accuracy of this remark.

TABLE XIX.—*Exhibiting the Admissions and Deaths from Remittent Fever in the European General Hospital at Bombay for Fifteen Years, ending* 1853 (*arranged according to months*).

—	Admissions.	Deaths.	Percentage of Deaths to Admissions.
Half-year from Dec. to May :			
15th December	39	7	17·9
15th January	39	11	28·2
15th February	24	6	25·0
15th March	14	2	14·2
15th April	23	6	18·1
15th May	48	6	12·5
Total	197	38	19·2
Half-year from June to Nov. :			
15th June	58	10	14·4
15th July	121	12	9·9
15th August	100	14	14·0
15th September	68	8	13·7
15th October	70	8	11·4
15th November	66	13	19·6
Total	483	65	13·4

From this table (which is confirmatory of the preceding) we learn that remittent fever is most frequently met with, and that it causes a larger total of deaths during the most malarious half of the year, from June to November. The injurious influence of malarious fevers in the production of a cachectic or asthenic condition of the system continued into, and almost through, the cold months, is here as well illustrated as it was with regard to intermittents.

From December to May, 197 admissions are registered, out of which, 38 deaths took place, or 19·2

per cent.; whereas during the other half of the year there were 483 admissions with 65 deaths, or only 13·4 per cent. The high ratios of deaths to treated, both from remittent and intermittent, are explained by the fact that patients do not solicit admission into the European hospital, except perhaps in the worst cases, or until these diseases have committed serious inroads upon their constitutions. At page 60, we found that 3·95 of remittents treated amongst the European troops in Bengal, and 3·52 per cent. in Madras, proved fatal.

SECTION II.—*Statistics of Fevers amongst Native Troops.*

1. AVERAGE RATES OF SICKNESS AND MORTALITY FROM FEVERS AMONGST NATIVE TROOPS IN INDIA.

TABLE XX.—*Exhibiting the Sickness and Mortality from Fevers, amongst Native Troops in the three Presidencies.*

Presidency.	Periods.	Strength.	Admissions.	Deaths.	Percentage of Admissions to Strength.	Percentage of Deaths to Strength.	Percentage of Deaths to Admissions.
Bengal	1826 to 1852–53	2,767,347	1,342,016	14,603	48·50	·528	1·08
Bombay	1803–4 to 1853–54	1,451,166	597,891	8,286	41·20	·57	1·38
Madras	1827 to 1851–52*	1,242,697	311,219	3,728	25·04	·30	1·19

* Exclusive of 1836, 1837, 1838, 1839, 1840, and 1841.

By a comparison of Table VII. with Table I., it was found that Europeans were much more subject to illness, and that they died in much greater numbers,

from all causes, than natives. A large portion of this excessive sickness and mortality in the former is fairly chargeable to the class "fevers." A comparison of the results obtained in this comprehensive table with those embodied in Table X., expressed in the subjoined tabular statement, will suffice to show the justice of this observation.

Presidency.	Comparative proportions of Fevers to given strength.		Comparative proportion of Mortality from Fevers to given Strength.		Comparative proportion of Mortality from Fevers to given Treated.	
	Europeans.	Natives.	Europeans.	Natives.	Europeans.	Natives.
Bengal	1·49	1	3·76	1	2·54	1
Bombay ...	1·50	1	2·54	1	1·60	1
Madras......	1·26	1	1·23	1	1·00	1

2. Evidence of Decrease of the Mortality from Fevers amongst Native Troops, notwithstanding a Marked Increment in the Proportion of Attacks.

Table XXI.—*Exhibiting the Sickness and Mortality from Fevers, during two distinct Periods, amongst Native Troops, in the three Presidencies.*

Presidency.	Periods.	Strength.	Admissions.	Deaths.	Percentage of Admissions to Strength.	Percentage of Deaths to Strength.	Percentage of Deaths to Admissions.
Bengal....	1826 to 1838	1,246,776	515,026	6,816	41·30	0·54	1·32
	1839 to 1851–52	1,397,438	742,946	7,172	53·16	0·51	0·96
Bombay .	1803–4 to 1827–28	610,441	206,392	3,731	33·81	0·61	1·80
	1828–29 to 1852–53	807,196	375,769	4,440	46·55	0·55	1·18
Madras ...	1827 to 1835	597,434	127,094	1,867	21·27	0·31	1·46
	1842 to 1851–52	645,263	184,125	1,861	28·5	0·28	1·01

Thus we learn that, during the most recent period, fevers have been on the increase amongst the Native troops, in each of the three Presidencies, having risen, in Bengal, from 41·30 per cent., during the thirteen years from 1826 to 1838, to 53·16, during a period of similar duration, from 1839 to 1851-52; in Bombay, from 33·81 per cent., during the twenty-five years from 1803-4 to 1827-28, to 46·55 during a similar period, from 1828-29 to 1852-53; and, in Madras, from 21·27 per cent., during the nine years from 1827 to 1835, to 28·5 during the ten years extending from 1842 to 1851-52. Still, notwithstanding this general increase in the proportion of fevers to strength, the deaths to strength have been less during the modern periods of observation. But, to illustrate these facts more clearly, I solicit the reader's most careful attention to the subjoined.

TABLE XXII.—*Compiled for the Purpose of exhibiting the Sickness and Deaths from Fevers, amongst Native Troops, in two Presidencies, during two Periods remotely removed from each other.*

Presidency.	Periods.	Strength.	Admissions.	Deaths.	Percentage of Admissions to Strength.	Percentage of Deaths to Strength.	Percentage of Deaths to Admissions.
Bengal ...	1826 to 1829	465,391	152,432	2,881	32·75	0·61	1·89
	1848–49 to 1851–52	453,710	259,263	2,120	57·14	0·46	0·81
Bombay .	1825–26 to 1828–29	150,950	58,197	1,016	38·55	0·67	1·74
	1848–49 to 1851–52	146,801	77,476	499	52·77	0·33	0·65

In Bengal, during the second quadrennial period (1848-49 to 1851-52), fevers have been 24·39 per cent. more frequent than in the more remote period (1826 to 1829); but in the former or recent poriod,

the mortality to strength and to treated was less, by 15 and 108 in every 10,000 souls, respectively, than in the latter or remote period. Again, in Bombay, these figures indicate a clear rise in the number of fevers, amounting to 20·02 per cent., during recent times, over that which obtained formerly. But the decrement of mortality of late years is distinct, having declined so much as 34 in every 10,000 of strength, and 109 in every 10,000 admissions.

It is impossible to resist the conclusion that this decrement in the mortality from fevers has been solely effected by an improved system of treating them—in spite of an enormous increment in their aggregate numbers—or by the displacement of the *lancet* and *hydrargyrum* by quinine and a general tonic management.

One important fact is to be gathered from the figures contained in the two last tables: no amendment has taken place in the sanatory condition of our black soldiers. For they do not enjoy nearly such an immunity from fevers *now* as they evidently did forty or fifty years ago. The increase in the average numbers of fevers amongst our native troops is chiefly owing to State necessities; the rapid expansion of territory; the occupation of new kingdoms, in which proper housing accommodation and diet and water were not obtainable for long periods, and where—from the uncleared and uncultivated nature of the country, its luxuriant vegetation, its impenetrable and malaria-generating jungles, its rich alluvial soils, in portions liable to be annually inundated by river-trunks of

considerable dimensions, its jheels, lakes, marshes, and undrained doabs, and low-lying and damp lands —all those agencies, circumstances, and conditions, which unite to render the marsh-poison most concentrated and noxious to a degree, are congregated in great abundance; to augmented labour during seasons when out-door work and exposure to wet, cold, and extreme atmospheric vicissitudes predispose to primary attacks, and excite to secondary ones or relapses in tropical or tropoidal regions.

3. Relative Prevalency of Various Types of Fevers amongst Native Troops.

Table XXIII.—*Exhibiting the relative Frequency of the different Types of Fever, and the Mortality arising from each, amongst the Native Troops in the Madras Presidency, for Ten Years, ending* 1838.

Strength, 568,403. Total Fever Cases, 137,596.

Types.	Admissions.	Deaths.	Percentage of each Type to Total Cases of Fever.	Percentage of Admissions of each Type to Strength.	Percentage of Deaths from each Type to Strength.	Percentage of Deaths from each Type to Admissions.
Intermittent	95,354	1,381	69·29	16·77	0·24	1·44
Remitttent	8,046	361	5·99	1·41	0·06	4·48
Continued	4,752	248	3·45	0·83	0·04	5·17
Ephemeral	29,444	135	21·39	5·18	0·02	0·45

By far the most prevalent type of malarious fever amongst the native troops in the Madras Presidency, is the intermittent; 69·29 out of every hundred cases of fever treated having been classed under this head.

The next in order of frequency are ephemerals; these having constituted 21·39 per cent. Remittents prevailed to the extent of 5·99, and continued fevers of 3·45. But, amongst European troops in the same presidency, we saw, from Table XIV., page 60, that the continued type had been most abundant; intermittents were classified as second in order of frequency, remittents third, and ephemerals fourth.

One very curious fact is illustrated in the above table which deserves particular notice: viz., the greater mortality to treated from all types, especially from continued and remittents, amongst Natives than Europeans, as is found on comparing it with Table XIV. The subjoined tabular statement demonstrates this fact most conclusively.

MADRAS.

Types.	Europeans.	Native.
	Deaths in 10,000 Admissions of each Type into Hospital.	Deaths in 10,000 Admissions of each Type into Hospital.
Intermittent	101	144
Remittent	352	448
Continued	120	517
Ephemeral	36	45

The apparent irreconcilability of this statement with that given in the sequel (at page 76) to Table XX., will entirely disappear, if the reader will bear in mind that the latter includes, though not uninterrupted, a period which brings it down to 1851-52, whilst the former only carries us down to 1838.

It has been suggested that this high rate of mortality to treated may be the consequence of original weakness of the Oriental constitution. This cannot be the case; for, in his own climate, the native suffers much less from disease in general, and dies much less frequently than the European, in proportion to given strength. It is universally acknowledged that nothing predisposes more strongly to the invasion of disease, and especially of fevers, than original or acquired weakness, or want of tone of the human framework. If it were really true, then, that the sepoys of Madras down to 1838, living as they are in, and made for, their own climate, possessed less staminal strength of frame than imported Europeans, one would naturally infer that the latter suffered much less from sickness, and died in fewer numbers, than the former. But all experience proves the converse to be the truth.

It has also been suggested that the difference of mortality to treated from fevers, against natives, may be, in great part, charged to spoliative treatment—the too free use of the lancet and mercury. But before this hypothesis can be established upon a durable basis, it must be shown that the medical officers in charge of European and Native regiments, many of whom have been educated and trained in the same schools, belong to the same service, and labour together in close contiguity, have practised opposite methods of treatment to such an extent as to sufficiently account for the discrepancy in the rate of mortality to treated in the two races.

It appears to me that the high ratio of mortality

to admissions in the natives of Madras, during the period to which our table refers, was assignable to the impossibility of placing them, whilst in hospital, on an equally advantageous footing with the European, in regard to ventilation, cleanliness, properly changed and regulated clothing, suitable diet, subordinate attendance; and to passive resistance in obeying the injunctions of their medical advisers, as also to a host of antagonistic habits and customs, inextricably intertwined with caste prejudices, or what they profess to call their religion.

Even at the present day, the surgeon of a European regiment has a much better hospital for his sick, and an infinitely better subordinate establishment than his brother officer attached to a Native regiment. The former knows that his prescribed directions will be legitimately carried out by his assistants with scrupulous exactitude; whereas the latter is often, in serious cases of fever, painfully conscious of his being surrounded by a group of individuals, including patients themselves, who conspire to thwart his most philanthropic designs. As in Europe and America, fevers require careful nursing and the most efficient subordinate management, the utmost punctuality as to time in the administration of medicinal remedies, careful regulation of diet, and cordials and free ventilation, so in India, similar means and measures are peremptorily demanded to ensure the greatest amount of success possible in the treatment of the severer types of malarious fever. But these essentials and auxiliaries are much more readily avail-

able to the surgeon of a European than to the surgeon of a Native battalion.

4. The Influence of Season on the Prevalence of, and Mortality from, Fevers amongst Natives of India.

Table XXIV.—*Exhibiting the Admissions and Deaths from Intermittent Fever in the Jamsetjee Jejeebhoy Hospital at Bombay, for Five Years, ending 31st December, 1853 (arranged according to Months.)*

Months.	Admissions.	Deaths.	Percentage of Deaths to Admissions.
Five Decembers	202	1	0·49
Five Januaries	107	6	5·60
Five Februaries	89	3	3·37
Five Marches	79	0	—
Five Aprils	111	0	—
Five Mays	148	2	1·35
Total	736	12	1·63
Five Junes	152	—	—
Five Julys	169	3	1·77
Five Augusts	140	1	0·71
Five Septembers	141	—	—
Five Octobers	185	1	0·54
Five Novembers	186	—	—
Total	973	5	0·51

Thus, from June to November, there were 973 admissions of intermittent fever, with 5 deaths, or 0·51 per cent.; whilst, from December to May (five half-years), the admissions amounted to 736, with 12 deaths, or 1·63 per cent.—a strong proof of the influence of cold and range of temperature in augment-

ing the tendency to a fatal termination in intermittent fever, occurring amongst those natives whose constitutions have been shaken or shattered by repeated attacks during some part of the malarious season. The reason why natives of the class I am now alluding to die in larger numbers than Europeans in Bombay, when once affected during the cold season, is probably because they are so notoriously unprotected by proper clothing, &c., from atmospheric vicissitudes, &c.

TABLE XXV.—*Exhibiting the Admissions and Deaths from Remittent Fever, in the Jamsetjee Jejeebhoy Hospital at Bombay, for Five Years, ending* 31*st December*, 1853 (*arranged according to Months*).

Months.	Admissions.	Deaths.	Percentage of Deaths to Admissions.
Five Decembers	72	42	58·3
Five Januaries	76	34	44·7
Five Februaries	57	27	47·3
Five Marches	60	23	38·3
Five Aprils	57	16	28·0
Five Mays	70	18	25·7
Total	392	160	40·8
Five Junes	42	20	47·6
Five Julys	51	16	31·3
Five Augusts	74	17	22·9
Five Septembers	71	26	36·6
Five Octobers	89	26	29·2
Five Novembers	65	26	40·0
Total	392	131	33·4

It would appear, therefore, that the aggregate admissions of remittent fever, during the five years,

has been equal, in both our half-yearly divisions, amounting to 392 cases; but the mortality is greatest during the period extending from December to May, giving 160 deaths, or 40·8 per cent., than during that which extends from June to November, our really malarious season, which gives 131 deaths, or 33·4 per cent. The enormously high ratio of mortality to treated, as herein shown to prevail at the Jamsetjee Jejeebhoy Hospital, shows very clearly that the natives, when suffering from remittent fever, do not solicit admission until the disease has made almost irreparable havoc upon their constitutions. The comparatively small number of admissions of cases of intermittent, as shown in the preceding table, during five years, into the hospital, situated in such a populous and malarious locality as Bombay is acknowledged to be, is strongly corroborative of this inference.

CHAPTER III.

On the Statistics of Dysentery and Diarrhœa, individually and unitedly, amongst European and Native Troops.

Section I.—*Statistics of Dysentery and Diarrhœa amongst European soldiers.*

1. Average Rates of Sickness and Mortality, from Dysentery and Diarrhœa, amongst European Troops in India.

Table XXVI a.—*Exhibiting the Sickness and Mortality, from Dysentery, amongst European Troops in India.*

Presidency.	Periods.	Strength.	Admissions.	Deaths.	Percentage of Admissions to Strength.	Percentage of Deaths to Strength.	Percentage of Deaths to Admissions.
Bengal	1812 to 1853–54	543,768	100,542	8,873	18·48	1·64	8·82
Bombay ...	1803–4 to 1853–54	306,978	51,010	4,705	16·61	1·53	9·22
Madras	1829 to 1851–52*	213,587	30,593	2,304	14·32	1·07	7·53

* Exclusive of 1839, 1840, and 1841.

Table XXVI b.—*Exhibiting the Sickness and Mortality, from Diarrhœa, amongst European Troops in India.*

Presidency.	Periods.	Strength.	Admissions.	Deaths.	Percentage of Admissions to Strength.	Percentage of Deaths to Strength.	Percentage of Deaths to Admissions.
Bengal	1812 to 1853–54	543,768	64,823	2,141	11·92	0·39	3·30
Bombay ...	1803–4 to 1853–54	306,978	32,290	551	10·51	0·17	1·77
Madras	1829 to 1851–52*	213,587	19,458	353	9·11	0·16	1·81

* Exclusive of 1839, 1840, and 1841.

These two tables will snffice to show the amount of sickness and mortality that has arisen from these two allied complaints, in separate form, so far as that can be accomplished from the means at my disposal. There is, however, good reason to suppose that the truthfulness of the data from which they have been compiled, has been considerably vitiated, by sufficient discrimination not having been exercised in classifying each under its own nosological head in the hospital returns. But whilst I give the statistics of dysentery and diarrhœa individually, I have also given the statistics of the two diseases, unitedly, as a class—a proceeding the justice and importance of which will appear more fully hereafter.

TABLE XXVII. — *Exhibiting the Sickness and Mortality, from Dysentery and Diarrhœa (as a class of disease), amongst European Troops in India.*

Presidency.	Periods.	Strength.	Admissions.	Deaths.	Percentage of Admissions Strength.	Percentage of Deaths to Strength.	Percentage of Deaths to Admissions.
Bengal	1812 to 1853–54	543,768	165,365	11,013	30·41	2·02	6·65
Bombay ...	1803–4 to 1853–54	306,978	83,300	5,256	27·13	1·71	6·30
Madras......	1829 to 1851–52*	213,587	50,051	2,657	23·43	1·24	5·30

* Exclusive of 1839, 1840, and 1841.

Here, then, in all these three tables, we find ample confirmation of the assertion made at page 43. In Bengal, bowel complaints prevailed to the extent of 30·41 per cent., and occasioned a mortality of 2·02 per cent. of strength, and of 6·65 to admissions. In Bombay, 27·13 per cent of strength have suffered

from disorders of this kind, and the mortality to strength and to treated amounted to 1·71 and 6·30 per cent. respectively. In Madras, 23·43 per cent. of strength suffered, and 1·24 died: the mortality to admissions reached 5·30. It appears, therefore, to be an established law that bowel complaints prevail, and prove mortal, in the direct ratio of the abundance, intensity, and fatality, of malarious fevers.

In reference to this subject, Mr. A. Grant, in an able paper* on hill diarrhœa and dysentery, makes the following etiological observations:—"The best founded and most influential exciting causes are the cold moist atmosphere, and the great and sudden vicissitudes of temperature by which perspiration is checked, leading to internal congestion, languid and impeded circulation in the liver, and functional derangement of that organ. But these ungenial influences of temperature and moisture must have *something superadded* to them, to account satisfactorily for the inherent and peculiar liability of these localities to produce diarrhœa: the climate of Mussoorie is equally humid,† but without the same tendency to diarrhœa; and this may be also said of Nainee Tal, Murree, and Darjeeling, the last being remarkably cold and cloudy, and the air long supersaturated with moisture. Other mountain ranges also possess a similar immunity, such as the Neilgherries and Mahableshwur. There must, therefore, to account for its prevalence from year to year, be

* "Indian Annals of Medical Science," Vol. I., p. 317.

† With that of Kussowlee, Subathoo, Dugshai, Simla.

some cause other than the ordinary or essential climatic agencies, some limited morbific influence of a specific nature; and this appears to me to be partly malarious, partly scorbutic. We know that primary cases of intermittent fever are by no means uncommon at Simla and the neighbouring stations, and we meet with occasional cases of the worst form of typhoid remittent; but notwithstanding these proofs of malaria, experience teaches us that in general it is not here powerful enough to excite periodic fever: it seems to ascend from the numerous deep ravines and water-courses which intersect these stations, but to be so diluted, or changed by the effect of elevation, cold, and moisture, as to cause bowel complaints instead; and this is exactly what occurs in some mountain ranges in other parts of the world, where we observe bad remittent fevers at the level of the sea, intermittents at the higher level, bowel complaints higher still, and at the highest, ulcers, which appear as the feeblest result of malarious poisoning in depressing the vital powers." Dr. Morehead,* whose opinion must always carry great weight, writes as follows:—" Continued exposure to malaria, or frequent recurrences of intermittent fever, engender, as is well known, a cachectic state of the system, in which the nutritive processes of the tissues and of the blood are defective and perverted, and in which splenic and hepatic enlargement, and other local congestions of blood, tend to occur. These states, by their persistence and their increase, not un-

* " Researches on Disease in India," Vol. I., p. 32.

frequently lead to death by asthenia. But it is not in this way that the indirect mortality from intermittent fever is chiefly caused. It takes place because the cachectic state of the system engendered by the fever is one particularly predisposed to local inflammatory or congestive attacks under the influence of external cold. The structure most especially liable to be thus affected is the mucous lining of the intestinal canal; and the diseases induced are classed, in our returns, under the heads diarrhœa and dysentery. There can be no question that much of the mortality recorded in India under the head 'bowel complaints' is, though indirectly, yet fairly chargeable to the account of malarious fevers. The chief season of malarious fevers proceeding from the influence of the generation of fresh malaria, and consequently the chief season during which this deterioration of the system takes place, may in general terms be stated to range from the month of June to the end of November. Succeeding these are the months of December, January, February, and March, with their lower absolute temperature, their greater range, their frequent chilling winds. It is in these months, then, that the asthenic constitution is liable to suffer from dysentery and diarrhœa." Again, this eminent author states, when treating of the etiology of dysentery, that, "There is no more common cause of cachexia in India than malarious influence, and recurrences of malarious fever. We consequently find that whenever persons cachectic from malaria, are ex-

posed to atmospheric states which depress the temperature of the surface of the body, dysentery becomes prevalent, and very fatal." (Op. cit., p. 526).

No single class of disease has hitherto committed such havoc amongst the European ranks, and caused so much dead loss to the Government, as bowel complaints. That resulting from cholera, hepatitis, and other classes of disease (fevers excepted), sinks into insignificance when compared with that consequent on attacks of dysentery and diarrhœa. And that these intestinal affections are, in their production and prevalence, intimately connected with malarious fevers is unquestionable. Malaria, therefore, is the most powerful and fatal enemy that the European soldier has to contend with in this country.

If the above facts be borne steadily in mind, I am sure, the scientific reader will coincide with me in this expression of opinion, after an examination of the following tabular statement:—

Presidency.	Percentage of Deaths to Strength from all Diseases amongst Europeans.	Percentage of Deaths to Strength from Fevers and Bowel Complaints amongst Europeans.
Bengal	6·94	4·01
Bombay	5·52	3·08
Madras	3·88	1·61

Now if we deduct the mortality caused directly or indirectly by malaria, the percentage of deaths

to strength caused by other diseases of all kinds amounts to—

2·93 in Bengal.
2·44 in Bombay.
2·27 in Madras.

But there is every reason to believe that the remarkable influence of malaria upon the mortality amongst Europeans is not confined simply to fevers and bowel complaints; and that the cachexia produced by its inroads upon the nutritive and blood-making functions and processes, is a most powerful predisponent cause to the majority of other diseases which combine to make up the Indian mortality bill.

If, then, this additional statement be really true (which, I think, it will generally be admitted to be), there is no doubt that the average standard of health of our race in this country would bear comparison with that of any race upon the face of the civilized world, or of any people in Europe, *provided the sources of malaria were dried up.*

There cannot be a doubt that it is chiefly owing to the universal existence and abundance of this insidious poison, that our race, in process of time, undergoes deterioration, physically and intellectually, with each successive generation, and ultimately ceases "to multiply and replenish the earth."* Is it not this enemy which has nipped in the bud every

* Twining first made the observation that the pure English stock in India ceases to propagate about the third generation, which remains, so far as I am aware, uncontradicted at the present time.

effort at colonization, in the true sense of the term? and will it not continue to do so, until compelled to retreat and disappear, concomitantly with an advanced state of civilization and a wide-spread system of sanatory reform?

The "removability" of malaria has been shown to be no chimera, but a practical possibility; in our military stations at least. These might be made models of health, and objects for imitation by the surrounding population. The consequent improvement in the health, happiness, physique, and military efficiency of the soldier, and in the health of the women and children, would be so much substantial gain to the moral and physical power of the Government, and a long leap or step on the road to a higher status of civilization.

2. Evidence of the Decrement of the Sickness and Mortality from Dysentery, and of Increment of the Sickness and Mortality from Diarrhœa amongst European Troops in India.

Table XXVIII. — *Exhibiting the Sickness and Mortality, from Dysentery, amongst European Troops, during two distinct periods, in each of the three Presidencies.*

Presidency.	Periods.	Strength.	Admissions.	Deaths.	Percentage of Admissions to Strength.	Percentage of Deaths to Strength.	Percentage of Deaths to Admissions.
Bengal ...	1812 to 1832	211,993	50,187	4,104	23·67	1·93	8·17
	1833 to 1853–54	331,775	50,355	4,769	15·17	1·43	9·47
Bombay..	1803–4 to 1827–28	116,218	27,073	2,323	23·29	1·99	8·58
	1828–29 to 1852–53	182,462	23,587	2,348	12·92	1·28	9·95
Madras ...	1829 to 1838	103,431	17,442	1,382	16·8	1·33	7·9
	1842 to 1851	110,156	13,151	922	11·9	0·8	7·0

The extraordinary diminution of cases of dysentery, with a somewhat corresponding and well-marked decrement in the mortality to strength, amongst our European troops throughout India, during the second as compared with the first period in each Presidency, is strikingly demonstrated by the results displayed in this table.

It has already been pointed out by figures, and the quoted experience of two very eminent authorities, how intimately the prevalence and abundance of malarious fevers are associated with the prevalence and abundance of dysentery; how attacks of the former, by inducing a cachectic condition, predispose the system, or more particularly the intestinal mucous membrane, to disease, organic or functional, under the influence of external cold, unusual damp, and great thermometric range. It has also been demonstrated by figures how wonderfully the mortality from fevers has been diminished during the latest periods of observation—a result not entirely effected, however, by a decrease in their actual numerical proportion, but principally by the more extensive adoption of an anti-periodic, tonic, and conservative method of treating these disorders.

It is doubtless an equally incontrovertible fact, that in this improved system of combating tropical fevers, chiefly exists the secret of the decrement of dysenteric attacks in recent periods. By the modern conservative therapeutic management — and more especially by the rejection of the lancet and mercury, and the substitution of a scientific system of employ-

ing bark and quinine—the duration of fevers is now cut short, and much of the cachexia partly occasioned by protraction of disease, and partly by a too anti-phlogistic treatment, is prohibited. If, then, this be a correct explanation, it tends strongly to show that the eradication of the efficient cause of the fevers of this country—malaria, would be consentaneously attended by the almost complete eradication of dysentery from the catalogue of Indian diseases, and of those chronic and intractable diarrhœal affections so commonly met with amongst asthenic individuals.

Another important inference to be drawn from these statements is that quinine is probably as good a *prophylactic* of malarious fever as it is acknowledged to be a powerful curative specific. Morehead observes, in reference to the "*Prophylactic Use of Quinine*," that—"The question of the prevention of intermittent and remittent fever in those exposed to malarious influence, by the daily use of a small quantity of quinine, is very important. So far as I am aware, evidence on this point is as yet neither extensive nor conclusive. But the expectation of a prophylactic influence from quinine is very reasonable in theory, and the subject is well worthy of attention. I have no opinions grounded on personal experience to offer."

Now when the enormous amount of sickness and mortality, the wide spread misery and unhappiness directly and indirectly produced by malarious fevers amongst European troops located in this country, are taken into serious consideration, it becomes a

matter of paramount importance to have a question of this kind definitively settled. From my own practice and personal experience, I have long ago been induced to think very highly of the prophylactic virtues of small doses of quinine taken daily during the malarious season, and more especially if the quotidian dose be taken immediately prior to the usual morning constitutional.

This question of prophylaxis, particularly in the absence of any well developed measures of sanatory reform, might be at once settled, if Government would sanction an experiment, on an extensive scale, to be carried out under the instructions of the heads of the medical departments in the three Presidencies. Not less than a regiment, at full strength, should be subjected to experiment for each Presidency. And the investigation might be conducted simultaneously, during the most malarious months of the year, at the Capitals, two of which are malarious enough in all conscience—Calcutta and Bombay. The daily dose of quinine, and the period or periods for administering it, could soon be decided upon by medical committee.

Supposing the average dose to be fixed at one grain per diem, for ninety days in each year—from about the 15th of August to the 15th of November—the cost of the experiment, proposed to be carried out on three European regiments representing 3,000 fighting men, would be 393*l.*: *i.e.* if the price of quinine be set down at 14*s.* per ounce, which may be viewed as a high rate. If only twelve out of

the thirty lives that must annually be sacrificed directly by malarious fevers (in Bengal), during the most favourable times (peace), were saved by the prophylactic process, the Government would be immediately reimbursed at the handsome rate of 306 per cent. upon the original expenditure!

Supposing, again, that the experiment were successful; that by it the preventive properties of quinine and the exact extent and degree of these were established upon a sound and durable foundation, it would be infinitely more economical to use quinine largely as a prophylactic and curative combined, than, as at present, chiefly with a view to secure the latter action of this important drug.

Thus 75,000 men would, in ninety days, swallow 6,750,000 grains, or 14,062 ounces, of quinine, costing 9,843*l.* 8*s.* Allowing, therefore, as granted at page 47, that the expenditure for quinine and bark will, in future, amount to 46,744*l.*, if only used, as has generally been the case hitherto, for purposes of cure, there will remain a balance of 36,900*l.* 12*s.* to be expended, in part, or wholly if requisite, in the purchase of quinine and bark, after all the demands of prophylaxis have been fully satisfied. This balance may be too high, owing, perhaps, to a slightly higher estimate of the original annual cost than will obtain; but it will bear a considerable amount of severe pruning, and still present a goodly appearance.

TABLE XXIX.—*Exhibiting the Prevalence of, and Mortality resulting from, Diarrhœa, amongst European Troops, during two distinct Periods, in each of the three Presidencies.*

Presidency.	Periods.	Strength.	Admissions.	Deaths.	Percentage of Admissions to Strength.	Percentage of Deaths to Strength.	Percentage of Deaths to Admissions.
Bengal....	1812 to 1832	211,993	24,487	810	11·55	0·38	3·30
	1833 to 1853–54	331,775	40,336	1,371	12·15	0·41	3·39
Bombay .	1803-4 to 1827–28	116,218	7,963	195	6·85	0·16	2·46
	1828–29 to 1852–53	182,462	23,680	352	12·97	0·19	1·48
Madras...	1829 to 1838	103,431	8,069	159	7·8	0·15	1·9
	1842 to 1851	110,156	11,389	194	10·3	0·17	1·7

This table, so far as it goes, tends to show that there has been a universal augmentation in the numerical proportion of cases of diarrhœa throughout India, during the most recent periods of observation; which is, probably, due to greater care having been manifested in entering diarrhœa and dysentery cases in the hospital returns. There is also illustrated a universal increase in the mortality to strength; which, however, if we except Bengal, is not proportionate to the average increase of this ailment.

The reason why I have not previously made allusion to increase of mortality to treated from dysentery during the second periods of observation, as compared with the first, will now appear. It will be observed from Table XXVIII., that with the exception of Madras, there is manifested a decided increment of deaths to treated in the second periods; whilst from diarrhœa, if we except Bengal, there is a decrement of deaths to treated. Whether this is to be ascribed to the greater accuracy which has

obtained, during the modern periods, in classifying these two diseases in the returns, it is difficult to say. A presumptive argument in favour of this hypothesis exists in the last table, which shows a very marked diminution of cases to treated in Bombay (which is less marked, however, in Madras)—especially when viewed in connection with the modern increase of diarrhœa and decrease of dysentery. The explanation of the increase of deaths to treated, from both diseases, in Bengal, is probably to be found in Table XII., in which it is shown that, during the corresponding recent period, fevers have increased in numbers by 15·4 per cent. to strength.

Be this as it may, one thing is clear enough. It is evident that the amalgamation of cases of diarrhœa with those of dysentery would, from the lesser severity and fatality of the former, reduce the percentage of deaths to treated resulting from the latter, as that would be expressed in our returns, whilst the admixture of cases of dysentery with those of diarrhœa would of necessity give an exaggerated colouring to the stated mortality to treated resulting from the latter. It is important that these possibilities—which may be the probabilities in this case—should be clearly comprehended; because a partial observer might, at first sight, jump right home to his preconceived conclusion, that the increment in the mortality from dysentery is really attributable to a retrograde system of treatment, whilst an examination of all the facts bearing upon these results

might induce him to shake off his bias, and come to a more rational appreciation of their real meaning.

I have been somewhat impressed with the idea that it is the existence of a process of amalgamation similar to that just described, which renders all the old statistical records of dysentery and diarrhœa (and perhaps most of the new also) exceedingly untrustworthy—especially when the statistics of these two diseases are given separately, or as individual constituents of the class which they form when united. It is manifest, therefore, that the best plan which could be adopted to enable us to arrive at a correct conclusion regarding the comparative ratios of deaths to admissions, during the two periods of observation in each Presidency, would be to throw these two correlated diseases together, and consider them as a class. This has been done in the following table :—

TABLE XXX.—*Exhibiting the Sickness and Mortality, from Dysentery and Diarrhœa (amalgamated into one class), amongst European Troops, during two distinct Periods, in each of the three Presidencies.*

Presidency.	Periods.	Strength.	Admissions.	Deaths.	Percentage of Admissions to Strength.	Percentage of Deaths to Strength.	Percentage of Deaths to Admissions.
Bengal ...	1812 to 1832	211,993	74,674	4,914	35·22	2·31	6·58
	1833 to 1853–54	331,775	90,691	6,140	27·34	1·85	6·77
Bombay..	1803–4 to 1827–28	116,218	35,036	2,518	30·14	2·16	7·18
	1828–29 to 1852–53	182,462	47,267	2,700	25·90	1·47	5·71
Madras ...	1829 to 1838	103,431	25,511	1,541	24·66	1·48	6·04
	1842 to 1851	110,156	24,540	1,116	22·27	1·01	4·54

Thus, throughout India, there is manifested, in this table, a well developed decrease in the numerical proportion of admissions and deaths to strength, and with the exception of Bengal, a marked decrease in the mortality to treated, during the modern periods of observation. If then I am right in casting suspicion on the truthfulness of our separate statistics on dysentery and diarrhœa, or if my explanation of the increase of mortality to treated arising from the former, and of the diminution of mortality from the latter, be correct, the question may be asked, of what practical value are separate statistics of dysentery and diarrhœa in leading us to a proper appreciation of different modes of treatment?

Even the very table which Mr. Hare produces (in the appendix to his excellent paper on Tropical Fever and Dysentery, published in the second volume of the "Indian Annals of Medical Science") to shew that, during the five years ending 1834, when spoliative treatment was, perhaps, at its height, only 1 patient in 5·59 died from dysentery in the Calcutta General Hospital, whereas, during the five years ending 1849, when a more conservative management was had recourse to, 1 patient in 3·43 succumbed, is pregnant with the suspicion that, during the former period, the reputed admissions with dysentery were copiously commingled with cases of diarrhœa, whilst, during the latter, there is good reason for believing that this fallacious system of permitting the returns to be thus adulterated did not exist, or, if it did, in a much smaller degree.

The following table, when truly interpreted, shows the justice of this observation most emphatically:—

Table XXXI.—*Exhibiting the Admissions and Deaths from Dysentery, during two Periods remotely removed from each other, in the General Hospital at Calcutta.*

Periods.	Admissions.	Deaths.	Percentage of Deaths to Admissions.	Proportion of Deaths to Admissions.
1830 to 1834...	671	120	17·88	1 in 5·59
1845 to 1849...	439	128	29·13	1 in 3·43

Now, is the proportion of deaths to admissions, in the first quinquennial period, when mercurialization, &c. was the order of the day, the *real* proportion of deaths to admissions with *true* dysentery, or dysentery generously contaminated with the much less fatal but correlated disease, viz., diarrhœa? Does not the large number of recorded admissions with dysentery, amounting in the aggregate to 671, during the first period, as compared with the much smaller number of admissions (439) during the second period, when, we are told, mercury was displaced *in toto* by acetate of lead and opium, especially when taken in connection with the almost *equal round total of deaths*, in both periods, tend to show that the latter, the amalgamation process, is the true explanation of the discrepancy in the ratio of deaths to treated?

I certainly do think that there is internal evidence in these figures of the existence of the suspected

fallacies herein pointed out; and I am morally persuaded that the statistics of diarrhœa, as recorded in the General Hospital, will, when published, afford presumptive evidence in support of this opinion. Have cases of diarrhœa, or have they not, increased and decreased with the decrease and increase of cases of dysentery? It is for reasons of this nature that I hesitate in giving implicit credence to the assertion that "the returns of the largest and longest established dysenteric hospital in the world (General Hospital at Calcutta) shew that since mercury has been avoided, the mortality has been double, for many years' continuance, what it was when salivation was sought for, as the first and only object of treatment; and to complete the remarkable proof of the importance of mercury (if my system by quinine and injections be not received), these statistics clearly shew, that as mercury has gradually been disused, so the mortality has correspondingly increased." (Hare, Indian Annals, vol. II., p. 497.)

3. The Influence of Sex, Station of Life, and Childhood, on the Prevalence of, and Mortality from, Bowel Complaints.

Table XXXII.—*Exhibiting the Sickness and Mortality from Bowel Complaints (Dysentery and Diarrhœa) amongst Four Classes of Europeans, for Four Years ending* 1853–54, *in the Bengal Presidency; and from Dysentery amongst the same Classes, for Ten Years ending* 1838, *at Seven of the largest Stations* in the Madras Presidency.*

Bengal.†

Class.	Strength.	Admissions.	Deaths.	Percentage of Admissions to Strength.	Percentage of Deaths to Strength.	Percentage of Deaths to Admissions.
Privates	84,143	19,349	1,426	22·99	1·69	7·36
Officers......	2,970	394	6	13·26	0·20	1·52
Women	7,941	1,384	101	17·42	1·27	7·29
Children ...	9,255	1,265	171	13·66	1·84	13·51

Madras.‡

Class.	Strength.	Admissions.	Deaths.	Percentage of Admissions to Strength.	Percentage of Deaths to Strength.	Percentage of Deaths to Admissions.
Privates	75,121	12,983	976	17·28	1·30	7·51
Officers......	2,319	186	10	8·02	0·01	5·38
Women	6,559	774	73	11·81	0·09	9·43
Children ...	9,877	991	152	10·09	0·02	15·33

* Madras, Secunderabad, Moulmein, Trichinopoly, Bangalore, Bellary, and Cannanore.

† "Analysis of Later Medical Returns of European Troops serving in the Bengal Presidency." By H. Macpherson, Esq., "Indian Annals," Vol. IX., p. 247 (January, 1858).

‡ Substantially a transcript of Table XII., from "Statistical Notes on some of the Diseases of India." By Edward John Waring, Esq., "Indian Annals," Vol. VI. p. 473 (1856).

I shall consider the two divisions of this table separately. 1st. In Bengal, bowel complaints abound

most amongst privates, 22·99 per cent. of whom are annually attacked; next, amongst women, who are affected at the rate of 17·42 per cent.; then amongst children, 13·66 per cent. of whom are attacked; and lastly, amongst officers, who suffer in the proportion of 13·26 per cent. The male sex, *cœteris paribus*, are, therefore, more liable to dysentery and diarrhœa than the female sex. 2ndly. The proportion of deaths to total strength reaches the highest figure amongst privates and children (1·69 and 1·84 per cent.); next, come women, 1·27 per cent. of whom succumb; and lastly, officers, who die at the rate of 0·20 per cent. The mortality is higher, therefore, amongst males than females, other circumstances being equal, and highest of all amongst children. 3rdly. The ratio of deaths to treated stands much higher amongst children than any other class, reaching as it does 13·5 per cent.; it is higher in privates than in women (7·36 and 7·29); whilst it sinks to the lowest point amongst officers, whose station of life and other advantages tend to keep it down to 1·84 per cent.

If anything could be more impressive or suggestive than the above dry detail, perhaps it would be the following summary, which brings these facts more prominently into view:—Of 10,000 strength, there are 973 more attacks of dysentery and diarrhœa, and 149 more deaths, amongst privates than officers; and the number of deaths out of 10,000 attacks in privates exceeds that in officers by 584. Out of 10,000 women, there are 416 more seizures and

107 more deaths than amongst a similar number of officers; and of 10,000 attacks, 577 more deaths occur amongst the former than the latter. Of 10,000 children, there are 933 fewer attacks than in soldiers, 376 than in women, and 40 more than in officers; but out of a similar number of attacks in these tender plants, 615 more prove fatal than in their fathers, 622 than in their mothers, and 1,199 than in officers. The sickness and mortality from dysentery and diarrhœa amongst the soldiers' progeny ought, properly speaking, to have been contrasted with those which obtain amongst the offspring of officers.

Now what are the causes which produce this very high ratio of mortality amongst privates, women, and children, compared with that which holds good amongst officers? The most formidable cause has already been pointed out in rather forcible colours, viz., malaria and malarious fevers. The others may be enumerated as follows: stifling air of unventilated and overcrowded barracks; the unhappy location of these and hospitals in insalubrious situations; the imperfect development, in practice, of those measures of purification which are designed to eradicate malaria from the interior and exterior of our stations for some miles; carelessness, on the part of both men and women, in not securing for themselves and children water uncontaminated with organic matter in process of decomposition; beer and porter of inferior quality; deficient supply of vegetable elements in food; tough, stringy, half-fed, and too frequently, it is feared,

diseased meat; badly cooked victuals; the consumption of acid and unripe fruits; the imbibition of large quantities of country spirit, or the vile arrack of our Indian bazars; the too frequent stimulation of the stomach with highly-seasoned curries, and consequent artificial clogging or overloading of the digestive organs; inadequate tinning of copper cooking vessels; want of exercise at appropriate periods; want of a healthful, cheerful, and invigorating occupation; *ennui*, the everlasting cancer and bane of a soldier's life; reckless exposure to a vertical sun, and to great changes of temperature, without having the cerebrum and abdomen properly protected by an adequate covering composed of the very worst conductors of heat; perpetual mental restraint; neglect in not applying for medical aid at the first onset of malaise or disorder, whether that be dysentery, diarrhœa, simple dyspepsia, or colic; negligence in not attending to the due regulation of the bowels with a view either to remove habitual constipation, or to put a stop to diarrhœa; and the impossibility (according to the ruling regulations) of conferring upon the private and his wife and children the same facilities and privileges as the officer and his wife and children enjoy, in regard to securing the great benefits of change of air to places in this country lauded for their comparative rather than their absolute healthiness, or to Europe, South Africa, or Australia, &c.

To these marked disadvantages, and malarious fevers operating in conjunction with a high and often relaxing temperature, must be attributed the

high ratio of mortality in women, children, and privates. The greater prevalence of, and mortality resulting from, dysentery and diarrhœa amongst privates than officers must convince the veriest sceptic of the urgent necessity, at this present moment, for the introduction into our European army in India of a liberal system of practical and responsible sanitary reform. As with regard to fevers, so in reference to bowel complaints, the difference of health and excess of casualties amongst soldiers as contrasted with officers, cannot be ascribed to anything but the inferior hygienic and sanitary condition of the former. If officers are attacked only at the rate of 13·26 per cent., die at the rate of 0·20 per cent., why should soldiers be attacked at the rate of 22·99 per cent., and die at the rate of 1·69 from dysentery and diarrhœa? Again, if officers, when once attacked, die in the proportion of 1·52 per cent. to admissions, how can we account for the soldier dying at the rate of 7·36 to admissions, unless we attribute all this to difference of condition and circumstances in the two classes, which I humbly but strenuously contend might be completely destroyed by the adoption of such measures as have already been pointed out.

If the mortality from these two affections amongst our soldiers were reduced to that which obtains amongst officers, the gain to the State, in men, would be 644, in money 64,400*l.*, annually, out of 40,000; not to mention the gain in military efficiency, and in the saving of women and children. It is important

that a matter of this kind should be placed in its true light. It may be here affirmed that in no other class of disease would the paramount excellence of preventive over curative science be so prominently developed as in the partial diminution of the sickness, and the considerable reduction of the mortality, resulting from dysenteric and diarrhœal disorders, simply because, at the present day, they cause more destruction, more casualties in the ranks, than any other class of disease. The feasibility of accomplishing a reduction in the prevalence and fatality of these diseases can no longer be a matter of doubt. It is an absolute certainty. Could a sum of money, then, equal to the above be better employed than in raising the standard of health of our European troops, and their female and juvenile members, and in consequently securing increased military efficiency by effecting a decrease in the frequency of and the deaths resulting from these complaints—two of the most serious diseases of the alimentary canal?

From the Madras portion of the table undergoing analysis, " it appears, that whilst amongst the men or privates the proportion of admissions to strength (from dysentery) is very much larger than amongst any other class, yet the mortality, after the disease has once supervened, is very much higher amongst children or those of tender years than amongst adult males. The same remark applies, though not with equal force, in regard to the women as compared with the men. The officers appear in every respect in a lower ratio than the privates of the same regiments; pro-

bably from the lesser degree of exposure they are subjected to, the more comfortable quarters they occupy, and the greater attention they receive when sick: greater than can be possibly paid to men in hospital." (Waring's Notes.)

4. Influence of Defective Ventilation, Faulty Construction of, and Unhealthy Sites for, Barracks, on the Prevalence of, and Mortality resulting from Dysentery.

Table XXXIII.—*Showing the comparative Number of Admissions and Deaths from Dysentery at Secunderabad, during a Period of Ten Years.*

Class.	Periods.	Strength.	Admissions with Dysentery.	Deaths from Dysentery.	Percentage of Admissions to Strength.	Percentage of Deaths to Admissions.
H. M.'s Regiments .	1829 to 1839	7,561	2,004	293	26·504	14·221
Hon. Co.'s Artillery	1829 to 1840	1,382	260	21	18·813	8·076

It is stated by the author last-named, in reference to these figures, that the barracks appointed for her Majesty's regiments "were built on low, marshy ground; a range of rocky hills on the north-east preventing a free current of air in that direction, at the same time that the building itself was faulty in construction and deficient in ventilation and accommodation;" whereas those set apart for the Honourable Company's European Artillery "were placed in a much more open and elevated position, and every attention was paid to proper drainage, ventilation, and accommodation. . . . . If evidence were

required to show that the excessive liability to dysentery depends in a great measure on the barracks of her Majesty's regiments, it may be found in the records of her Majesty's 55th Regiment. From these it appears, that a great improvement took place with respect to dysentery in this corps; as the following statement shews:"—

Year.	Admissions with Dysentery.	Deaths from Dysentery.	Proportion of Deaths to Admissions.
1837	431	95	1 in 4½
1838	275	37	1 in 7½
1839	212	21	1 in 10

"Now, in 1837, the men were quartered in the old, low, crowded, badly-ventilated barracks; in 1838, they were partly in the old and partly in the improved buildings, and in 1839, they were entirely in the latter." To have given this tabular statement greater weight, the strength during each year should have been furnished. But as regards the diminution of mortality to treated, it must be acknowledged "to speak forcibly for itself." It is another instance, amongst numerous others which this treatise contains, of the fact that—

> "For want of timely care
> Millions have died of medicable wounds."

5. THE INFLUENCE OF AGE ON THE PREVALENCE OF, AND MORTALITY FROM BOWEL COMPLAINTS AMONGST EUROPEAN SOLDIERS IN INDIA.

TABLE XXXIV.—*Exhibiting the Influence of Age on the Mortality from Bowel Complaints (Dysentery and Diarrhœa) amongst European Troops in the Bengal Presidency, for Four Years ending* 1853–54; *and on the Prevalence of, and Mortality from Dysentery, amongst the European Troops in the Madras Presidency, for Three Years, terminating* 1851.

BENGAL.

Ages.	Strength.	Deaths.	Percentage of Deaths to Strength.	Proportion of Deaths to Strength.
Under 20 years...	7,599	12	0·157	1 in 633·25
From 20 to 25...	27,341	403	1·473	1 in 64·80
„ 25 „ 30...	29,158	560	1·920	1 in 52·00
„ 30 „ 35...	14,390	326	2·265	1 in 44·10
„ 35 „ 40 / „ 40 „ 45 / „ 45 „ 50	5,596	119	2·126	1 in 47·00
Unknown, or from 50 upwards	59	5	8·474	1 in 11·80
Total	84,143	1,425	1·693	1 in 59·00

MADRAS.

Ages.	Strength	Admissions.	Deaths.	Percentage of Admissions to Strength.	Percentage of Deaths to Strength.	Percentage of Deaths to Admissions.	Proportion of Deaths to Admissions.
Under 20 years ...	3,864	225	11	5·822	0·284	4·88	1 in 20·40
From 20 to 25 ...	8,733	737	43	8·439	0·492	5·837	1 in 17
„ 25 „ 30 ...	9,108	834	64	9·156	0·702	7·697	1 in 13
„ 30 „ 35 ...	4,626	320	27	6·917	0·583	8·437	1 in 11·80
„ 35 „ 40 ...	1,928	124	12	6·431	0·622	9·686	1 in 10·33
„ 40 „ 45 ...	480	24	4	5·000	0·833	16·666	1 in 6
„ 45 „ 50 ...	112	1	...	0·892	—	—	—
Unknown, or from 50 upwards	94	2	...	2·127	—	—	—
Total	28,945	2,267	161	7·832	0·556	7·101	1 in 14

The Bengal portion of this table, which has been constructed from Mr. Hugh Macpherson's Tables XV. and XVI., shows very plainly that bowel complaints prove more and more mortal with increasing years. With one exception, which, however, is artificial, not natural, every succeeding gradation of five years is attended with a greater mortality to strength than the one which precedes it. The artificial nature of the exception, from 35 and upwards, at which period the mortality to strength appears to be less in this table than in the antecedent quinquennial period, from 30 to 35, is fully manifested when these are viewed in connection with similar periods in Table VI., which shows that whilst the percentage of invalids to strength between 30 and 35 was 3·18, it amounted to no less than 11·44 from 35 and upwards!

The Madras portion, for which I am indebted to Mr. Waring, shows that up to 30, attacks of, and the mortality from, dysentery increase *pari passu* with age. Beyond that age the obnoxiousness to the disease decreases, and so does the mortality; but this is highest, nevertheless, between 40 and 45. The reason of this, I have no doubt, would be fully explained, if the effect of age in invaliding, in this Presidency, could be demonstrated. The mortality to admissions with dysentery, as displayed in the last two columns, bears a marked relation to age—augmenting, as it does, with almost arithmetical progression, in the direct ratio of advancing years.

6. The Influence of Residence in India upon the Prevalence of, and Mortality resulting from Dysentery amongst European Troops.

Table XXXV.—*Exhibiting the Ratio of Admissions and Deaths, from Dysentery (arranged according to length of Service), among European Troops of the Madras Army, for Three Years, viz.,* 1848–51 *inclusive.*

Length of Service.	Strength of each Class.	Admissions.	Deaths.	Percentage of Admissions to Strength.	Percentage of Deaths to Strength.	Percentage of Deaths to Admissions.
Under 1 year......	1,474	141	15	9·565	1·017	10·638
From 1 to 2 yrs.	2,192	263	9	11·998	0·410	3·422
„ 2 „ 3 „	3,503	246	27	7·022	0·770	10·975
„ 3 „ 4 „	2,971	217	16	7·303	0·538	7·373
„ 4 „ 5 „	2,127	140	11	6·582	0·517	7·857
„ 5 „ 6 „	1,770	194	8	10·960	0·451	4·123
„ 6 „ 7 „	2,641	279	24	10·564	0·908	8·602
„ 7 „ 10 „	7,422	535	33	7·208	0·444	6·168
„ 10 „ 15 „	3,497	190	12	5·433	0·343	6·311
„ 15 „ 20 „	818	46	4	5·623	0·488	8·695
„ 20 „ 25 „	331	11	1	3·323	0·302	9·090
„ 25 „ 30 „	118	3	1	2·542	0·847	33·333
Above 30 years ...	81	2	...	2·469	—	—
Total	28,945	2,267	161	7·832	0·556	7·101

Mr. Waring remarks upon this table, which is transcribed from his "Notes on some of the Diseases of India," "that up to the tenth year of residence in India the proportion of admissions with dysentery, although presenting much variation, is most prevalent, but after that date the proportion of admissions gradually diminishes. In the five years between 10 and 15 years, the total number of admissions is only just one-half that which it was in a single year

between the 5th and 6th, or between the 6th or 7th. The second year of residence appears to be most obnoxious to it, nearly 12 per cent. of strength being admitted. The proportion of deaths to admissions presents nothing so marked as we see in the table on the influence of age."

I have strong doubts whether much confidence can be reposed in tables of this description, as at present constituted. Sufficient has been shown in the preceding table to convince any one, however sceptical he may be, that increasing years augment, in a most marked manner, the tendency to death amongst European soldiers located in this country. But her Majesty's regiments most especially, when they first arrive in India, and for some years afterwards, generally contain a large number of men who are verging upon, or who have passed the age of from 25 to 35 years; and it is not improbable that the high ratio of admissions and mortality from dysentery, during the earlier periods of residence, as noted in our table, may have really occurred amongst men included in the ages alluded to, or even in older men, although they may only have resided a few months, or a few years, in India.

To make tables of residence worth anything, to make them infallible, each period of residence should harmonise with a certain period of age. Suppose we took, as a starting point, the age of 18 to 20, and understood the strength placed opposite that period to represent all men of two years' service; 20 to 25 years to represent all men of seven years' service;

25 to 30 to represent all men of twelve years' service; 35 to 40 to represent all men of seventeen years' service; 40 to 45 to represent all men of twenty-two years' service; 45 to 50 to represent all men of twenty-seven years' service, and so on to the end of the chapter, then our tables of residence would not be open to a fallacy which appears to me to vitiate any conclusions or inferences that may be drawn from them.

7. The Influence of Season on the Prevalence of, and the Mortality resulting from, Dysentery in India.

Table XXXVI.—*Exhibiting the Admissions and Deaths from Dysentery in the European General Hospital at Bombay, for Fifteen Years, from July,* 1838, *to 30th June,* 1843, *and from January,* 1844, *to 31st December,* 1853 (*arranged according to Months*).

Months.	Admissions.	Deaths.	Percentage of Deaths to Admissions.
Half-year from Dec. to May:			
Fifteen Decembers	214	49	22·89
Fifteen Januarys	185	46	24·86
Fifteen Februarys	81	25	30·61
Fifteen March's	93	20	21·50
Fifteen Aprils	95	20	21·05
Fifteen Mays	90	15	16·66
Total	758	175	23·08
Half-year from June to Nov.:			
Fifteen Junes	120	18	15·00
Fifteen Julys	161	23	14·28
Fifteen Augusts	117	17	14·52
Fifteen Septembers	85	20	23·52
Fifteen Octobers	92	16	17·39
Fifteen Novembers	158	20	12·65
Total	733	114	15·55

It was seen from Tables XVIII. and XIX. that, though a much larger aggregate number of intermittent and remittent fevers, as also a much greater resultant total of deaths from them, occurred during the malarious half of the year, the proportion of deaths to admissions was uniformly highest during the comparatively non-malarious season. It was also explained in the sequel that this latter circumstance arose from the relapses produced by the application of violent atmospheric vicissitudes operating upon constitutions rendered cachectic by primary attacks and recurrences of these fevers occurring during the previous malarious months. And sufficient evidence has been produced at page 89, and in the subsequent observations, to show the effect of malarious poisoning—more especially of the malarious cachexia—in indirectly augmenting the proclivity to, and the mortality resulting from, dysenteric affections.

This table is strongly confirmatory of these observations; with this exception—viz., that dysentery is here shown to be slightly more prevalent during the season least favourable to the generation of malarious exhalations, and a much larger aggregate of deaths to admissions takes place during this season; but the proportion of casualties to admissions is very much higher during it than during the really malarious portion of the year. These revelations, however, are in perfect harmony with the theory of the predisposing powers of malaria to the invasion of dysentery. It is during the cold months, as a rule, when organic lesion is most likely to occur in the intestinal mucous

membranes of those Europeans whose constitutions have been shattered by repeated attacks of ague or remittent fever. And it is undoubtedly the external cold, and great comparative depression and variation of the thermometer acting upon these debilitated and, too frequently, inadequately clothed persons, that diminish the chances of recovery from attacks.

The following table, for which I am indebted to Mr. Webb, shows, with few exceptions, that the proportion of deaths to treated is highest in some of the Bombay stations during the coldest months:—

TABLE XXXVII.—*Exhibiting the Percentages of Deaths to Admissions, from Dysentery and Diarrhœa amongst European Troops, during two equal Divisions of the Year, in Five of the largest Bombay Stations.*

Stations.	Dysentery.		Diarrhœa.	
	Percentage of Deaths to Treated.		Percentage of Deaths to Treated.	
	Half-year from April to September.	Half-year from October to March.	Half-year from April to September.	Half-year from October to March.
Bombay	8·7	13·9	1·4	2·9
Poona............	6·4	9·8	1·1	1·1
Belgaum.........	7·9	6·0	1·8	0·5
Deesa	3·1	7·9	1·1	1·5
Aden	8·4	12·2	2·8	3·5
Total	7·0	11·2	1·5	2·1

Whilst it will be observed from this table that the mortality to treated is higher during the half-year

extending from October to March than from April to September, it will also be noticed that Belgaum is exceptional, and that the mortality from both diseases during the cold and spring months is highest at Bombay and Aden.

Section II.—*Statistics of Dysentery and Diarrhœa amongst Native Troops.*

1. Average Rates of Sickness and Mortality from Dysentery and Diarrhœa amongst Native Troops.

Table XXXVIII a.—*Exhibiting the Sickness and Mortality from Dysentery amongst Native Troops.*

Presidency.	Periods.	Strength	Admissions.	Deaths.	Percentage of Admissions to Strength.	Percentage of Deaths to Strength.	Percentage of Deaths to Admissions.
Bengal	1826 to 1852–53	2,767,347	109,098	2,709	3·94	·097	2·48
Bombay	1803–4 to 1853–54	1,451,166	59,890	1,975	4·12	·135	3·29
Madras	1827 to 1851–52*	1,242,694	13,777	1,071	1·10	·086	7·77

Table XXXVIII b.—*Exhibiting the Sickness and Mortality from Diarrhœa amongst Native Troops.*

Presidency.	Periods.	Strength	Admissions.	Deaths.	Percentage of Admissions to Strength.	Percentage of Deaths to Strength.	Percentage of Deaths to Admissions.
Bengal	1826 to 1852–53	2,767,347	62,152	2,098	2·24	·075	3·37
Bombay	1803–4 to 1853–54	1,451,166	35,486	873	2·44	·060	2·46
Madras	1827 to 1851–52*	1,242,694	24,532	1,293	1·97	·104	5·27

* Exclusive of 1836–37–38–39–40 and 1841.

As with regard to separate returns of dysentery and diarrhœa in Europeans, so with reference to individual statistics of these diseases in natives there is a grave source of fallacy which must vitiate more or less all our conclusions—viz., the indiscriminate amalgamation of dysentery with diarrhœa, and *vice versâ*—a process which has the effect of diminishing the real or actual mortality from dysentery, whilst it unnaturally swells that arising from diarrhœa. Whether we view the relative prevalence of the two diseases, the mortality to strength or to treated, there is the strongest evidence staring us in the face that this laxity of diagnosis, or at all events of nosological arrangement, has existed to such an extent as to make it quite a lottery whether a case of flux was to be classified under the head dysentery or diarrhœa. Whoever heard of dysentery being more prevalent amongst natives than diarrhœa? Whoever heard of diarrhœa being more fatal in proportion to attacks than dysentery? Yet, if we are to believe these figures, we must admit that dysentery has been much more abundant in Bengal and Bombay than diarrhœa, and that diarrhœa proved more deadly in proportion to attacks than dysentery in Bengal. My own experience is that natives seldom die from diarrhœa. If a flux of any kind (cholera excepted) is attended with fatal results, *post mortem* examination has usually demonstrated ulcerative disease in the colon. Cholera can seldom be mistaken for either disease, although the preliminary symptoms might be mistaken for simple diarrhœa.

But such objections as the above-mentioned do not apply to the class which dysentery and diarrhœa constitute. I have, therefore, thrown them together in the following :—

Table XXXIX.—*Exhibiting the Sickness and Mortality from Dysentery and Diarrhœa (as a Class of Disease) amongst Native Troops.*

Presidency.	Periods.	Strength	Admissions.	Deaths.	Percentage of Admissions to Strength.	Percentage of Deaths to Strength.	Percentage of Deaths to Admissions.
Bengal......	1826 to 1852–53	2,767,347	171,250	4,807	6·18	·173	2·80
Bombay ...	1803–4 to 1853–54	1,451,166	95,376	2,848	6·57	·196	2·98
Madras......	1827 to 1851–52*	1,242,694	38,309	2,364	3·08	·190	6·17

* Exclusive of 1836–37–38–39–40, and 1841.

By a comparison of the results embodied in this table with those comprised in Table XXVII., the following remarkable facts are revealed in truly striking colours :—

1st. That the *proportion of sickness* from dysentery and diarrhœa combined, amongst Europeans as compared with that of native troops,—

Is in Bengal as 4·92 to 1.
„ Bombay „ 4·12 „ 1.
„ Madras „ 7·60 „ 1.

2ndly. That the *mortality to strength* from dysentery and diarrhœa combined, amongst Europeans as compared with that of native troops,—

Is in Bengal as 11·67 to 1.
„ Bombay „ 8·73 „ 1.
„ Madras „ 6·52 „ 1.

3rdly. That the *mortality to admissions*, with dysentery and diarrhœa combined, amongst Europeans as compared with that of native troops,—

Is in Bengal as 2·37 to 1.
" Bombay " 2·11 " 1.
" Madras " 1·00 " 1·16.

What makes these figures cut such a lamentable appearance, is the important fact that out of 10,000 officers, in Bengal, only 3 more deaths occur from bowel complaints than in 10,000 sepoys; and that out of 10,000 officers, in Madras, 18 fewer deaths take place than in a similar number of sepoys.

2. Evidence of Increased Sickness, but of Decrease in the Mortality from Bowel Complaints amongst Native Troops.

Table XL.—*Exhibiting the Sickness and Mortality from Bowel Complaints (Dysentery and Diarrhœa) amongst Native Troops, during two distinct Periods, in each of the three Presidencies.*

Presidency.	Periods.	Strength	Admissions.	Deaths.	Percentage of Admissions to Strength.	Percentage of Deaths to Strength.	Percentage of Deaths to Admissions.
Bengal ...	1826 to 1838	1,246,776	69,083	2,437	5·54	0·19	3·50
	1839 to 1851–2	1,397,438	92,057	2,201	6·58	0·15	2·39
Bombay ..	1803–4 to 1827–28	610,441	29,063	1,274	4·76	0·20	4·38
	1828–9 to 1852–3	807,196	64,626	1,536	8·00	0·19	2·37
Madras ...	1827 to 1835	597,434	14,283	1,004	2·39	0·16	7·02
	1842 to 1851	645,263	24,026	1,360	3·72	0·21	5·66

The *first* fact deserving of especial notice in this table is the universal increase of bowel complaints amongst native soldiers during the latest periods

of observation. This is to be accounted for by the great augmentation of malarious fevers amongst our indigenous soldiers, as pointed out in Table XXI., page 76; and probably the reason why this increase of dysentery and diarrhœa is not proportionate to the increase of fevers, is partly owing to the fact that, comparatively speaking, these diseases have never been nearly so prevalent in natives as in Europeans, and partly to the more extended introduction of a conservative, tonic, and antiperiodic method of treatment of fevers.

The *second* fact is that, in two out of the three presidencies, there is a diminution of mortality to strength, and in all three a very decided decrease of mortality to admissions. Now it forcibly strikes me that the increased proportion of admissions is just as powerful proof of the *deteriorated sanitary condition of the native soldier*, as the decrease of mortality to treated, which alone has kept down the mortality to strength, is *undeniable evidence of advancement in the methods employed for combating the encroachments of these two diseases.*

3. The Influence of Season on the Prevalence of, and the Mortality resulting from Dysentery amongst Natives in India.

Table XLI.—*Exhibiting the Admissions and Deaths from Dysentery, for six Years ending* 1853, *amongst Natives admitted into the Jamsetjee Jeejeebhoy Hospital at Bombay.*

Months.	Admissions.	Deaths.	Percentage of Deaths to Admissions.
Half-year from Dec. to May :			
Six Decembers	154	49	31·8
Six Januarys	120	49	40·8
Six Februarys	93	26	27·9
Six March's..........	65	34	52·3
Six Aprils	73	35	47·9
Six Mays	91	20	21·9
Total	596	213	35·73
Half-year from June to Nov. :			
Six Junes	82	43	52·4
Six Julys	129	55	42·6
Six Augusts	118	46	38·9
Six Septembers	99	44	44·4
Six Octobers	75	36	48·0
Six Novembers	102	37	36·2
Total.................	605	261	43·14

This table shows that there has been a larger aggregate number of admissions and deaths, with also a higher percentage of deaths to admissions, in the Jamsetjee Jeejeebhoy Hospital at Bombay, during the half-year ending November than during that ending May.

CHAPTER IV.

On the Statistics of Hepatitis amongst European and Native Troops in India.

Section I.—*Statistics of Hepatitis amongst European Soldiers.*

1. Average Rates of Sickness and Mortality from Hepatitis amongst European Troops in India and elsewhere.

Table XLII.—*Exhibiting the Sickness and Mortality from Hepatitis amongst European Soldiers in different quarters of the globe.*

Stations.	Period of Observation.	Strength	Admissions.	Deaths.	Percentage of Admissions to Strength.	Percentage of Deaths to Strength.	Percentage of Deaths to Admissions.
	Years.						
Canada	20	64,280	488	12	0·75	·01	2·45
Nova Scotia and New Brunswick	20	46,442	384	10	0·82	·02	2·60
England	10	160,103	1,358	59	0·84	·03	4·34
Jamaica	20	51,567	539	51	1·04	·09	9·46
Gibraltar	19	60,269	759	22	1·25	·03	2·89
Corfu	10	16,963	231	14	1·36	·08	6·06
Bermudas	20	11,721	168	6	1·43	·05	3·57
Ionian Islands	20	70,293	1,168	58	1·66	·08	4·96
St. Helena	9	8,973	171	24	1·90	·26	14·03
Malta	20	40,826	857	47	2·09	·11	5·48
Cape of Good Hope	19	22,714	496	25	2·18	·11	5·04
Windward and Leeward Command	20	86,661	1,946	161	2·24	·18	8·27
Ceylon	20	42,978	2,382	213	5·54	·49	8·94
Bengal	42	543,768	32,780	2,269	6·02	·41	6·92
Tenasserim Provinces	10	6,818	488	29	7·15	·42	5·93
Bombay	51	306,978	24,347	1,263	7·93	·40	5·18
Western Africa	18	1,843	150	11	8·13	·59	7·33
Mauritius	19	30,515	2,508	122	8·21	·39	4·86
Madras	20	213,587	19,057	869	8·92	·40	4·55

For the materials of which this table is composed I am indebted to Mr. James Ranald Martin,* Mr. Waring,† and to the Bengal ‡ and Bombay § statistical returns. It is well calculated to demonstrate the remarkable influence which residence in tropical climates exercises in augmenting the proclivity of Europeans to invasions of hepatic disorders. Thus 5·54 per cent. of the troops are on an average annually attacked in Ceylon; 6·02 in Bengal; 7·15 in the Tenasserim Provinces; 7·93 in Bombay; 8·13 in Western Africa; 8·21 in the Mauritius; and 8·92 in Madras: whilst in the other stations, which are, as a general rule, either situated in temperate latitudes, or, if positioned near or within the tropics, so insulated by the ocean and tempered by prevailing winds that the temperature is more equable and malaria less abundant, the prevalence of this class of affections ranges only from ·75 per cent. in Canada, ·82 in Nova Scotia and New Brunswick, and ·84 in England, to 2·09 in Malta, 2·18 at the Cape of Good Hope, and 2·24 in the Windward and Leeward Command. There need be little wonder, then, that eminent writers on tropical diseases—Annesley, Twining, Johnson, Martin, and Morehead, have allotted so much space in their respective works for the detailed consideration of liver complaints.

* Quoted from Colonel Tulloch. Johnson and Martin on "Tropical Climates" (Sixth Edition).

† Waring's "Notes on Some of the Diseases of India"—"Indian Annals," Vol. VI.

‡ "Indian Annals," Vol. VII. § "Indian Annals," Vol. VI.

2. Evidence of a Decrement of the Sickness and Mortality from Hepatitis amongst European Troops in India.

Table XLIII.—*Exhibiting the Sickness and Mortality from Hepatitis amongst European Soldiers, during two equal Periods, in each of the three Presidencies.*

Presidency.	Periods.	Strength	Admissions.	Deaths.	Percentage of Admissions to Strength.	Percentage of Deaths to Strength.	Percentage of Deaths to Admissions.
Bengal ...	1812 to 1832	211,993	14,015	924	6·61	0·43	6·59
	1833 to 1853–54	331,775	18,765	1,345	5·65	0·40	7·16
Bombay ..	1803–4 to 1827–28	116,218	9,544	490	8·21	0·42	5·13
	1828–29 to 1852–3	182,462	14,199	749	7·78	0·41	5·27
Madras ...	1829 to 1838	103,431	11,251	545	10·8	0·52	4·8
	1842 to 1851	110,158	7,806	324	7·0	0·29	4·1

From this table, it may be affirmed that during the most modern periods of observation, there has been a palpable diminution of cases of liver disease, as compared with the remote periods, amounting to 96 in Bengal, 43 in Bombay, and to 380 in Madras, out of 10,000 of strength. This gratifying result is partly due to the greater temperance of the European army in diet and drink, and to their improved condition, and partly to our improved treatment of malarious fevers. The decrease of deaths to strength is just perceptible in Bengal and Bombay, but is more marked in the southern presidency. With the exception of Madras, the proportion of deaths to admissions has manifested a decided increase during the recent periods of review. But an examination of the last quinquennial periods of the subjoined table will show that in Bombay, as well as

Madras, the proportion of casualties to admissions has diminished.

TABLE XLIV.—*Exhibiting the Sickness and Mortality resulting from Hepatitis amongst European Troops in the Three Presidencies, arranged in quinquennial Periods.*

Presidency.	Periods.	Strength	Admissions.	Deaths.	Percentage of Admissions to Strength.	Percentage of Deaths to Strength.	Percentage of Deaths to Admissions.
Bengal ...	1812 to 1816	38,168	2,133	179	5·58	·46	8·39
	1817 to 1821	47,361	3,329	249	7·02	·52	7·47
	1822 to 1826	52,152	3,810	222	7·30	·42	5·82
	1827 to 1831	61,935	3,997	226	6·45	·36	5·65
	1832 to 1836	58,018	3,752	268	6·46	·46	7·14
	1837 to 1841	62,451	3,919	249	6·27	·38	6·35
	1842 to 1846–47	86,553	4,642	361	5·36	·41	7·77
	1847–48 to 1851–2	94,760	4,803	394	5·06	·41	8·20
Bombay ..	1803–4 to 1807–8	3,619	315	13	8·70	·35	4·12
	1808–9 to 1812–13	26,311	1,879	90	7·14	·34	4·78
	1813–14 to 1817–8	30,860	1,947	108	6·30	·35	5·54
	1818–19 to 1822–3	31,593	2,900	171	9·17	·54	5·89
	1823–24 to 1827–8	23,835	2,503	108	10·50	·45	4·31
	1828–29 to 1832–3	28,825	3,148	112	10·92	·38	3·55
	1833–34 to 1837–8	27,575	1,769	104	6·41	·37	5·87
	1838–39 to 1842–3	32,709	2,262	197	6·91	·60	8·70
	1843–44 to 1847–8	44,775	3,224	199	7·20	·44	6·17
	1848–9 to 1852–3	48,578	3,796	137	7·81	·28	3·60
Madras ...	1829 to 1833	54,559	5,986	305	10·97	·55	5·09
	1834 to 1838	48,872	5,265	240	10·77	·40	4·55
	1842 to 1846	61,235	4,470	180	7·29	·29	4·02
	1847 to 1851	48,922	3,336	141	6·81	·28	4·22

3. Influence of Sex, Station of Life, and Childhood on the Prevalence of, and Mortality from, Hepatitis amongst European Troops in India.

Table XLV.—*Exhibiting the Sickness and Mortality from Hepatitis amongst European Soldiers, Officers, Women, and Children, in the Bengal Presidency, during the Four Years ending* 1853–54, *and amongst the same Classes at Seven of the largest Stations in the Madras Presidency, during a Period of Ten Years, from* 1829 *to* 1838, *inclusive.*

Presidency.	Classes.	Strength	Admissions.	Deaths.	Percentage of Admissions to Strength.	Percentage of Deaths to Strength.	Percentage of Deaths to Admissions.
Bengal*	Soldiers......	84,143	4,626	261	5·49	0·31	5·64
	Officers......	2,970	150	3	5·05	0·10	2·00
	Women......	7,941	155	9	1·95	0·11	5·80
	Children ...	9,255	5	...	·05	...	...
Madras†	Soldiers......	75,121	8,111	517	10·8	0·68	6·37
	Officers......	2,319	244	8	10·5	0·34	3·28
	Women......	6,559	287	13	4·3	0·19	4·52
	Children ...	9,877	36	4	0·3	0·04	11·11

* Compiled from Mr. Hugh Macpherson's Table XXIX., "Indian Annals," Vol. IX., page 247.

† Transcribed from Mr. Waring's "Notes on some of the Diseases of India," "Indian Annals," Vol. VI., page 481.

In both presidencies the rule is that hepatitis is much more abundant and mortal amongst males than females; and that it is much more prevalent and fatal amongst the latter than their offspring. The marvellous immunity of children from the disease is not a little remarkable, only 5 admissions being recorded out of a total strength of 9,255 in Bengal, and 36 out of a strength of 9,877 in Madras. Another feature of the above table is that, though the officers are nearly as frequently attacked as the soldiers, the proportion of deaths to strength in the former is three times less in Bengal and twice as small in Madras, and to treated, nearly thrice as low in Bengal and twice as low in Madras, as in the latter class. The women,

too, who share the privations and disadvantages of their husbands (the soldiers), also recover much less frequently, when once seized with hepatic disease, than the officers do. This brief statement of facts affords another powerful illustration of the comparative want of resisting and recuperative powers of privates and their wives, which cannot be attributed to anything but to peculiarities connected with their station of life, and especially to the inferior hygienic and sanitary condition and circumstances under which they are situated. But whenever, in the foregoing pages, I have been compelled, in the conscientious performance of a public duty, to make comparisons of this description, similar unpleasant facts have, with exceptions "like angels' visits, few and far between," been prominently revealed.

4. Influence of Age on the Prevalence of, and Mortality from, Hepatitis amongst European Soldiers in India.

Table XLVI.—*Exhibiting the Influence of Age on the Mortality from Hepatitis amongst the European Soldiers in the Bengal Presidency, during Four Years ending* 1853–54; *and in the Madras Presidency, during Three Years ending* 1850–51.

Bengal.*

Ages.	Strength at each Age.	Deaths from Hepatitis at each Age.	Percentage of Deaths to Strength at each Age.
Under 20 years	7,599	2	·026
20, and under 25......	27,341	56	·204
25, „ 30......	29,158	115	·394
30, „ 35......	14,390	83	·576
35, „ 40... } 40, and upwards ... }	5,596	18	·321
Unknown	59	—	—

* Compiled from Macpherson's Tables XV. and XVI., "Indian Annals," No. IX., pages 224 and 225.

TABLE XLVI.—*continued.*

MADRAS.*

Ages.	Strength at each Age.	Deaths from Hepatitis at each Age.	Percentage of Deaths to Strength at each Age.
Under 20 years	3,864	5	·129
20, and under 25......	8,733	23	·263
25, „ 30......	9,108	23	·252
30, „ 35......	4,626	10	·216
35, „ 40......	1,928	8	·414
40, and upwards	686	—	—
Unknown...............	—	—	—

* Extracted from Mr. Waring's Table XVIII., "Indian Annals," No. VI., page 480.

The minimum of mortality from hepatitis amongst European soldiers in Bengal occurs, therefore, under 20 years of age, and the maximum between 30 and 35. The progressive increase in the mortality with advancing years is herein well marked, rising, as it does, from ·026 per cent. under 20 to ·204 between 20 and 25, ·394 between 25 and 30, and ·576 between 30 and 35, after which there is a decline to ·321 per cent., which, however, is higher than either the first or second period. This decline is not real, but artificial, and is undoubtedly caused by the large amount of invaliding at this period.

In Madras the minimum mortality also occurs under the age of 20, but the maximum mortality takes place between 35 and 40. The quinquennial period embraced between 30 and 35 years of age, which gives the maximum percentage of deaths to

strength in Bengal, furnishes, in the Southern Presidency, even a smaller ratio than either of the two antecedent quinquennial periods, which are not far from being equal. This postponement of the highest ratio of deaths to strength, is in harmony with the revelations embodied in Table I., which shows that the casualties from all diseases are considerably less in this than in either of the other Presidencies; and the reason why they are lower between 30 and 35 than between 20 and 25, and 25 and 30, is not improbably attributable to the modifying influence of invaliding.

5. The Influence of Residence in India upon the Mortality from Hepatitis amongst European Troops.

Table XLVII.*—*Exhibiting the "Period of Residence in India of Casualties from Hepatitis" amongst the European Soldiers in the Bengal Presidency, for Four Years ending* 1853–54.

Periods.	Total Deaths from all Causes.	Deaths from Hepatitis at each Period.	Percentage of Deaths from Hepatitis to Total Deaths at each Age.
Under 1 year.........	404	8	1·98
From 1 to 3 years	1,009	63	6·24
" 3 " 5 "	1,110	55	4·95
" 5 " 7 "	552	45	8·15
" 7 " 10 "	548	57	10·40
" 10 " 14 "	313	32	10·22
" 14 " 20 "	77	2	2·59
Above 20 years......	16	—	—
Born in India.........	7	—	—
Unknown	218	12	—

* Compiled from Mr. H. Macpherson's Table XVII., "Indian Annals," No. IX., page 226.

This table is doubtless open to the same objections as Table XXXV., but, in addition, it is much impaired in value by not affording the strength at each period of residence. It only shows that the proportion of deaths to total deaths from all causes at each period increases with length of service in Bengal. The minimum of deaths to total deaths is under the first year's residence; the maximum between the seventh and tenth, and tenth and fourteenth, after which period the percentage of deaths declines very perceptibly. But after fourteen years' service there are really few soldiers left to yield deaths from hepatitis, or indeed from any cause; hence the low percentage of deaths to total deaths between the fourteenth and twentieth year of residence in India.

TABLE XLVIII.*—*Exhibiting the Influence of Residence in India on the Mortality from Hepatitis amongst the European Troops in the Madras Presidency, for Three Years ending* 1850–51.

Periods.	Strength at each Period.	Deaths from Hepatitis at each Period.	Percentage of Deaths to Strength at each Period.
Under 1 year.........	1,474	1	·067
From 1 to 3 years	5,695	14	·245
„ 3 „ 5 „	5,098	13	·255
„ 5 „ 7 „	4,411	13	·294
„ 7 „ 10 „	7,422	18	·242
„ 10 „ 15 „	3,497	8	·228
„ 15 „ 20 „	818	2	·244
„ 20 „ 30 „	530	—	—

* Compiled from Mr. Waring's Table XVII., "Indian Annals," No. VI., page 478.

The minimum of deaths to strength is, according to this table, under one year's residence; the maximum

takes place between the fifth and seventh, but there is greater uniformity in the ratios of deaths to strength than might have been expected. The same modifying influence which affected the last quinquennial periods in the table of age has doubtless proportionately lessened the mortality during the later periods of residence.

6. The Influence of Season on the Prevalence of, and Mortality resulting from, Hepatitis amongst Europeans in India.

Table XLIX.*—*Exhibiting the Influence of Season on the Production of Hepatitis, and the Mortality resulting therefrom, in the European General Hospital at Bombay, for Fifteen Years, from* 1838 *to* 1853 (*arranged according to Months*).

Months.	Admissions.	Deaths.	Percentage of Deaths to Admissions.
Fifteen Decembers	70	11	15·71
Fifteen Januarys	77	12	15·58
Fifteen Februarys	69	16	23·18
Fifteen March's	64	6	9·37
Fifteen Aprils	66	8	12·12
Fifteen Mays	57	5	8·77
Total	403	58	14·39
Fifteen Junes	55	7	12·72
Fifteen Julys	42	2	4·76
Fifteen Augusts	61	4	6·55
Fifteen Septembers	53	18	33·96
Fifteen Octobers	48	6	12·5
Fifteen Novembers	49	7	14·28
Total	308	44	14·28

* Compiled from Morehead's Tables XXIX., XXX., and XXXI., "Researches on Disease in India," Vol. II., pp. 126 to 128.

Thus, in the first half-yearly period, which is the non-malarious half of the year, there is the largest number of admissions and deaths; but the mortality to treated is almost equal during both divisions of the year. The maximum number of admissions occurred in January (77); the minimum in July (42). The month of maximum mortality to admissions was September, 33·96 per cent. of the patients having succumbed; the month of minimum mortality to admissions was July, 4·76 per cent. of cases having died. Now let us examine the admissions and deaths in each quarter as follows:—

Quarters of the Year.	Admissions.	Deaths.	Percentage of Deaths to Admissions.
1st. Fifteen Quarters, from December to February	216	39	18·05
2nd. Fifteen Quarters, from March to May	187	19	10·16
3rd. Fifteen Quarters, from June to August	151	13	8·22
4th. Fifteen Quarters, from September to November ...	150	31	20·66

The proportion of deaths to treated is highest during the quarter ending 30th of November, amounting to 20·66 per cent. The first half of this quarter is the most malarious period of the Indian year; the second half, from the middle of October to the termination of the quarter, is characterized for its hot days and cold nights, or rather for its wide and suddenly wide thermometric range, which excites to relapses and primary attacks of intermittents or remittents,

whereby the chyloporetic viscera, especially the spleen and liver, become functionally or organically damaged, or both, and the constitution becomes enfeebled.

The proportion of deaths to treated during the quarter ending 28th February amounts to 18·05 per cent. The comparative non-generation of malaria is the characteristic of this period from its beginning to its termination. But the external cold which follows so closely upon the heels of the sickly season tends to develop, in the unprotected, badly clothed, and badly fed, with great intensity, those functional derangements in the abdominal viscera which facilitate the destructive ravages of hepatitis, as also of fevers and dysentery.

The percentage of deaths to treated is much reduced during the quarter ending 31st May, amounting to 10·16. The influence of the transition from winter cold to the mildness of an Indian spring, and further, to the extreme heat of summer, in diminishing the mortality, is here well illustrated. This is *par excellence* the quarter when malaria is almost non-existent. The cutaneous port-holes are now opened, and continue during the day and night to act most energetically. The consequent relief to those organs which have been hardly pressed hitherto, inclusive of the liver, is great and immediate. Hence the remarkable decrease in the proportion of deaths to admissions during this period, as contrasted with either of the two preceding periods which have been considered.

The proportion of deaths to treated during the

quarter ending the 31st August amounts only to 8·22 per cent. The generation of malaria is abundant during this period. But the resulting fevers are mild and tractable. Besides, the viscera of the cachectic have been much relieved from congestion and functional embarrassment during the previous hot months. Hence hepatitis does not prove, comparatively speaking, nearly so fatal to admissions in this as in the other quarters.

SECTION II.—*Statistics of Hepatitis amongst Native Troops.*

1. AVERAGE RATES OF SICKNESS AND MORTALITY FROM HEPATITIS AMONGST NATIVE TROOPS.

TABLE L.—*Exhibiting the Sickness and Mortality from Hepatitis amongst Native Troops, in the Three Presidencies.*

Presidency.	Period.	Strength.	Admissions.	Deaths.	Percentage of Admissions to Strength.	Percentage of Deaths to Strength.	Percentage of Deaths to Admissions.
Bengal	1826 to 1852–53	2,767,347	2,836	214	0·10	·007	7·54
Bombay	1803–4 to 1853–54	1,451,166	2,712	279	0·18	·019	10·28
Madras	1827 to 1851–52*	1,242,694	1,539	166	0·12	·013	10·07

* Exclusive of 1836, 1837, 1838, 1839, 1840, and 1841.

It is interesting, as well as instructive, to compare the results obtained in the above table with those referring to the three Indian Presidencies as set down in Table XLII. By this comparison, the following remarkable facts are revealed, which, more than any

others narrated in this treatise, must convince the veriest sceptic that there is more in *original constitution* than has ever been dreamt of by those philosophers who ascribe all the "ills which" (European) "flesh is heir to" in this country to individual indiscretions and excesses, &c.

1st. That the *proportion of sickness* from hepatitis amongst Europeans, as compared with that of native troops—

Is in Bengal as 60 to 1.
„ Bombay „ 44 „ 1.
„ Madras „ 74 „ 1.

2nd. That the *ratio of mortality to strength* from hepatitis amongst Europeans, as compared with that of native troops—

Is in Bengal as 58 to 1.
„ Bombay „ 21 „ 1.
„ Madras „ 30 „ 1.

3rd. That the *ratio of mortality to admissions* from hepatitis amongst Europeans, as compared with that of native troops—

Is in Bengal as 1 to 1·08.
„ Bombay „ 1 „ 1·9.
„ Madras „ 1 „ 1·1.

This is, then, a forcible illustration of what I feel disposed to call the comparative inadaptibility of the European constitution to a tropical climate, which combines great heat, deluging monsoons, and more than three-fourths of its lands uncultivated or lying waste, with extreme consequent malariousness. Even the wretched inhabitants of our Indian gaols are

infinitely less obnoxious to hepatic disease, and die in much fewer numbers than our European soldiers; as the subjoined figures will show:—

TABLE LI.—*Exhibiting the Sickness and Mortality from Hepatitis amongst the Native Prisoners in the Three Presidencies.*

Presidency.	Period.	Strength.	Admissions.	Deaths.	Percentage of Admissions to Strength.	Percentage of Deaths to Strength.	Percentage of Deaths to Admissions.
Bengal	1833 to 1854	1,053,825	1,467	167	·139	·015	11·38
Bombay ...	1831–2 to 1854	126,587	723	85	·57	·067	11·75
Madras	10 years.	51,775	29	6	·05	·011	20·6

Now when we consider the ill-ventilated and overcrowded state of most of our Indian gaols, and also the defective and insufficiently varied dietary allowance supplied to their inmates; and bear in mind that hepatitis is 43 times more frequent in Bengal, 13 times in Bombay, and 178 times more frequent in Madras amongst our European troops than amongst native prisoners; and that the disease is 27 times more fatal in proportion to given strength in the first, 6 times in the second, and 36 times in the third named presidency amongst the former than the latter race; it is impossible to resist the conclusion that residence in this country is exceedingly prejudicial to the health and lives of our brave countrymen in arms—particularly as contrasted with two classes of the indigenous community.

A large proportion of the hepatitis and the resulting mortality amongst European soldiers, has been ascribed to the excessive imbibition of intoxicating

drinks; but, as Dr. Morehead correctly remarks, "The evidence that intemperance in drinking exercises a particular influence in the production of hepatitis is by no means conclusive. That a considerable proportion of both European and native hospital admissions from hepatitis is of individuals addicted to intemperance, is undoubted; but this fact is equally true of other forms of disease. That the cachexia engendered by spirit-drinking, and the exposure to cold and wet consequent on the insensibility of intoxication, are often operative in inducing disease, is also not to be questioned; but there is nothing in my notes or my impressions to convince me that these are more frequently causes of hepatitis than of dysentery. The specialty of spirit-drinking as a cause of cirrhosis is not called in question, but this is a form of disease common to the spirit-drinker in all countries, and almost exclusively confined to his class. The occurrence of hepatitis, on the other hand, in its severest forms, is not an unusual event in persons of temperate habits—a statement which practitioners in India generally will, I am sure, amply confirm."*

It is probably true that "the great heat of the climate, and thirst and lassitude produced by it," are productive of more intemperance in this country than in England or the colonies. It is doubtful, however, whether the supposed excessive prevalence of this pernicious habit exceeds, in India, that which holds good elsewhere, to such a degree as to account

* "Researches on Disease in India," Vol. II., p. 7.

for the unparalleled abundance of hepatitis amongst European troops in the eastern hemisphere.

There are other fertile causes, viz., malarious cachexia and malarious fevers; exposure to the direct rays of the sun, high temperature, and to great atmospheric changes; overcrowded and badly-lighted barracks; bad food and intemperance in the consumption of it; bad water; want of occupation or sufficient amusements; carelessness in not attending to the prompt removal of costiveness and the correction of biliousness: all of which operate, more or less in combination, with unusual force upon the constitutions of exotic Europeans.

Mr. Waring doubts the influence of high temperature, exposure to the sun, &c., in producing hepatic disease, in the following words:—"It has been repeatedly suggested that a very high range of temperature and exposure to the direct rays of the sun operate in the production of hepatic disease in India, but the very fact of the native convict being so exempt from its invasion tends to disprove any such idea, as perhaps there is no one class of persons in India who are so constantly, day after day, for years together, exposed, whilst working on the roads, to the full influence of the sun's rays. So, likewise, with respect to sudden and great alternations of temperature, another alleged cause of hepatic disease. The Indian convict, perhaps, more than any other class of persons, is exposed to these, often working for some hours in the full heat of the sun, and before his return to gaol deluged with rain, and yet we

see not above 5 in 10,000 are attacked with hepatic disease."

This style of reasoning, unless carefully examined, is likely to mislead. It may be all true enough in regard to the natives generally; but surely we are not to infer from this line of argument, that the European, under whatever circumstances of diet or dress, however much he attempted to imitate the indigenous inhabitants, could undergo, with similar impunity, exposure to the direct rays of the sun, high temperature, and great vicissitudes in this malarious climate. It is well known that he cannot. His thin skull, white skin, and general organization render it impossible for him to undergo much exposure of any kind without augmenting his proclivity to the invasion of hepatic disease.

With reference to the comparative freedom from this class of disease enjoyed by European children (*vide* Table XLV. *et seq.*), the same talented and indefatigable author ascribes it to their resemblance of native children "in three respects: 1st, lightness and unrestrained style of clothing (thus allowing unchecked operation of the cutaneous function); 2ndly, in simplicity of diet; and, 3rdly, in the practice of temperance." But how do we know whether hepatitis is not much more frequent amongst European than native children? And with regard to the small proportion of attacks amongst European women (*vide* the same table), there can, I think, be no doubt that this is chiefly owing to their being much less subjected to the sun's rays, high tempe-

rature in the open air, to sudden alternations of temperature, to the mental and physical wear and tear of active service or on the march, and of course also in part to their greater temperance in drinking and eating.

2. Evidence of the Increase of Hepatitis amongst Native Troops throughout India.

Table LII.—*Exhibiting the Sickness and Mortality from Hepatitis amongst the Native Troops of the three Presidencies (during two distinct Periods).*

Presidency.	Periods.	Strength.	Admissions.	Deaths.	Percentage of Admissions to Strength.	Percentage of Deaths to Strength.	Percentage of Deaths to Admissions.
Bengal ...	1826 to 1838	1,246,776	1,207	88	·096	·007	7·28
	1839 to 1851–52	1,397,428	1,490	116	·106	·008	7·78
Bombay ..	1803–4 to 1827–28	610,441	956	115	·156	·018	12·02
	1828–29 to 1852–3	807,196	1,675	157	·207	·019	9·37
Madras ...	1827 to 1835	597,434	556	65	·093	·010	11·69
	1842 to 1851	645,263	980	101	·151	·015	10·30

The universal augmentation of hepatitis, and a scarcely corresponding increase in the ratio of deaths to strength, are in complete harmony with the results obtained in Table VIII. and with Table XXI. The ratio of deaths to admissions was higher during the second than the first period in Bengal. The converse is manifested very decidedly in Bombay, less so in Madras. The universally higher proportion of deaths to cases treated in natives than Europeans, was illustrated in the sequel to Table L., also in Table LI.; and is equally well shewn in the last column of this table, when the results contained

in it are contrasted with those which embellish the last column of Table XLIII. I think the cause of this increased ratio of deaths to admissions has been fairly pointed out at page 82.

3. The Influence of Season on the Prevalence of, and the Mortality resulting from, Hepatitis amongst Natives of India.

Table LIII.*—*Exhibiting the Influence of Season on the Production of, and Mortality from, Hepatitis, in the Jamsetjee Jeejeebhoy Hospital at Bombay, for Six Years, from* 1848 *to* 1853 *inclusive (arranged according to Months, &c.)*

Months.	Admissions.	Deaths.	Percentage of Deaths to Admissions.
Six Decembers	37	10	27·02
Six Januarys	51	18	35·29
Six Februarys	48	18	37·5
Six March's	33	10	30·30
Six Aprils	36	7	19·44
Six Mays	34	12	35·29
Total	239	75	31·38
Six Junes	29	5	17·24
Six Julys	18	3	16·66
Six Augusts	44	21	47·72
Six Septembers	26	9	34·6
Six Octobers	16	3	18·75
Six Novembers	34	9	26·47
Total	167	50	29·94

* Compiled from Morehead's Tables XXXII. and XXXIII., "Researches on Disease in India," Vol. II., pp. 129 and 130.

From this table we learn that 239 cases were treated during the six half-yearly periods from

December to May, with 75 deaths or 31·38 per cent.; and that only 167 were admitted during the six half-yearly periods from June to November, of which 50 died, or 29·94 per cent. The maximum of aggregate admissions occurred in the six Januarys (51); the minimum in the six Octobers (16); but July only contributed 18 cases. The maximum number of fatal cases was in the six Augusts (21); the minimum in October and July (3 respectively). Considered with regard to quarters of the year, the following results are obtained from the above table:—

Quarters of the Year.	Admissions.	Deaths.	Percentage of Deaths to Admissions.
1st. Six Quarters, from December to February	136	46	33·82
2nd. Six Quarters, from March to May	103	29	28·15
3rd. Six Quarters, from June to August	91	29	31·86
4th. Six Quarters, from September to November	76	21	27·63

Viewed in the aggregate, these results fully uphold the announced law that the admissions with hepatitis and the aggregate mortality are greatest during the coldest quarter of the year, in natives as in Europeans; and that during this season, the proportion of deaths to admissions is highest. With reference to the high ratio of deaths to treated herein shown to hold good amongst natives, this is undoubtedly,

as Morehead suggests, owing to the great reluctance which they manifest in entering our hospitals, until the disease has advanced to its most hopeless stage of inflammation — suppuration. Probably a large proportion of the deaths was from hepatic abscess.

CHAPTER V.

On the Statistics of Cholera amongst European and Native Troops in India.

Section I.—*Statistics of Cholera amongst European Troops.*

1. Average Rates of Sickness and Mortality from Cholera amongst European Troops in India.

Table LIV.—*Exhibiting the Sickness and Mortality from Cholera amongst European Troops serving in the Three Presidencies.*

Presidency.	Periods.	Strength.	Admissions.	Deaths.	Percentage of Admissions to Strength.	Percentage of Deaths to Strength.	Percentage of Deaths to Admissions.
Bengal	1818 to 1853–54	495,760	14,260	4,806	2·87	0·97	33·70
Bombay ...	1818–19 to 1853–54	256,188	6,781	2,206	2·64	0·86	32·53
Madras	1829 to 1851–52*	213,587	4,243	1,478	1·98	0·69	34·83

* Exclusive of 1839, 1840, and 1841.

Cholera, therefore, has been most prevalent in the Bengal Presidency, next in Bombay, and least abundant in Madras. A similar order of things is observed as regards the mortality to strength.

2. Evidence of the Decrease of Cholera, and of a Marked universal Increase in the Mortality amongst European Troops in India.

Table LV.—*Exhibiting the Sickness and Mortality from Cholera amongst European Troops, during Two distinct Periods, in each of the Three Presidencies.*

Presidency.	Periods.	Strength.	Admissions.	Deaths.	Percentage of Admissions to Strength.	Percentage of Deaths to Strength.	Percentage of Deaths to Admissions.
Bengal....	1818 to 1835	198,028	6,447	1,700	3·25	0·85	26·36
	1836 to 1853–54	297,732	7,813	3,106	2·62	1·04	39·75
Bombay .	1818–19 to 1835–36	100,837	2,989	647	2·96	0·64	21·64
	1836–37 to 1853–54	155,351	3,792	1,559	2·44	1·003	41·11
Madras ...	1829 to 1838	103,431	2,833	770	2·7	0·74	27·1
	1842 to 1851–52	110,156	1,410	708	1·2	0·64	50·2

Up to this stage of my statistical inquiries, it has been my pleasing duty to illustrate, by figured statements, the progressive advancement of the medical treatment of fevers, bowel complaints, and hepatitis, so far as that has been revealed by the best of all criterions—viz., the diminution of mortality to admissions. A reverse picture is now presented to view. The results of the above table, though they indicate a decided decrement in the frequency of cholera amongst our European troops, demonstrate a very remarkable augmentation in the ratio of deaths to attacks throughout India; the former being as consolatory as the latter is lamentably unsatisfactory. This increment of deaths in proportion to the number of cases brought under treatment, during the proximate as compared with the more remote periods, appears most conspicuously in the eighth column; but it is still more strikingly manifested, when the

computations contained in it are converted into the following statements. Thus, from 1818 to 1835 inclusive (eighteen years), out of 1,000 attacks, 263 deaths are recorded to have occurred in Bengal; but, from 1836 to 1853-54 (also eighteen years), the mortality, in a similar number of cases, reached 397, which shows an increase of 134 deaths. From 1818-19 to 1835-36 inclusive, the mortality, per 1,000 admissions, amounted to 216 in Bombay; but, during a period of similar duration, from 1836-37 to 1853-54, also inclusive, it rose to 411, which demonstrates an excess of 195 deaths. From 1829 to 1838 inclusive (ten years), 271 deaths occurred, out of every 1,000 admissions, in Madras; but, from 1842 to 1851-52, the average number of deaths amounted to 502, which exhibits the astonishing increase of 231 casualties.

This is surely a most melancholy state of affairs. No *suppressio veri* must, however, be permitted. It is absolutely necessary, for the sake of humanity and the progress of medical science, that our reverses as well as our successes should be faithfully and candidly recorded. For it is only by adopting a course of this kind that vital statistics, when applied to large bodies of men, can become valuable and trustworthy handmaids for the exposition of error and the elucidation of truth.

Actuated by these feelings, I have now to show that the real ratio of mortality during the latest years, to which the published statistics of the three armies carry us, is positively much understated by the proximate periods of the above table. The subjoined table, which serves to point out how steadily

the proportion of deaths to attacks has increased throughout the Indian peninsula, since the great outbreak at Jessore, in Bengal Proper, in the year 1817, establishes the accuracy of this observation:—

TABLE LVI.—*Exhibiting the Sickness and Mortality from Cholera amongst European Troops in the Three Presidencies (arranged in Quinquennial Periods.)*

Presidency.	Periods.	Strength	Admissions.	Deaths.	Percentage of Admissions to Strength.	Percentage of Deaths to Strength.	Percentage of Deaths to Admissions.
Bengal ...	1818 to 1822	47,017	1,018	272	2·16	0·57	26·71
	1823 to 1827	54,168	2,005	625	3·70	1·15	31·17
	1828 to 1832	62,800	2,495	544	3·97	0·86	21·80
	1833 to 1837	57,549	1,561	420	2·71	0·72	26·91
	1838 to 1842	68,238	2,406	855	3·52	1·25	35·53
	1843 to 1846–47	87,086	2,599	1,177	2·98	1·35	45·22
	1848–9 to 1853–4*	118,902	2,176	913	1·83	0·76	41·95
Bombay ..	1818 to 1822-23	31,593	1,284	238	4·06	0·75	18·53
	1823–24 to 1827–8	23,835	885	201	3·71	0·84	22·71
	1828–29 to 1832–3	28,825	510	156	1·76	0·54	30·58
	1833–34 to 1837–8	27,575	408	77	1·47	0·27	18·87
	1838–39 to 1842–3	32,709	1,650	616	5·04	1·88	37·33
	1843–44 to 1847–8	44,775	1,553	706	3·46	1·57	45·46
	1848–9 to 1853–4*	56,876	491	212	0·86	0·37	43·17
Madras ...	1829 to 1833	54,559	2,312	627	4·23	1·14	27·11
	1834 to 1838	48,872	521	143	1·06	0·29	27·63
	1842 to 1846	61,234	1,272	622	2·07	1·01	48·89
	1847 to 1851	48,922	138	86	0·28	0·17	62·31

* Six years.

Thus the mortality to treated in Bengal has risen from 26·71, 31·17, 21·80, and 26·91 per cent., during the first, second, third, and fourth, to 35·53, 45·22, and 41·92 per cent., during the fifth, sixth, and seventh periods; in Bombay, from 18·53, 22·71, 30·58, and 18·87 per cent., during the first, second, third, and fourth, to 37·33, 45·46, and 43·17 per cent., during the fifth, sixth, and seventh periods; and in Madras from 27·11 and 27·63 per cent.,

during the first and second, to 48·89 and 62·31, during the third and fourth periods. It is not improbable that this enormously high ratio of mortality has been continued down, from the latest years to which these figures extend, to the present time. From the absence of data to substantiate this reserved expression of opinion, it must be viewed as merely conjectural, or as a hypothesis naturally issuing out of the melancholy records of the past.

Whether the unfavourable results which have followed the treatment of cholera, during the modern periods of observation, are to be attributed to the gradual relinquishment, to a great extent, of the system which held that the administration of "heroic" doses of calomel was a *sine quâ non* in the therapeutical management of the disease, and to the substitution in its room of alterative, astringent, stimulant, sedative, opiate, or saline methods of treatment; or whether this increasing ratio of mortality to admissions is to be credited to a progressively increasing virulency of the cholera poison—are questions which it is almost impossible to answer in the present state of our knowledge. The comparative helplessness of the physician in the treatment of cholera, since 1838 in Bengal and Bombay, and since 1842 in Madras—this helplessness increasing, too, with each quinquennial period down to the most recent times—is a fact which stands forth in appalling prominence, and demands the most patient and unremitting consideration—etiological, pathological, and therapeutical—of the medical profession throughout India.

In endeavouring to frame a proper estimate of the manifold causes which have operated in augmenting the non-amenability of this dire pestilence to successful treatment, we must not omit to include all those injurious circumstances and conditions, inseparably connected with active service in the field and prolonged residence in an uncongenial climate, which reduce the vital powers of the system below the normal or healthy standard. Nor must we forget to enter into our account the defective sanitary condition of the European soldier, the thorough rectification of which will, I am fully persuaded, go further to diminish the prevalence of, and mortality from, cholera than all the medicines in the Materia Medica put together. That I have not here exaggerated the immense importance, the superlative superiority, of prophylactic over curative science in committing myself to this observation, appears forcibly from—

TABLE LVII.—*Exhibiting the Comparative Sickness and Mortality from Cholera amongst European Soldiers and their Officers, for Eight Years ending* 1853–54, *and amongst Women and Children, for Four Years ending* 1853–54, *in the Bengal Presidency.*

Classes.	Strength.	Admissions.	Deaths.	Percentage of Admissions to Strength.	Percentage of Deaths to Strength.	Percentage of Deaths to Admissions.
Privates	156,139	2,717	1,107	1·74	0·70	40·74
Officers	5,708	42	7	0·73	0·12	16·66
Women	7,941	126	40	1·58	0·50	31·74
Children ...	9,255	111	44	1·19	0·47	39·63

From this table it appears that out of 10,000 privates, 174 are annually on an average attacked with cholera, and 70 of these die; but in the same number of officers, only 73 are attacked with cholera, of whom 12 die; the excess of seizures in the former class being 101, and of deaths 61. Out of 10,000 cholera admissions amongst privates, 4,074 succumb, whilst out of 10,000 in officers, only 1,666 die; the difference against the privates amounting to no less than 2,408!

From such a conclusive statement of facts, I think it is highly probable that the same disadvantages which have been reported to predispose the constitutions of our European soldiers to the excessive invasion of fevers, dysentery, diarrhœa, and hepatitis, exercise a most unhappy influence in increasing their liability to attacks of cholera, and in lessening their recuperative chances when the disease has once supervened. The preventive qualities of the well-ventilated, airy, capacious and comparatively cool bungalow, and the superior hygienic, sanitary and dietetic arrangements of the officer, are here contrasted as favourably with the too often ill-positioned, imperfectly ventilated, and contaminated barrack-rooms and general sanitary condition of the constituents of the ranks, as the palatial residences of Belgravia are with the wretched hovels and polluted cells of St. Giles', Whitechapel, or Bermondsey.

But the difference which exists in the sanitary condition of the soldier as compared with that of his officer may, as has already been pointed out, be, in a

great measure, destroyed. And it is all the more important that this desirable end should be accomplished so far as practicable, because, as has just been fully demonstrated, remedial measures are not nearly so successful at the present day as they were forty-one years ago, when the scourge is said to have originated at Jessore—subsequently to spread its destructive ravages, as if by providential decree, over the four quarters of the globe.

3. The Influence of Age upon the Mortality from Cholera amongst European Soldiers in India.

Table LVIII.*—*Exhibiting the Effect of Age upon the Mortality from Cholera amongst European Troops, in the Bengal Presidency, for the Four Years ending* 1853–54.

Ages.	Strength at each Age.	Total Deaths from all Causes at each Age.	Deaths from Cholera at each Age.	Percentage of Deaths from Cholera to Strength at each Age.	Percentage of Deaths from Cholera to Total Deaths from all Causes at each Age.
Under 20 years .	7,599	152	6	0·07	3·94
20, and under 25	27,341	1,201	153	0·55	12·73
25, " 30	29,158	1,727	241	0·82	13·95
30, " 35	14,390	825	137	0·95	16·84
35, and upwards	5,595	333	50	0·89	15·01
Unknown......	59	16	—	—	—
Total	84,143	4,254	587	0·68	—

* Compiled from Mr. Hugh Macpherson's Tables XV. and XVI., "Indian Annals," Vol. IX., pp. 224 and 225.

The fifth column of this instructive table shows most conclusively that the mortality to strength increases in the direct ratio of age. The steady rise in the percentage of deaths, from 7 in 10,000 men

under the age of 20, to 55 between 20 and 25, to 82 between 25 and 30, to 95 between 30 and 35, and to 89 after the 35th year of age, is emphatically illustrated by these figures. One great defect of this table is the absence of the admissions with cholera at each age; but the means of supplying this omission are not in my possession.

4. The Influence of Residence in India on the Mortality from Cholera amongst European Troops in India.

Table LIX.—*Exhibiting the Effects of Residence in India on the Mortality from Cholera amongst European Troops, in the Bengal Presidency, for Four Years ending* 1853–54.

Ages.	Total Deaths from all Causes at each Period of Residence.	Deaths from Cholera at each Period of Residence.	Percentage of Deaths from Cholera to Total Deaths at each Period of Residence.
Under 1 year.........	404	56	13·86
From 1 to 3 years	1,009	93	9·21
" 3 " 5 "	1,110	270	24·32
" 5 " 7 "	552	61	11·05
" 7 " 10 "	548	47	8·57
" 10 " 14 "	313	31	9·90
" 14 " 20 "	77	4	5·19
Above 20 years	16	—	—
Born in India.........	7	—	—
Unknown	218	25	—
Total	4,254	587	—

This table is only valuable so far as it illustrates the ratio of mortality from cholera to total mortality from all causes at each period of residence. Apart from the objections already made by me to all our tables of residence, as at present constructed, which

apply in full force to this one, the results embodied in it are reduced in value by the absence of the strength and admissions at each period of residence. Without the strength, I am unable to show clearly whether the proportion of deaths to strength increase *pari passu* with length of service; and without the admissions, the effect of length of service on the liability to the pestilence cannot be demonstrated—two points which it is so desirable to have settled.

5. THE INFLUENCE OF SEASON ON THE PREVALENCE OF, AND THE MORTALITY RESULTING FROM, CHOLERA AMONGST EUROPEAN TROOPS IN INDIA.

TABLE LX.—*Exhibiting the Ratio of Admissions and of Deaths to Strength, and of Deaths to Treated, from Cholera, amongst the European Troops stationed at Bombay for an average of Eight Years; Poona, Eight Years; Belgaum, Two Years; Deesa, Eight Years; and Aden, Seven Years; (arranged according to Months.)*

Months.	Ratio of Admissions per 1,000 of Strength.	Ratio of Deaths per 1,000 of Strength.	Percentage of Deaths to Treated during each Half of the Year.
April	8·886	3·701	50·710
May	11·967	5·638	
June	12·415	5·837	
July	8·100	3·849	
August	15·365	5·938	
September	10·244	4·498	
October	2·352	0·347	19·510
November	1·427	0·886	
December	1·444	0·611	
January	0·619	—	
February	1·289	0·290	
March	4·737	1·917	

From these figures, we observe not only the much greater frequency of cholera during the half-year from April to September than during that which extends from October to March, but also the much greater mortality to treated. During the former, the proportion was 50·710; during the latter, only 19·510 per cent. It appears from our table, that cholera commences its ravages in earnest during the most non-malarious months of the year, from March through the intense heats of April, May, and June, and continues to rage, or, at all events, has the power of continuing to prevail, through the malarious months of July, August, and September, with great virulence.

TABLE LXI.—*Showing that out of* 3,676 *Cases of Cholera occurring, during Seventeen Years, from* 1830 *to* 1846, *in the European Troops of the Bombay Army*, 2,918 *took place between April and September, whilst only* 758 *occurred between October and March.*

Months.	Admissions with Cholera.
Seventeen Aprils	329
Seventeen Mays	391
Seventeen Junes	1,117
Seventeen Julys	360
Seventeen Augusts	331
Seventeen Septembers	390
Total	2,918
Seventeen Octobers	96
Seventeen Novembers	191
Seventeen Decembers	114
Seventeen Januarys	118
Seventeen Februarys	61
Seventeen March's	178
Total	758

Thus cholera has been nearly four times as prevalent during the half-yearly period between April and September as between October and March. The subjoined table is fully confirmatory of the two preceding ones :—

TABLE LXII.—*Exhibiting the Mortality to Admissions, &c., from Cholera, for Sixteen Years, from* 1838 *to* 1853, *at the European General Hospital at Bombay* (*arranged according to Months*).

Months.	Admissions.	Deaths.	Percentage of Deaths to Admissions.
Sixteen Aprils	17	15	88·23
Sixteen Mays	72	39	54·16
Sixteen Junes	61	32	52·45
Sixteen Julys	31	19	61·29
Sixteen Augusts	28	14	50·00
Sixteen Septembers	25	12	48·00
Total	234	131	55·98
Sixteen Octobers	11	6	54·54
Sixteen Novembers	21	11	52·38
Sixteen Decembers	40	23	57·5
Sixteen Januarys	12	11	96·66
Sixteen Februarys	8	4	50·00
Sixteen March's	22	10	45·45
Total	114	65	57·01

From these results, it may be broadly stated that more than *twice* as many cholera cases and *twice* as many deaths have occurred in the European General Hospital at Bombay during the half-year embracing the months of April, May, June, July, August, and September, as during that which embraces October,

November, December, January, February, and March; but the percentage of deaths to treated is slightly greater during the latter, being 57·01, whereas it amounts to 55·98 during the former period.

TABLE LXIII.—*Exhibiting the Admissions and Deaths from Cholera in the European General Hospital at Calcutta, for Eleven Years, from* 1842–43 *to* 1852–53 (*arranged according to Months*).

Months.	Admissions.	Deaths.	Percentage of Deaths to Admissions.
Eleven Februarys	64	26	40·62
Eleven March's	137	77	56·20
Eleven Aprils	144	84	58·33
Eleven Mays	57	38	66·66
Eleven Junes	58	41	70·68
Eleven Julys	39	17	43·58
Total..............	499	283	56·71
Eleven Augusts	42	22	52·38
Eleven Septembers	18	9	50·00
Eleven Octobers	50	19	38·00
Eleven Novembers	54	28	51·85
Eleven Decembers	40	16	40·00
Eleven Januarys	38	27	71·05
Total..............	242	121	50·00

For the materials of which this table is composed, I am indebted to the tabular statement prefacing Dr. John Macpherson's "Notes on Cholera," &c., published in the first number of the Indian Annals of Medical Science (October, 1853). The similarity of these results with those which have been already given to indicate the preference of cholera for particular seasons of the year, is here very apparent.

Section II.—*Statistics of Cholera amongst Native Troops.*

1. Average Rates of Sickness and Mortality from Cholera amongst Native Troops.

Table LXIV.—*Exhibiting the Sickness and Mortality from Cholera amongst the Native Troops in the Three Presidencies.*

Presidency.	Periods.	Strength.	Admissions.	Deaths.	Percentage of Admissions to Strength.	Percentage of Deaths to Strength.	Percentage of Deaths to Admissions.
Bengal	1826 to 1851–52	2,644,214	14,052	4,292	0·53	0·16	30·54
Bombay ...	1818–19 to 1853–54	1,126,746	10,920	3,624	0·96	0·32	33·06
Madras	1829 to 1851 *	1,231,666	16,671	7,154	1·35	0·58	42·91

* Exclusive of 1839, 1840, and 1841.

We learn from this table, that cholera has been most abundant and most fatal in the Madras Presidency, and that it has been more prevalent and mortal in Bombay than in Bengal. The prevalence and mortality, therefore, of this pestilence amongst native troops have been in the inverse ratio of the general salubrity of these places. But is not this occurrence owing to some disturbing causes which do not appear in our figures, and which do not apply to European soldiers, who suffer and succumb from cholera in the direct ratio of the general insalubrity of the presidency in which they happen to be stationed? How does the prevalence of, and the mortality resulting from, cholera amongst the sepoys, bear a comparison with those amongst European troops, as set forth in Table LIV.? The subjoined summary

statements furnish a most suggestive answer to this question.

1st. The *proportion of cholera cases to given strength* amongst European troops, as compared with that of native troops,—

Is in	Bengal	as	5·4	to	1.
,,	Bombay	,,	2·7	,,	1.
,,	Madras	,,	1·4	,,	1.

2ndly. The *ratio of mortality to strength* from cholera amongst Europeans, as compared with that of native troops,—

Is in	Bengal	as	6	to	1.
,,	Bombay	,,	2·6	,,	1.
,,	Madras	,,	1·18	,,	1.

3rdly. The *ratio of mortality to admissions* from cholera amongst Europeans, as compared with that of native troops,—

Is in	Bengal	as	1·103	to	1.
,,	Bombay	,,	1	,,	1·016.
,,	Madras	,,	1	,,	1·23.

No words of mine could give additional force to such important revelations as these. And how powerfully they oppose the renewed theory of colonization, and point out the urgent necessity for the immediate introduction of a high standard of sanatory reform, need not, I am sure, be further reiterated.

2. Evidence of Decrease of Cholera and the Mortality resulting from it (not universal, however) amongst Native Troops.

Table LXV.—*Exhibiting the Sickness and Mortality from Cholera amongst Native Troops, during Two distinct Periods, in each of the Three Presidencies.*

Presidency.	Periods.	Strength	Admissions.	Deaths.	Percentage of Admissions to Strength.	Percentage of Deaths to Strength.	Percentage of Deaths to Admissions.
Bengal ...	1826 to 1838	1,246,776	6,942	2,108	0·55	0·16	30·36
	1839 to 1851–52	1,397,438	7,110	2,184	0·50	0·17	30·80
Bombay ..	1818–19 to 1835–36	525,227	7,038	2,154	1·339	0·41	30·60
	1836–37 to 1853–54	601,519	3,882	1,470	0·64	0·24	37·86
Madras ...	1829 to 1838	586,403	5,436	2,413	0·9	0·4	45·1
	1842 to 1851	645,263	11,235	4,741	1·7	0·7	42·1

Amongst Europeans, it was observed from Table LV., that the diminution of cholera was universal and well marked; but in this table, the decreased prevalence is slight in Bengal, well developed in Bombay, whilst in Madras it was nearly twice as common amongst native troops during the second as during the first period of observation. The mortality to strength has diminished as perceptibly in Bombay in consequence of decreased prevalence of the disease, as it has risen in Madras on account of increased prevalence, whilst in Bengal the mortality is about stationary during both periods of review.

The most curious fact revealed in this table, when compared with the one already quoted, is that there is no well-marked increase in the ratio of deaths to treated amongst the natives during the latest periods

of observation, if we except Bombay, where there is manifested an increment of 7·26 per cent.; but, in Madras, there is recorded a decrement of 3 per cent. These inexplicable facts are equally well illustrated in the following table:—

TABLE LXVI.—*Exhibiting the Sickness and Mortality from Cholera amongst the Native Troops of the Bengal and Bombay Presidencies (arranged in Quinquennial Periods).*

Presidency.	Periods.	Strength.	Admissions.	Deaths.	Percentage of Admissions to Strength.	Percentage of Deaths to Strength.	Percentage of Deaths to Admissions.
Bengal ...	1826 to 1830	562,909	3,008	775	0·53	0·13	25·76
	1831 to 1835	450,890	1,994	529	0·44	0·11	26·52
	1836 to 1840	433,043	2,943	1,204	0·67	0·27	40·91
	1841 to 1845	519,654	3,698	1,212	0·71	0·23	32·77
	1846–7 to 1852–3*	800,858	2,998	867	0·37	0·10	28·91
Bombay ..	1818–19 to 1822–3	174,184	4,096	1,149	2·35	0·65	28·05
	1823–4 to 1827–8	171,837	1,587	600	0·92	0·34	37·80
	1828–9 to 1832–3	163,187	836	254	0·51	0·15	30·38
	1833–4 to 1837–8	127,557	1,018	337	0·79	0·26	33·10
	1838–9 to 1842–3	135,702	1,402	513	1·03	0·37	36·58
	1843–4 to 1847–8	200,308	1,216	451	0·60	0·22	37·08
	1848–9 to 1852–3	180,442	765	300	0·42	0·16	39·21

* Seven years.

CHAPTER VI.

On the Statistics of Phthisis amongst European and Native Troops in India.

Section I.—*Statistics of Phthisis amongst European Troops.*

1. Average Rates of Sickness and Mortality from Phthisis amongst European Troops in India.

Table LXVII.—*Exhibiting the Sickness and Mortality from Phthisis amongst European Troops in two Presidencies.*

Presidency.	Periods.	Strength.	Admissions.	Deaths.	Percentage of Admissions to Strength.	Percentage of Deaths to Strength.	Percentage of Deaths to Admissions.
Bengal	1812 to 1853–4	543,768	11,239	1,173	2·06	0·22	10·43
Bombay ...	1803–4 to 1853–4	306,978	6,444	474	2·99	0·12	7·37

It appears from this table, that phthisis has been less abundant in Bengal than in Bombay, but that the mortality to strength has been much higher in the former than the latter, and this is owing to a marked difference in the proportion of deaths to treated.

The mortality to treated, in both presidencies,

is much smaller than, judging from European experience, one would have expected. It is highly probable that this is to be accounted for in great part by a preponderating majority of consumptive patients being discharged from hospital very much improved in their general health, to become afterwards the victims of dysentery, diarrhœa, &c. Add to this source of fallacy, the not improbable fact that cases of phthisis are, perhaps, in a large majority of instances, second, third, or even fourth readmissions, and then we can understand how it happens that the mortality to admissions stands so low in our table.

2. Evidence of the Decreased Prevalence of, and Mortality from, Phthisis amongst European Troops in India.

Table LXVIII. — *Exhibiting the Sickness and Mortality from Phthisis amongst European Troops, during Two distinct Periods, in two Presidencies.*

Presidency.	Periods.	Strength.	Admissions.	Deaths.	Percentage of Admissions to Strength.	Percentage of Deaths to Strength.	Percentage of Deaths to Admissions.
Bengal ...	1812 to 1831	199,616	7,771	530	3·89	0·26	6·83
	1832 to 1851–52	301,782	3,270	558	1·08	0·18	17·06
Bombay .	1803–4 to 1827–28	116,218	3,296	194	2·83	0·16	6·88
	1828–29 to 1852–53	182,462	3,109	265	1·15	0·14	8·52

The decreased frequency of consumption, during the second periods of observation, is herein very well shown. The decrease in the mortality to strength is also perceptible in both presidencies, but more markedly in Bengal than Bombay. The rise in the

ratio of deaths to admissions will also be noticed. It has risen from 6·83 during the twenty years extending from 1812 to 1831, to 17·06 during the next twenty years, reaching from 1832 to 1851, in Bengal; and from 6·88, during the remote period, to 8·52, during the recent one in the Western Presidency.

Is the extraordinary diminution of consumption, as depicted in our table, *real*, or only the natural result of a more perfect system of diagnosis, whereby, during the later periods of observation, chest diseases were more accurately classified under their specific nosological heads? Is it not principally owing to the more universal use of auscultation, &c., by which means phthisis has of late become more and more completely isolated from bronchitis, pleuritis, pneumonia, &c.? And does not the comparatively greater freedom from the *amalgamation process* in the recent periods of observation, as compared with the remote periods, sufficiently explain the augmentation in the ratio of deaths to treated, as that is illustrated in the table undergoing examination?

Section II.—*Statistics of Phthisis amongst Native Troops.*

1. Average Rates of Sickness and Mortality from Phthisis amongst Native Soldiers.

Table LXIX.—*Exhibiting the Sickness and Mortality from Phthisis amongst Native Troops in Two Presidencies.*

Presidency.	Periods.	Strength.	Admissions.	Deaths.	Percentage of Admissions to Strength.	Percentage of Deaths to Strength.	Percentage of Deaths to Admissions.
Bengal	1826 to 1852–53	2,767,347	5,543	722	0·20	0·02	13·02
Bombay ...	1803–4 to 1853–54	1,451,166	3,866	549	0·26	0·03	14·20

As with respect to European troops, phthisis appears to be less common amongst the native troops in Bengal than in Bombay, but there is little difference in the ratios of mortality. It may not be uninteresting to compare, according to the plan universally adopted in this treatise, the prevalence of, and mortality from, phthisis amongst European troops, with its prevalence and mortality amongst native troops. Thus, by comparing the results obtained in this table with No. LXVII., it appears—1st. That the *proportion of phthisis cases to given strength* amongst European troops, as compared with that of native troops,—

Is in Bengal as 10·33 to 1.
„ Bombay „ 11·50 „ 1.

2ndly. That the *mortality to strength from Phthisis*

amongst Europeans, as compared with that of native troops,—

Is in Bengal as 11 to 1.
„ Bombay „ 4 „ 1.

3rdly. That the *mortality to admissions from phthisis* amongst Europeans, as compared with that of native troops,—

Is in Bengal as 1 to 1·24.
„ Bombay „ 1 „ 1·92.

Even the wretched denizens of our Indian jails enjoy a comparatively greater immunity from phthisis, and die in fewer numbers in proportion to given equals of strength, than do our European soldiers, as the following table and sequel amply demonstrate:—

Table LXX. — *Exhibiting the Sickness and Deaths from Phthisis amongst Native Prisoners in India.*

Presidency.	Periods.	Strength.	Admissions.	Deaths.	Percentage of Admissions to Strength.	Percentage of Deaths to Strength.	Percentage of Deaths to Admissions.
Bengal	1833 to 1853–54	1,053,825	3,104	1,446	0·29	0·13	46·58
Bombay ...	1831–2 to 1853–4	126,587	572	89	0·45	0·07	15·55

By a comparison of these results with those arrived at in Table LXVII., it follows:—

1st. That the *proportion of phthisis cases to given strength* amongst our European troops, as compared with that of native prisoners,—

Is in Bengal as 7 to 1.
„ Bombay „ 6·50 „ 1.

2ndly. That the *mortality to strength* from phthisis

amongst European troops, as compared with that of native prisoners,—

Is in Bengal as 1·75 to 1.
,, Bombay ,, 1·75 ,, 1.

3rdly. That the *mortality to admissions* from phthisis amongst European soldiers, as compared with that of native prisoners,—

Is in Bengal as 1 to 4·45.
,, Bombay ,, 1 ,, 2·1.

Now, if it be borne in mind that the ill-ventilated and over-crowded state of most Indian jails is peculiarly favourable to the origination or elicitation of tubercular or consumptive disease—a fact which is fully corroborated by the increased prevalence of, and mortality from, phthisis in native prisoners, as compared with sepoys—any unbiassed person will, I feel assured, after a careful perusal of these comparative statements, readily acknowledge that, though phthisis may not be uncommon amongst the indigenous population, it is much less abundant amongst them than in our imported European soldiers. I think with Dr. T. W. Wilson,* one of the most accomplished practical physicians I have had the good fortune to meet and converse with in this country, that the registers of the native army very probably do not give a correct idea regarding the abundance of tuberculosis amongst its members, and that a goodly proportion of consumptive patients has been, through errors or the absence of diagnosis, grouped under the heads cachexia and bowel com-

* On "Tubercular Disease in the East." By T. W. Wilson, Esq., M.D. "Indian Annals," No. III., p. 182 to 198.

plaint. But whilst committing myself to this expression of opinion, I am far from believing that our returns are so fallacious as regards the frequency of, though they may be so with respect to the mortality from, tubercular disease in natives, as might have been, at first sight, expected. For we must not omit to recognise the possibility—nay, the great probability of the existence of imperfect diagnosis in adding to the recorded number of phthisical patients ; viz., by the admixture of bronchitis, pleuritis, or simple pneumonia with phthisis—a practice which would unnaturally swell the aggregate of phthisical admissions as entered in our hospital returns, at the same time that it would give a lower ratio of deaths to treated than would otherwise have been demonstrated had pure cases of consumption only been inserted.

2. The Influence of Season on the Mortality from Phthisis amongst Natives of India.

Table LXXI.—*Exhibiting the Sickness and Mortality from Phthisis in the Jamsetjee Jejeebhoy Hospital at Bombay for Six Years ending* 1853 (*arranged according to months*).

Months.	Admissions.	Deaths.	Percentage of Deaths to Admissions.
Six Decembers.........	33	20	60·6
Six Januarys	34	23	67·7
Six Februarys	34	18	52·9
Six March's	41	18	43·9
Six Aprils	40	21	52·5
Six Mays	36	23	63·9
Total..............	218	123	56·42

TABLE LXXI.—*continued.*

Months.	Admissions.	Deaths.	Percentage of Deaths to Admissions.
Six Junes	32	22	68·7
Six Julys	39	26	66·6
Six Augusts	29	29	100·0
Six Septembers	53	19	35·9
Six Octobers	33	31	93·7
Six Novembers	41	18	43·9
Total	227	145	63·87

Thus the admissions and deaths, as also the proportion of deaths to admissions, have been highest during the half year from June to November. The month of maximum admissions was September; of minimum admissions, December and October. The maximum mortality was during the six Augusts; the six March's and six Novembers giving the minimum.

CHAPTER VII.

On the Statistics of "Other Diseases" amongst European and Native Troops in India.

1. Average Rates of Sickness and Mortality from "Other Diseases" amongst European Troops in India.

Table LXXII.—*Exhibiting the Sickness and Mortality from "Other Diseases" amongst European Troops in India.*

Presidency.	Periods.	Strength.	Admissions.	Deaths.	Percentage of Admissions to Strength.	Percentage of Deaths to Strength.	Percentage of Deaths to Admissions.
Bengal	1812 to 1853-4	543,768	510,956	7,665	93·98	1·49	1·50
Bombay ...	1803-4 to 1853-4	306,978	316,125	3,524	102·97	1·14	1·11

This group, which is composed of more than *one hundred and twenty* individual diseases, is chiefly important on account of the inefficiency and enervating influence produced by the large number of its constituents on the European soldiers of the Indian army. But it is also important as causing almost 1½ per cent. of the mortality in Bengal, and 1·14 per cent. of the mortality in the Bombay Presidency.

2. Average Rates of Sickness and Mortality from "Other Diseases" amongst Native Troops.

Table LXXIII.—*Exhibiting the Sickness and Mortality from "Other Diseases" amongst Native Troops.*

Presidency.	Periods.	Strength.	Admissions.	Deaths.	Percentage of Admissions to Strength.	Percentage of Deaths to Strength.	Percentage of Deaths to Admissions.
Bengal	1826 to 1852-3	2,767,347	928,322	13,518	33·54	0·489	1·45
Bombay ...	1803-4 to 1853-4	1,451,166	584,097	7,360	40·25	0·50	1·26

This group is, therefore, also highly important in regard to the sickness and mortality resulting from it amongst the sepoys. But in keeping with the whole tenor of these statistical researches, *ab initio ad terminationem*, the aggregate sickness and mortality are very much less in natives than foreigners, which is fully demonstrated as follows:—

1st. The proportion of "other diseases" to given strength amongst Europeans as compared with that of native troops—

Is in Bengal as 2·8 to 1.
" Bombay " 2·5 " 1.

2ndly. The mortality to strength from "other diseases" amongst Europeans as compared with that of native troops—

Is in Bengal as 3·1 to 1.
" Bombay " 2·2 " 1.

Having now completed the task which I originally sketched out for myself, immediately after the Bengal sepoys had thrown off their allegiance to the great East India Company, I have finally to state, that, though many grave and gloomy facts have been revealed in their true colours in the foregoing pages, there is reason to believe that future chroniclers of the Vital Medical Statistics of the Anglo-Indian armies will have it in their power to present to the world a brighter and more satisfactory picture than it has been my lot to portray,—if due attention be paid to the common-sense dictates of sanatory science.

APPENDIX.

THE following "*Suggestions for the Investigation of Mountain Climates in the East Indies,*" which were published by Mr. James Ranald Martin in the "Lancet" of the 13th Feb., deserve the most careful attention of the medical officers of the Indian service, and are therefore quoted *in extenso*:—

1st. The medical history of mountain climates, noting the physical character and state of health of the inhabitants at different elevations.

2nd. Climates of elevated valleys as compared to those of the plains.

3rd. Climates at different degrees of mountain elevation.

4th. Differences produced by different aspects—N., S., E., W.

5th. Differences produced by disposition of surrounding hills.

6th. Climates of solitary mountains.

7th. Meteorology of mountain climates:—

a. Temperature of mountain climates.
b. Range of diurnal variations at different elevations.
c. Range of annual variations at different elevations.
d. Atmospheric pressure at different elevations.
e. Humidity at different elevations.
f. Rain and snow at different elevations.
g. State of the sky at different elevations—electricity.
h. Relative dryness of the air of mountains as compared to plains.

i. Rate of evaporation at different heights.

j. Frequency and intensity of aërial currents at different heights.

k. Power of the solar rays at different heights.

l. Relative moisture of the soil at high and low elevations.

m. Relative amount of dew at high and low elevations.

n. Relative frequency of atmospheric renewal at high and low elevations.

8th. Physiological influences of mountain climates of the medium elevations of from 2,000 to 4,000 feet:—

a. On the nervous centres.

b. On respiration.

c. On circulation.

d. On secretion.

e. On digestion.

f. On locomotion.

g. Summary of the influence of diminished pressure.

h. Summary of the influence of diminished oxygen.

9th. Physiological influences of mountain climates of elevation from 4,000 to 8,000 feet:—

a. On the nervous centres.

b. On respiration.

c. On circulation.

d. On secretion.

e. On digestion.

f. On locomotion.

g. Summary of the influences of diminished pressure.

h. Summary of the influences of diminished oxygen.

10th. Pathological influences of mountain climates at medium elevations of from 2,000 to 4,000 feet:—

a. Diseases of the nervous centres.

b. Diseases of the thoracic viscera.

c. Diseases of the abdominal viscera.

d. Rheumatism, fevers, and their types.

e. Ophthalmia.

f. Other diseases.

11th. Pathological influences of mountain climates of elevations of from 4,000 to 8,000 feet:—

a. Diseases of the nervous centres.
b. Diseases of the thoracic cavity.
c. Diseases of the abdominal viscera.
d. Rheumatism, fevers, and their types.
e. Ophthalmia.
f. Other diseases.

12th. The habitations best suited to mountain climates.

13th. The best modes of water supply on elevated ranges.

14th. The kinds of diet suited to various altitudes.

15th. The kinds of clothing suited to elevated regions.

16th. Capabilities of elevated ranges for the cultivation of vegetables and fruits.

17th. Facilities for cultivating trees, and the influence of arboriculture on mountain climates.

18th. Facilities for exercising-grounds.

Sickness and Mortality from Six principal Diseases and "Other Diseases" amongst European Troops in the East Indies.

Table A.—*Showing the Sickness and Mortality from Fevers, Dysentery, Diarrhœa, Cholera, Hepatitis, Phthisis, and "Other Diseases" (in Bengal and Bombay) amongst the European Troops in the three Presidencies.*

Diseases.	Bengal—42 Years.					Bombay—51 Years.					Madras—10 Years.				
	Aggregate Strength—543,768.					Aggregate Strength—306,978.					Aggregate Strength—110,156.				
	Admissions.	Deaths.	Percentage of Sick to Strength.	Percentage of Deaths to Strength.	Percentage of Deaths to Treated.	Admissions.	Deaths.	Percentage of Sick to Strength.	Percentage of Deaths to Strength.	Percentage of Deaths to Treated.	Admissions.	Deaths.	Percentage of Sick to Strength.	Percentage of Deaths to Strength.	Percentage of Deaths to Treated.
Fevers	394,983	10,837	72·64	1·99	2·74	190,136	4,221	61·93	1·37	2·22	30,919	310	28·0	0·2	1·0
Dysentery	100,542	8,873	18·48	1·64	8·82	51,010	4,705	16·61	1·53	9·22	13,151	922	11·9	0·8	7·0
Diarrhœa	64,823	2,141	11·92	0·39	3·30	32,290	551	10·51	0·17	1·77	11,389	194	10·3	0·1	1·7
Cholera............	14,260	4,806	2·62	0·89	33·70	7,017	2,216	2·28	0·72	31·58	1,410	708	1·2	0·6	50·2
Hepatitis	32,780	2,269	6·02	0·41	6·92	24,347	1,263	7·83	0·41	5·18	7,806	324	7·0	0·2	4·1
Phthisis	11,239	1,173	2·06	0·22	10·43	6,444	474	2·99	0·12	7·37	—	—	—	—	—
Other Diseases .	510,956	7,665	93·98	1·49	1·50	316,125	3,524	102·97	1·14	1·11	—	—	—	—	—
Total	1,129,583	37,764	207·73	6·94	3·34	627,369	16,954	204·36	5·52	2·70	—	—	—	—	—

SICKNESS AND MORTALITY FROM SIX PRINCIPAL DISEASES AND "OTHER DISEASES" AMONGST NATIVE TROOPS IN INDIA.

TABLE B.—*Showing the Sickness and Mortality from Fevers, Dysentery, Diarrhœa, Cholera, Hepatitis, Phthisis, and "Other Diseases," amongst the Native Troops in the three Presidencies.*

Diseases.	BENGAL—27 Years. Aggregate Strength—2,767,347.					BOMBAY—51 Years. Aggregate Strength—1,451,166.					MADRAS—10 Years. Aggregate Strength—645,263.				
	Admissions.	Deaths.	Percentage of Admissions to Strength.	Percentage of Deaths to Strength.	Percentage of Deaths to Treated.	Admissions.	Deaths.	Percentage of Admissions to Strength.	Percentage of Deaths to Strength.	Percentage of Deaths to Treated.	Admissions.	Deaths.	Percentage of Admissions to Strength.	Percentage of Deaths to Strength.	Percentage of Deaths to Treated.
Fevers	1,342,016	14,603	48·50	0·528	1·08	597,891	8,286	41·20	0·57	1·38	184,125	1,861	28·5	0·2	1·0
Dysentery	109,098	2,709	3·94	0·099	2·48	59,890	1,975	4·12	0·13	3·29	8,348	553	1·2	0·08	6·6
Diarrhœa	62,152	2,098	2·25	0·077	3·37	35,486	873	3·82	0·60	2·46	15,678	807	2·4	0·1	5·1
Cholera............	14,641	4,587	0·53	0·162	31·33	11,097	3,638	0·76	0·25	32·78	11,235	4,741	1·7	0·7	42·7
Hepatitis	2,836	214	0·10	0·007	7·54	2,712	279	0·18	0·019	10·28	980	101	0·1	0·01	10·3
Phthisis	5,543	722	0·20	0·027	13·02	3,866	549	0·26	0·03	14·22	—	—	—	—	—
Other Diseases..	928,322	13,518	33·54	0·489	1·45	584,097	7,360	40·25	0·50	1·26	—	—	—	—	—
Total	2,464,608	38,451	89·06	1·390	1·56	1,295,039	22,960	89·24	1·58	1·771	—	—	—	—	—

Sickness and Mortality amongst Indian Prisoners.

Table C.—*Exhibiting the Sickness and Mortality from Six Chief Diseases, and "All Diseases," amongst the Prisoners of the Bengal Presidency, for Twenty-one Years, from* 1834 *to* 1854; *and in the Bombay Presidency for Twenty-three Years, from* 1831–32 *to* 1854.

Bengal—Strength, 1,053,825.

Diseases.	Admissions.	Deaths.	Percentage of Admissions to Strength.	Percentage of Deaths to Strength.	Percentage of Deaths to Admissions.
Fevers	506,846	11,539	48·09	1·09	2·27
Dysentery	90,099	15,370	8·54	1·45	17·05
Diarrhœa	89,137	7,430	8·45	0·70	8·33
Cholera	21,663	9,236	2·05	0·87	42·63
Hepatitis	1,467	167	0·139	0·015	11·38
Phthisis	3,104	1,446	0·29	0·13	46·58
Other Diseases	589,933	31,216	55·98	2·86	5·29

Bombay—Strength, 126,587.

Diseases.	Admissions.	Deaths.	Percentage of Admissions to Strength.	Percentage of Deaths to Strength.	Percentage of Deaths to Admissions.
Fevers	54,461	1,664	43·03	1·31	3·05
Dysentery	10,367	936	8·18	0·73	9·02
Diarrhœa	10,641	964	8·40	0·78	9·05
Cholera	3,869	1,384	3·05	1·09	35·77
Hepatitis	723	85	0·57	0·067	11·75
Phthisis	572	89	0·45	0·07	15·55
Other Diseases	81,626	2,662	66·06	2·10	3·27

Relative Salubrity of Different Stations in the Bombay Presidency for Native Troops.

Table D.*—*Exhibiting the Sickness and Mortality from "All Diseases" amongst the Native Troops of the Bombay Presidency at forty-six different Stations (arranged according to salubrity).*

Stations.	Period of Observation.	Strength.	Admissions.	Deaths.	Percentage of Sick to Strength.	Percentage of Deaths to Strength.
	Years.					
Wagotun	2...1850 to 1851...	63	42	...	66·66	0·00
Mahableshwur.	12...1840 to 1851...	1,059	834	1	78·75	0·09
Asseerghur	10...1842 to 1851...	9,274	6,169	40	66·51	0·43
Rutnagherry ...	6 { 1844 to 1846 and 1849 to 1851 }	2,260	1,748	11	77·34	0·48
Dhurumgaum ..	12...1840 to 1851...	14,862	7,533	78	50·67	0·52
Sholapore	5...1847 to 1851...	5,729	4,734	30	82·63	0·52
Dhoolia	12...1840 to 1851...	5,651	2,206	34	39·03	0·60
Seroor	12...1840 to 1851...	3,204	2,494	20	77·84	0·62
Khanghur	5...1847 to 1851...	6,379	7,007	41	109·84	0·64
Neemuch	2...1850 to 1851...	2,676	2,582	19	96·48	0·71
Kansba	4...1840 to 1843...	543	541	4	99·63	0·73
Sattarah	12...1840 to 1851...	10,396	8,923	78	85·83	0·74
Kolapore.........	7 { 1844 to 1845 and 1847 to 1851 }	8,852	7,294	67	83·39	0·75
Tannah	12...1840 to 1851...	5,588	5,406	43	96·74	0·76
Rajcote	12...1840 to 1851...	15,233	18,901	119	124·07	0·78
Malligaum	11 { 1840 to 1844 and 1846 to 1851 }	13,485	7,080	105	52·52	0·78
Hursole	7 { 1840 to 1845 and 1851 }	1,769	2,251	14	127·24	0·79
Larkhana	8...1844 to 1851...	6,065	7,025	50	115·82	0·82
Belgaum.........	6...1846 to 1851...	9,132	5,862	88	64·19	0·96
Mhow	7...1840 to 1846...	22,069	19,219	219	87·08	0·99
Poona	12...1840 to 1851...	32,200	28,993	323	90·04	1·00
Kanak	3...1840 to 1842...	1,487	1,347	15	90·58	1·00
Deesa	12...1840 to 1851...	14,230	14,107	144	99·13	1·01
Nusseerabad ...	2...1850 to 1851...	3,821	4,934	39	129·12	1·02
Vingorla.........	6 { 1844 to 1846 and 1849 to 1851 }	2,896	1,703	31	58·80	1·07
Nassick	6 { 1845 to 1846 and 1848 to 1851 }	2,626	1,887	29	71·85	1·10
Bhooj	12...1840 to 1851...	11,297	13,433	129	118·90	1·14
Punjaub Army.	3...1847 to 1850...	14,777	15,916	169	107·70	1·14
Sukkur	6...1846 to 1851...	9,053	11,668	104	128·77	1·14

* Bombay Med. and Phys. Society's Transactions, No. II., New Series, p. 264 (compiled).

RELATIVE SALUBRITY OF DIFFERENT STATIONS, &c.—*continued.*

Stations.	Period of Observation.	Strength.	Admissions.	Deaths.	Percentage of Sick to Strength.	Percentage of Deaths to Strength.
	Years.					
Ahmednuggur .	12...1840 to 1851...	12,600	14,413	145	114·38	1·15
Shikarpoor......	6...1846 to 1851...	11,091	14,284	134	128·78	1·20
Surat	12...1840 to 1851...	9,726	11,014	133	113·24	1·35
Dapoolee.........	12...1840 to 1851...	7,462	3,573	109	47·88	1·46
Baroda	12...1840 to 1851...	20,679	30,503	305	147·50	1·47
Ahmedabad ...	12...1840 to 1851...	26,260	31,513	393	120·00	1·49
Jerruck	6...1846 to 1851...	6.188	5.680	100	91·79	1·61
Kaira	10...1840 to 1849...	8.281	6,743	134	81·42	1·61
Broach	12...1840 to 1851...	4,297	5,124	75	119·24	1·74
Balmeer	5...1840 to 1844...	1,918	1,302	36	67·88	1·87
Porebunder ...	7...1840 to 1845...	770	643	16	83·50	2·07
Aden	5...1840 to 1844...	5,704	4,942	126	86·64	2·20
Bhewndy	12...1840 to 1851...	3,965	2,008	89	50·64	2·24
Hydrabad	9...1843 to 1851...	34,707	53,815	810	155·05	2·33
Bombay	12...1840 to 1851...	32,805	39,166	809	119·38	2·46
Kurrachee	12...1840 to 1851...	40,063	40,371	1,074	100·76	2·68
Indus Army ...	4...1840 to 1843...	21,881	39,106	794	133·01	3·62

INFLUENCE OF INTEMPERANCE ON SICKNESS AND MORTALITY AMONGST EUROPEANS IN INDIA.

TABLE E.—*Exhibiting the Sickness and Mortality, from all Diseases, amongst Three Classes of European Troops in the Madras Presidency, during One Year*—1849.

Classes.	Strength.	Total Admissions.	Total Deaths.	Percentage of Admissions to Strength.	Percentage of Deaths to Strength.	Percentage of Deaths to Admissions.
Teetotallers	450	589	5	130·88	1·11	0·84
Temperate	4,318	6,114	100	141·59	2·31	1·63
Intemperate	940	2,024	42	214·86	4·45	2·07

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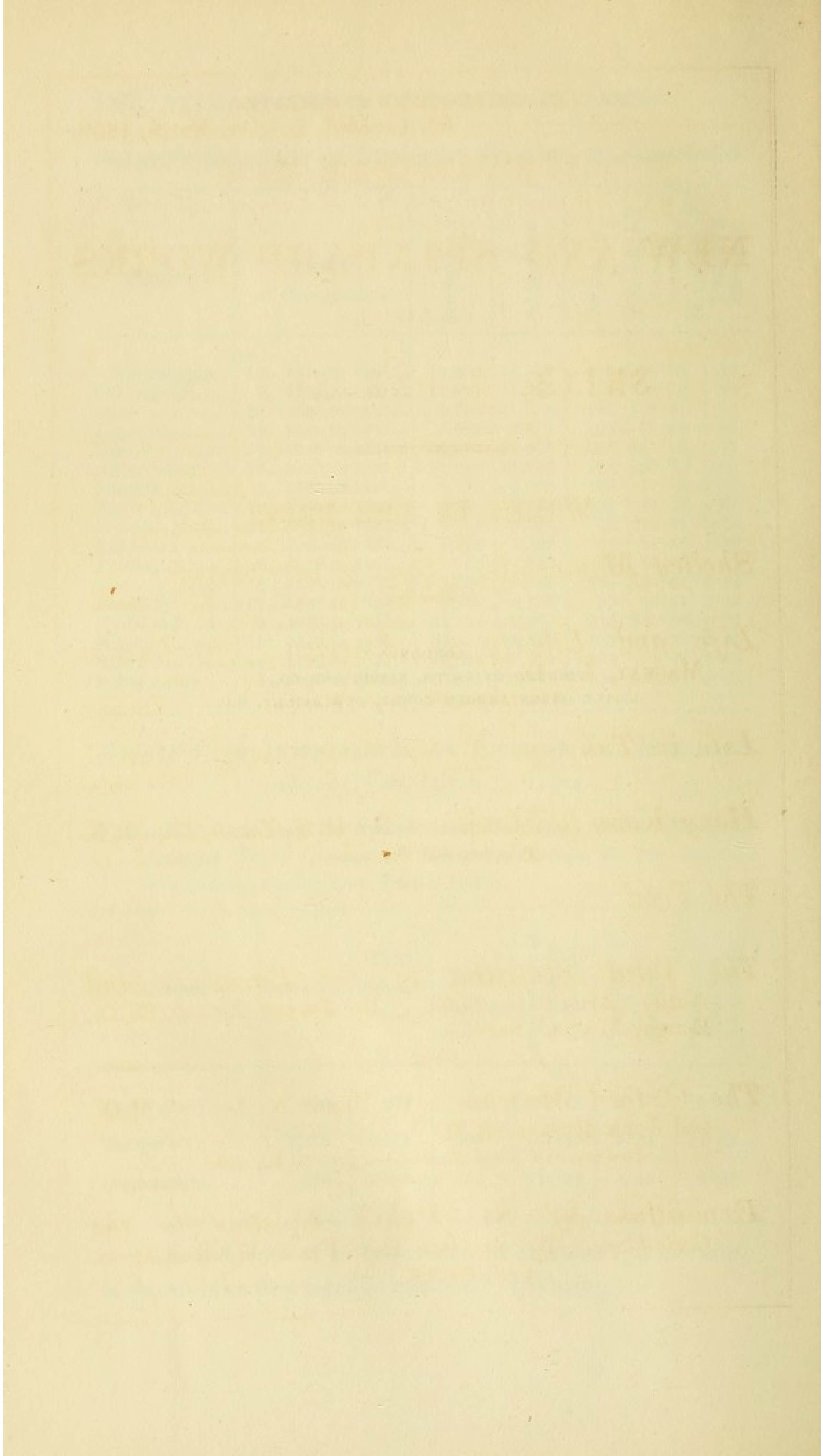

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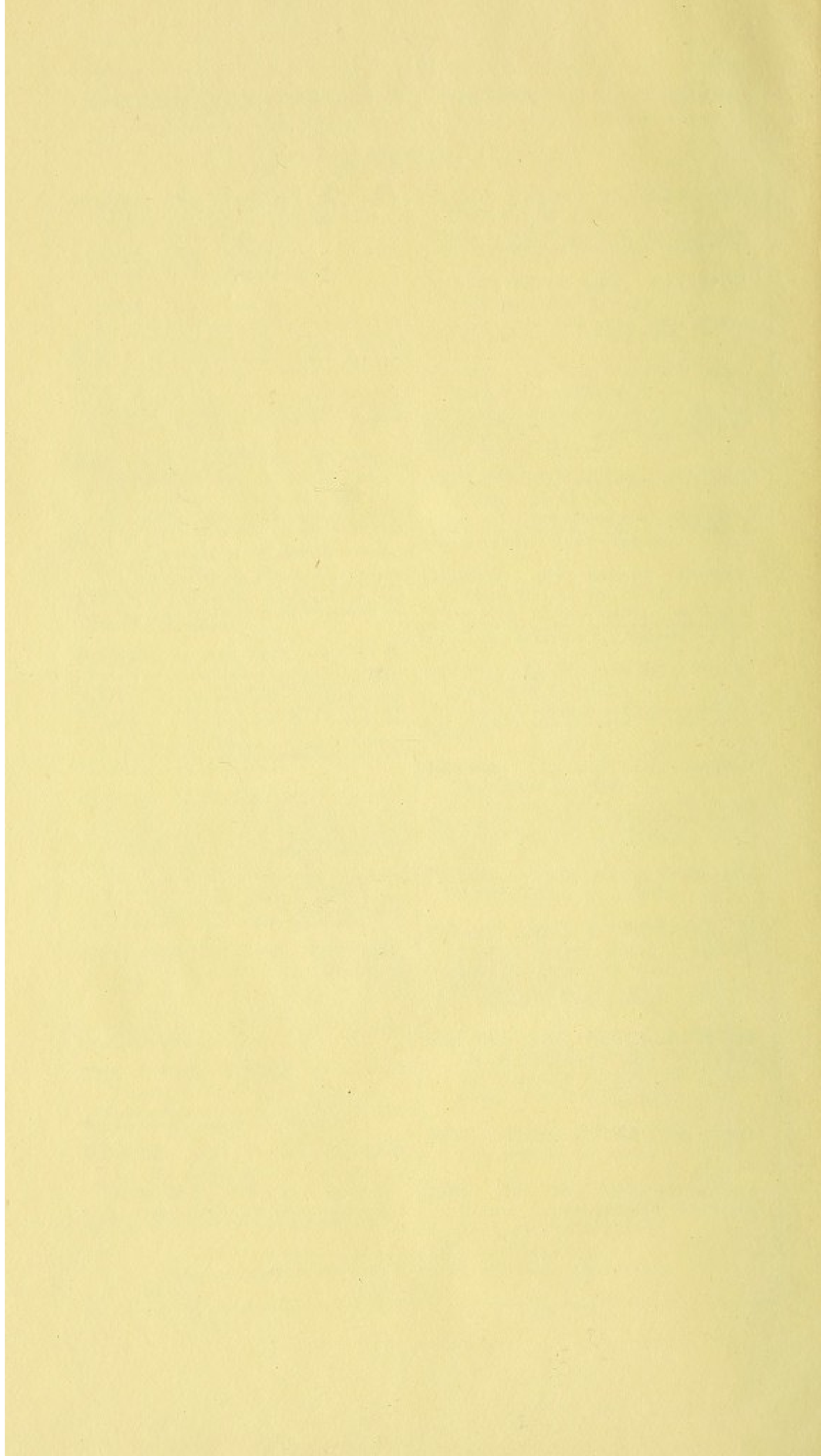

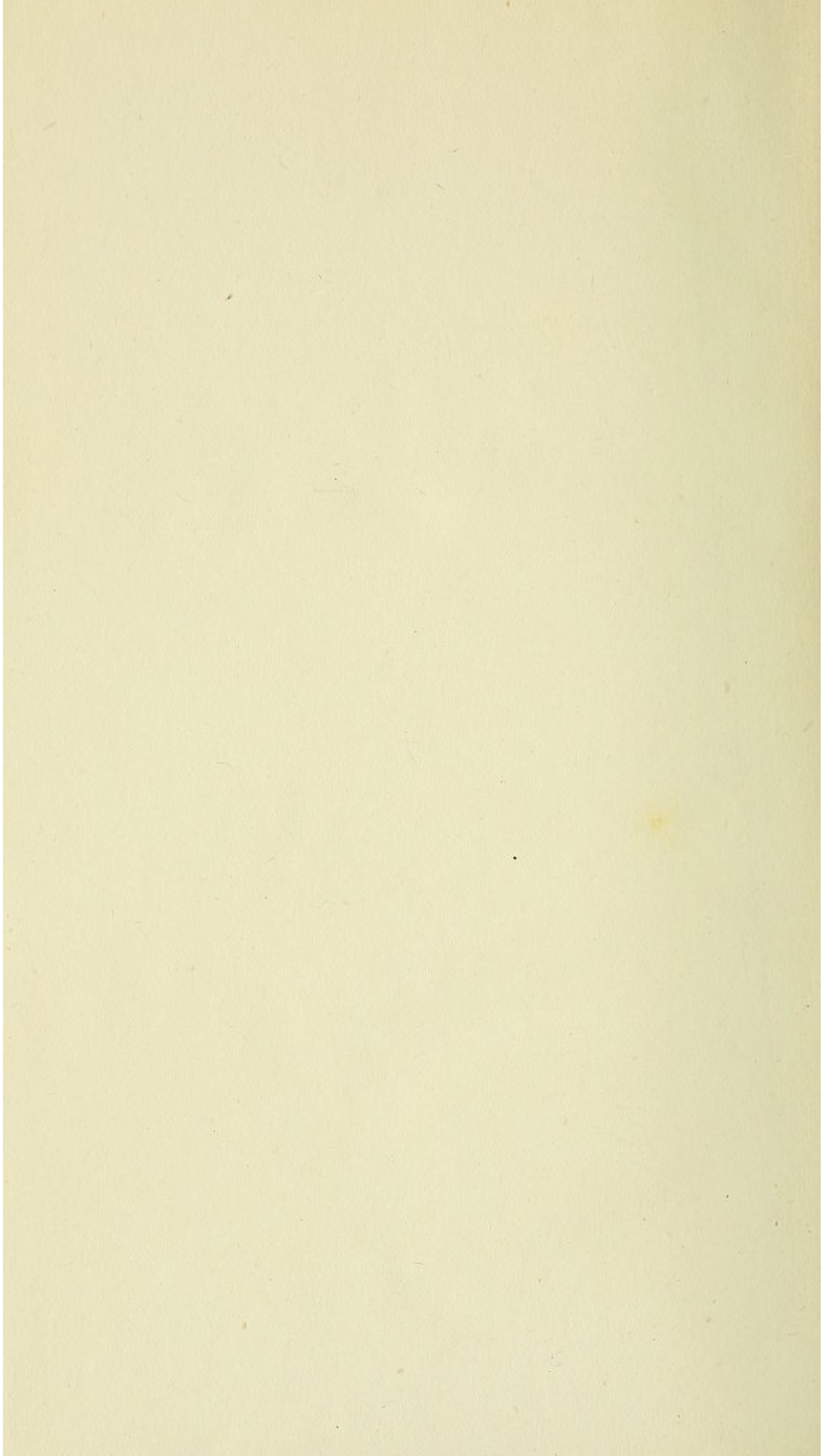

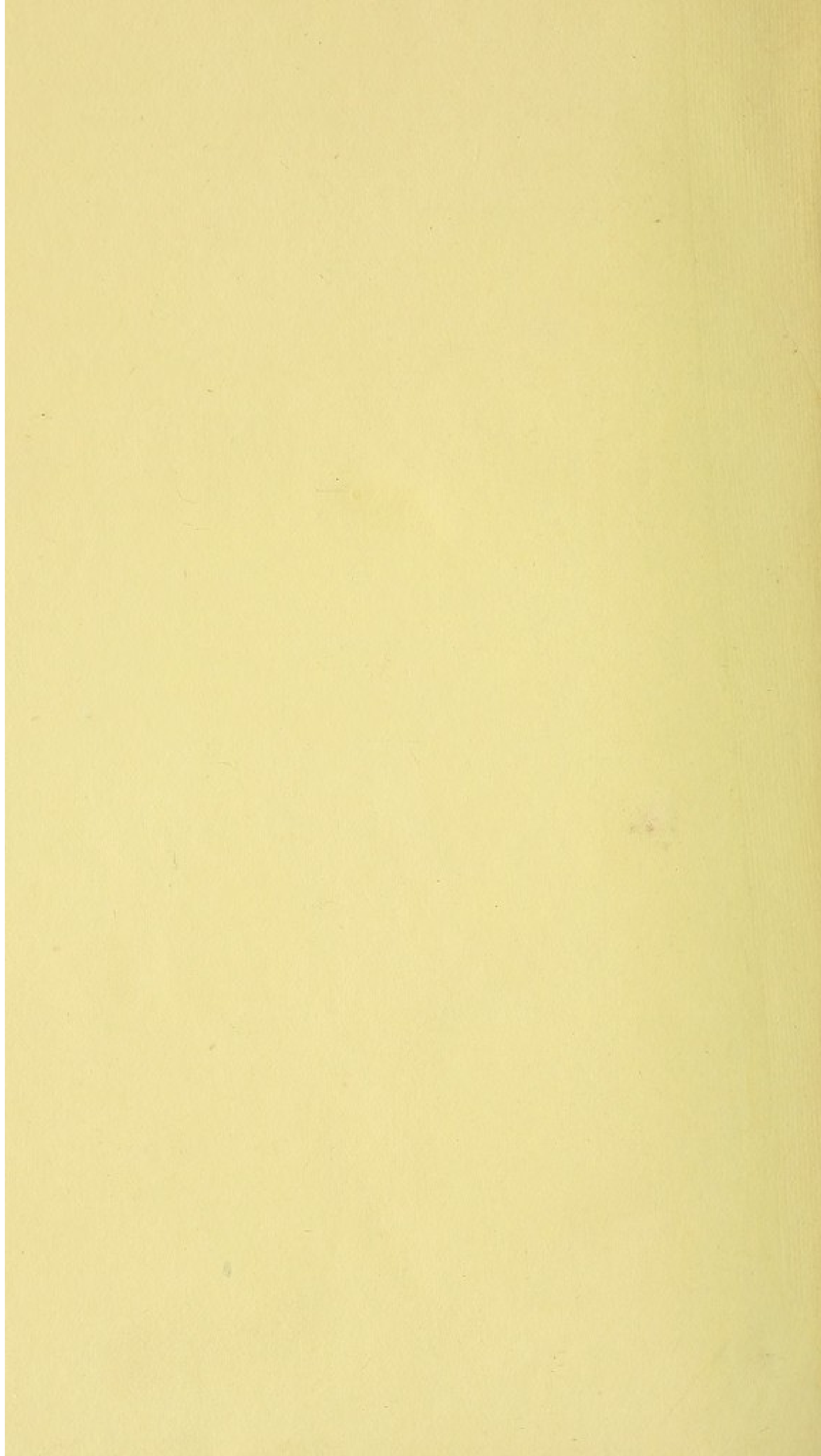

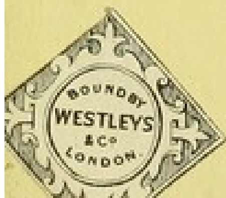
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