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MEDICAL NOTES

ON THE

CLIMATE OF BURMAH,

AND ON THE

DISEASES WHICH HAVE THERE PREVAILED
AMONG EUROPEAN TROOPS.

BY

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MEDICAL NOTES ON THE CLIMATE OF BURMAH.

Perhaps there are few subjects on which so much has been written as that of fever, and yet there are few in which there yet remains so much room for investigation and research. This observation applies most particularly to the fevers of tropical climates, regarding which the most vague and varied opinions are entertained by many, and as to the pathological nature of which but a very imperfect knowledge is possessed by any. One cannot avoid being forcibly struck with the truth of this remark, who has visited our Indian possessions, observed the various forms of fever which there prevail, listened to the opinions, and watched the practices of different medical men. With regard to one and the same fever, the most opposite opinions may sometimes be found to be entertained, and the most opposite modes of practice put in force. Surely, then, notwithstanding the admirable writings of Annesley, Twining, Johnson, Martin, and others, our knowledge of tropical fevers requires to be placed on a better footing, and the subject still offers a wide field for research, while, at the same time, it is one of the highest importance, if we consider, that every European who makes any sojourn in India, suffers more or less from fever, and that so many fall victims to it.

It is not the object of this paper, however, to enter into any general discussion on tropical fevers. What we now want is not a complication of theories and opinions, but a series of carefully observed and recorded facts; and now that we have an "Indian Annals of Medical Science," it is to be hoped that our medical brethren in the East will, from their ample opportunities, contribute more than hitherto to the advancement of our knowledge on these and other subjects. Believing, then, that it is the duty of every one to contribute what he can towards the advancement of his profession, I have ventured to lay before my medical brethren the following observations on the fevers and other diseases, which have been prevailing among our troops in our newly-acquired possessions in Burmah; these observations having been derived from cases occurring among the Europeans of the Second Bengal Fusiliers, during the three months after their first arrival in Burmah, but equally applicable to the diseases which prevailed in other European regiments. These obser-

vations, too, are the more important, as it is always interesting to observe the diseases with which strangers are attacked on their first immigration into a country, in reference to which we know but little.

The unhealthiness of the climate of Burmah has long been notorious, so much so, that the "pestilential swamps on the banks of the Irrawaddy," have become almost a byword, and a byword not altogether undeserved, when we consider, that some of our regiments lost upwards of 26 per cent. of their strength in the space of one year, partly from the accidents of warfare, but principally from the baneful effects of the climate. Mr Taylor, the surgeon of H. M. 80th, informs us, that the mortality in his regiment during twelve months in Burmah, was 26·5 per cent., or more than four times the average ratio of mortality during nearly eight years of previous service in India;¹ and in H. M. 18th, Royal Irish, according to Mr Stewart, out of a strength of 1088, there were 1624 admissions into hospital in twelve months, and 260 deaths, or 23·9 per cent.² It will be my object to point out some of the causes of the great sickness which has prevailed; but I may here remark, that very possibly the climate of Burmah may yet prove not so peculiarly unhealthy as it is generally believed to be; and that, in all probability, there would have been an equal amount of sickness and mortality, among European troops, had they been exposed in many parts of our Indian territory before subjection to European civilization and improvement, in the way in which our troops have been exposed in Burmah.

The following observations may be classified under five heads:—First, we shall say a few words on the geological and geographical position of Prome, and on the climate, more particularly of the season, in which the 2d Europeans arrived there. Secondly, we shall mention a few particulars connected with the arrival of the 2d Europeans at Prome. Thirdly, we shall enumerate the various diseases which prevailed among them, after their arrival; and, fourthly, the causes to which the great prevalence of disease may be attributed. In the fifth and last place, we shall enter into a few particulars with regard to a few of these diseases, more particularly the fevers.

I. First, then, we shall consider the geographical and geological position of Prome, and say a few words on the climate. Prome in lat. 18° 48' North, and 95° 10' East longitude, is built on the left or eastern bank of the Irrawaddy, a little below the point where this is joined by the Nawaing river,

¹ Indian Ann. of Med. Sc. I., p. 409.

² Indian Ann. of Med. Sc. I., p. 430.

about 300 miles above Rangoon, and 360 miles below Ava, and 40 miles from the present frontier of the British possessions in Burmah. The country, for several hundred miles above Rangoon, consists of one vast alluvial plain, intersected by rivers, by which it is inundated every rainy season, and covered with rice fields or dense jungle. This plain is continued up along the banks of the river to within 30 miles of Prome. Here, at a place called Sahlaydan, on the western bank of the river, a range of hills appears, a branch of the great Arracan range, which is continued up along that side of the river to above Prome, while a little farther up, on the opposite bank, another range commences, continuous with the hills, which, from their terminating in the immediate vicinity of Prome, generally receive the name of the Prome mountains. These consist of a number of undulating hills, the highest point, "Boxer's Hill," being about 200 feet above the level of the river. The hills on the opposite side are much higher, some of them exceeding 400 feet. The Prome range, at whose northern extremity the town of Prome is built, extends from the river's bank eastward for about two miles, and is then succeeded by an alluvial plain, stretching uninterruptedly to the base of the Galladzet Mountains, a distance of about 30 miles. This plain, which in a southerly direction, is continuous with the great alluvial plain of the Irrawaddy already mentioned, is covered with jungle, extensive rice fields, and a few teak forests, and during the rainy season the greater part of it is under water, the only mode of communication between many of the towns and villages being by means of boats; while the protracted dryness after the rains breaks up the rice fields by extensive fissures, often two or three feet in depth.

The hills at Prome consist of a shingly sand, lying in strata at an inclination of about 45° , with a dip to the eastward. Some of the strata contain a considerable quantity of argillaceous matter, and often form a marked contrast to those immediately above and below them. This sand, which probably belongs to the Diluvium, afterwards alluded to, appears to lie upon a formation of a granular, sandy, yellow limestone, arranged in strata, also at an inclination of 45° , with a strike north and south, and containing a quantity of marine shells and other organic remains very similar to those of the London clay¹. This formation is best seen in the hills opposite to Prome, but large blocks of the

¹ The following shells, &c., found in this rock have been identified by Mr Sowerby, with those found in the London clay, and *Calcaire grossier* of Paris, *Ancillaria*, *Murex*, *Cerithium*, *Oliva*, *Astarte rugata*, *Nucula rugosa*, *Teredo*, Teeth of shark, fish scales, &c.

rock are also found on the Prome side, along the bank of the river, between Prome and Shoaydong¹. In the Prome hills there is also found a soft green, and yellow sandstone, and I have also observed a sandy clay, which presents the peculiar honey-combed appearance, constituting the mineral Laterite.²

Professor Buckland,³ from a number of geological specimens brought from Burmah, in the year 1826, by Mr Crawford, who had accompanied the British embassy to Ava, endeavours to make out the following geological formations in Burmah. 1. *Alluvium*, formed by deposits from the river, and constituting the extensive plain, already alluded to. 2. *Diluvium*, seen principally in a district, 20 miles square, at Yay-nan-gheoum, about halfway between Prome and Ava, where the celebrated Petroleum Wells are. This formation consists of a sand with a coarse gravel, containing the fossil remains of numerous vertebrate animals. Among these Mr Clift⁴ has described those of two new species of mastodon, and also remains of the following genera, hippopotamus, sus, rhinoceros, tapir, ox, deer, antelope, trianynx, emys, leptorynchus, and crocodile. Remains of vertebrate animals I have often also observed in the coarse shingly sand, forming the hills of Prome, in the deep cuttings through these hills, which our Indian Government has lately been making for the construction of roads. Along with these animal remains is also found large quantities of fossil wood, both monocotyledonous, and dicotyledonous. Portions of this fossil wood are often washed out from their bed by the rain and torrents, and carried down the river, on the banks of which they are often found, many miles below their original locality. The natives of Burmah regard this wood with a certain degree of veneration, and often transport it to immense distances, for the purpose of employing it as pillars of support for their religious edifices. This practice probably constitutes the true explanation of the statement made by Lieutenant Alexander, that the waters of the Irrawaddy had the power of converting wood into stone in the space of 30 months,⁵ about which there was formerly some discussion⁶. 3. *Freshwater Marl*, a marly blue clay, containing numbers of a species of Cyrene, and found at Yay-nan-gheoum. 4. *London clay and calcaire grossier*, already

¹ A town 8 miles below Prome.

² This mineral has been stated not to exist at Prome. Ind. Ann. Med. Sc. I. 389.

³ Trans. Geol. Soc. Ser. 2. vol. ii. p. 377.

⁴ Ibid., 2. vol. ii. p. 369.

⁵ Edinburgh Philosophical Journal. 1828.

⁶ "On the power of the Waters of the Irrawaddy to convert wood into stone." Trans. Geol. Soc. Ser. II. vol. ii. p. 394.

alluded to as found at Prome. Numerous marine shells have also been found in a dark-coloured slaty limestone, near the Petroleum wells. 5. A soft green, and yellow sandstone, corresponding to our *Plastic clay formation*, found at Prome, and Yay-nan-gheoum, and at the latter place, like our clay, associated with brown coal, and petroleum. 6. *Transition limestone*, found at Kyouktaran, near the commencement of the alluvial plain, and at Toungbaran, and Loonghee, on the left bank of the river between Prome and Ava. 7. *Metamorphic* rocks are found in the Sakaing chain of mountains, a little to the north of Ava, such as mica slate, hornblende, and statuary marble. An immense quantity of this last rock is made use of by the Burmese, for making images of their great object of worship—*Godama*, an incarnation of Budh. It is very white, has a beautifully crystalline structure, and is susceptible of a high polish.

The native town of Prome is built on the plain at the northern extremity of the Prome mountains, along the banks of the river, and here also, originally, were the quarters for our troops. Before the arrival, however, of the 2d Fusiliers, barracks for their accommodation had been built along the summits of the hills, sites, the propriety of selecting which, is very doubtful.

As to the climate of Prome, the seasons may be said to be two, the wet, and the dry. The rains commence about the middle or latter end of May, and terminate about the commencement or middle of October. In 1853 they terminated on the 22d of October; in the preceding year, by the end of September. Extending, as the rainy season does, over a period of about five months, the quantity of rain that falls at Prome is not great, the whole annual fall (1853), as ascertained by Colonel Turton of the Bengal Engineers, not exceeding 30 inches; being less, in fact, than in many parts of Great Britain. At Rangoon the annual fall is more than double that at Prome, Dr Fayrer's observations showing that it there amounted (1853), to 81.25 inches. The average temperature in the rainy season is about 80°. During the whole season, the air is extremely damp; in fact, almost saturated with moisture. Everything feels wet, cloth clothes become covered with mildew, leather-work with mould, &c. The following are the results of observations made, partly by myself, and partly by Dr Anderson, of the Bengal service, during the dry season of 1853-54. The dry season, extending from October till May, presents some varieties. Heavy dews and fogs towards morning

are extremely common, during the latter part of October, November, and December, sometimes lasting till 8 or 9 A.M., and completely obscuring the sun's rays. These, however, ultimately break through with great power, so that, even at this period, we have nothing approaching to the cold season in Bengal; for, though the thermometer may sometimes fall to 56° Fahr. in the morning, yet the same day it may rise to between 80° and 90° . These fogs at Prome were observed to lie along the earth's surface, and principally in the valleys, between the different hills. Thus, on looking down from the summit of a hill into an adjoining valley, sometimes nothing but a mass of dense fog could be seen; while, on the summits of the hills beyond, objects could be distinguished with perfect ease. About the middle of February the temperature increases, and the nights and mornings become warmer. The months of March, April and beginning of May, are extremely hot and dry; the thermometer, in the day time, ranging from 90° to 110° in the house, and the atmosphere being so dry, that wooden furniture cracks, and warps; the divisions at the point of a quill pen fly asunder, vegetation is burnt up, and respiration often becomes a labour. At this period, hot dry winds from the north-west are not uncommon, and the nights are very close and unpleasant. The following table shows the mean, maximum, and minimum temperatures, both in the sun and shade, for the latter part of October, and the months of November, December, January, February and March 1853-54.

TABLE I.
Monthly Temperatures at Prome.

MONTHS.	In the Shade.			In the Sun.		
	Max.	Min.	Mean.	Max.	Min.	Mean.
October, from the } 24th, .	91.5	69	81.46	120	112	116
November, . . .	90	58.5	77.339	120	109	115.6
December, . . .	86	56	73.85	117	102	111.74
January, . . .	88	58	75.196	121	98	108.58
February, . . .	98	57	78.48	125.5	95	114.6
March, . . .	106	63	84	127	112	120

The next table shows the maximum, minimum, and mean weekly temperatures in the shade, for the 22 weeks extending from the 24th of October to the end of March.

TABLE II.

Weekly Temperatures at Prome.

WEEKS.				Maximum.	Minimum.	Mean.
October	1.	.	.	91 ^o ·5	69 ^o ·	81·46
November	2.	.	.	90 ^o ·	74 ^o ·	81·12
...	3.	.	.	86·5	68 ^o ·	78·41
...	4.	.	.	85·5	58·5	74·98
...	5.	.	.	83·5	59 ^o ·	75·19
December	6.	.	.	86 ^o ·	65 ^o ·	75·99
...	7.	.	.	80 ^o ·	61·5	73·94
...	8.	.	.	79·5	56 ^o ·	72·08
...	9.	.	.	83 ^o ·	57 ^o ·	73·29
...	10.	.	.	83 ^o ·	62 ^o ·	74·47
January	11.	.	.	86 ^o ·	63 ^o ·	76·21
...	12.	.	.	86 ^o ·	61 ^o ·	74·55
...	13.	.	.	87 ^o ·	59 ^o ·	74·33
...	14.	.	.	88 ^o ·	58 ^o ·	76·05
February	15.	.	.	88 ^o ·	59 ^o ·	76·74
...	16.	.	.	90 ^o ·	57 ^o ·	76·75
...	17.	.	.	92 ^o ·	63 ^o ·	77·05
...	18.	.	.	98 ^o ·	64 ^o ·	83·64
March	19.	.	.	100 ^o ·	63 ^o ·	84·5
...	20.	.	.	109 ^o ·	66 ^o ·	85 ^o ·
...	21.	.	.	102 ^o ·	70 ^o ·	85·42
...	22.	.	.	106 ^o ·	74 ^o ·	88·7

The preceding tables show, in the season 1853-54, a gradual decrease in the temperature, from the end of the rains in October till the second week of December, when it was at its minimum,—the mean weekly temperature for this week being 72·085°; and, from this time, it again progressively increased. The lowest temperature observed during the season was on the 19th of December; on which day, at 5½ A.M., the thermometer stood at 56° Fahr. In the season preceding (52-53), the coldest day was observed by Mr Taylor to be the 2d of February,—the thermometer on the morning of that day being at 55°. From the middle of February, the temperature is seen to have increased very rapidly. With regard to the influence of the temperature on health, two points deserve to be noticed.

The one is, that there is no "cold season" at Prome approaching to that of Bengal and most parts of India. This

may be illustrated by contrasting the mean temperature of the two coldest months—December and January—at Prome, with that of Calcutta and Benares, whose latitudes do not differ by many degrees.

TABLE III.

Mean Temperature of December and January at Prome, compared with that at Calcutta and Benares.

MONTHS.	Prome, Lat. 18° 48' N.	Calcutta, Lat. 22° 23' N.		Benares, Lat. 25° 20' N.
		1	2	
December, . . .	73°·85	68°·6	66°·6	62°·49
January, . . .	75°·196	66°	66°	67°·53

True, as we have already seen, the thermometer at Prome may occasionally fall to 55°, before sunrise, but the same day it may rise to between 80° and 90°. Were it not that the temperature was sometimes so low in the morning, the mean monthly temperature would be much greater even than it is in these months.

This great alternation of temperature in the course of the 24 hours is the other point to which I wish to call attention; and this, no doubt, contributes greatly to the unhealthiness of the climate. A few examples may render it more striking.

TABLE IV.

Daily Alternations of Temperature at Prome.

DATE.	In the Shade.			In the Sun.	
	5 $\frac{1}{2}$ A.M.	3 P.M.	Alterna- tion.	Maximum.	Alterna- tion.
October 25.	69°	90°·5	21°·5	106°	37°
November 22.	59	80°·5	21°·5	114	55
December 19.	56	78°	22°	116	60
January 24.	58	88°	30°	107	49
February 27.	64	95°	31°	114	50
March 27.	72	102°	30°	125	53

¹ Henry Traill, Esq., 1785. Trans. As. Soc. Bengal, vol. ii., 1790.

² Dr Johnson. On Tropical Climates, p. 20.

³ James Prinsep. Trans. As. Soc. xv., 1825.

If we contrast this alternation with that of most parts of India, we observe a remarkable difference. We find in a "Meteorological Diary"¹ kept at Calcutta for 23 months by Mr Henry Traill, that the greatest alternation of temperature *for the whole month* never exceeded 26° , and sometimes was not more than 9° ; and again, from observations made on the temperature of Benares by Mr James Prinsep,² the greatest *monthly* alternation never exceeded 26.5° , whereas at Prome we have the *daily* alternation sometimes amounting to 31° . It may also be mentioned, that the heavy dews and damp mornings in November and December rendered the atmosphere even more chilly than would have been expected from the thermometric indications; and the contrast between the cold of the morning and heat of the day was often very striking.

The atmosphere, which for some weeks after the cessation of the rains was extremely damp, gradually became drier. This was confirmed by observations made with the wet bulb thermometer. Thus, during November the difference between the dry and wet bulb thermometer at the hottest part of the day seldom exceeded 20° , while in March it often amounted to 35° or 40° . At Rangoon the atmosphere is much more moist, and hot dry winds are unknown.

I have no record of barometric observations, but, generally speaking, the barometric range was trifling.

The prevailing winds during the dry season were north-east and north-west.

II.—We shall now mention a few particulars connected with the arrival of the 2d Fusiliers at Prome. This regiment, upwards of 1000 strong, before proceeding to Prome had been stationed at Fort William, Calcutta, but in the month of March four companies (about 400 men) were sent across the Bay of Bengal to Moulmain, near the north extremity of the Tenasserim coast, where they remained until the rest of the regiment was ordered to Burmah. The regiment may be said to have arrived at Prome in three different detachments. It will be necessary for me to say a few words with regard to each of these, as it will afterwards be seen that there was a marked difference between the three detachments, in reference to the prevalence of disease after their arrival at Prome.

The first detachment, consisting of Nos. 4 and 10 companies, amounting to 200 men with 6 officers, left Calcutta

¹ Trans. Asiat. Soc. Bengal, vol. ii.

² Ibid., vol. xv.

on the 1st of October 1853, and, after a very rough and tedious voyage, during which the men had to lie upon the deck of the steamer, exposed to the rain and sea-spray, arrived at Rangoon late on the evening of the 9th. On the 10th, thinking they were to remain at Rangoon, a number of the men were employed as fatigue parties in removing their baggage from the river up to the town, a distance of two miles, under a burning sun. On the 11th others were similarly employed in conveying their baggage back again to the river, to be put on board one of the river steamers. On the morning of the 12th they embarked in an open "flat" boat in tow of a steamer. The 200 men were crowded into the two decks of this flat, where they had but little protection from the rain, which occasionally fell in torrents, especially during the night. Hardly a night passed that many of them were not drenched by the rain, and in addition to this they were tormented by myriads of mosquitoes of the largest and most irritating description, which entirely prevented sleep. In one part of the river, known as the "Pannaling Creek," these are so numerous, as actually, at certain hours of the day, to darken the atmosphere, and their bites were so irritating, that I have seen large ulcers result from them, and one of the men, who threw himself overboard and was drowned, was generally supposed to have done so, in consequence of the extreme annoyance he was suffering. Eleven days were they subjected to these hardships, reaching Prome on the 22d of October, the very last day of the rains. Here they were quartered in barracks, built along the tops of the hills, of wooden poles covered over with thin thatch, and with walls of thin matting, which afforded but little protection from the intense heat during the day or from the cold during the night. It may also be mentioned that this detachment left Calcutta in such haste, that they brought no blankets, and but little bedding with them.

The second detachment, consisting of Nos. 5, 7, 8 and 9 companies, amounting to about 400 men, which for some months had been stationed at Moulmain, arrived at Prome on the 28th of October. They had had no fatigue work, were only five days in coming up the river to Prome, and had no rain. They had blankets, but old ones. During their stay at Moulmain, they had not suffered greatly from sickness, but had become considerably debilitated from the effects of the climate and other causes.

The third or remaining portion of the regiment (Nos. 1, 2, 3, and 6 companies, with the head-quarters), amounting to about 400, left Calcutta on the 17th of October, had a

III.—We now proceed to consider the diseases which prevailed in the regiment, after its arrival at Prome. In order to give a correct idea of these, we have condensed the following table from the monthly hospital reports.

DISEASES.

DISEASES.																																					
Strength at Prone, varied from 531 to 425.	Apoplexy.	Bubo simplex.	Catarrh.	Cephalalgia.	Cholera biliosa.	Cholera spasmodica.	Colic.	Constipatio.	Contusio.	Cynanche tonsillarıs.	Debilitas.	Delirium tremens.	Diarrhoea.	Dysentery.	Dyspepsia.	Ebrietas.	Epilepsy.	Febris Contin.	Feb. Intermit. Quotid.	Feb. Int. Tertian.	Febris Remittens.	Gonorrhoea.	Hemorrhoids.	Hepatitis.	Lumbago.	Morbus Cordis.	Ophthalmia.	Orethritis.	Phlegmon.	Pleuritis.	Rheumatism.	Sciatica.	Syphilis prim.	Do. consec.	Ulcers.	TOTAL.	
Admitted,	1	2	1	1	1	3	5	6	2	1	3	1	18	20	6	3	2	4	178	41	105	1	1	5	1	2	3	3	1	1	8	2	1	1	1	1	435
Discharged, ..	...	2	1	1	1	2	5	6	2	...	...	116	11	6	3	1	4	163	40	97	1	1	1	..	1	3	2	...	1	5	1	1	1	1	1	1	381
Died,	1	...	...	...	1	...	...	...	...	...	...	...	1	5	...	...	...	...	...	5	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	14
Remaining,...	...	...	...	...	...	...	...	...	...	1	3	...	1	4	...	...	1	...	15	1	3	...	3	...	3	1	1	...	1	1	...	3	1	...	...	...	40
TOTAL,	1	2	1	1	1	3	5	6	2	1	3	1	18	20	6	3	2	4	178	41	105	1	1	5	1	2	3	3	1	1	8	2	1	1	1	1	435

The table shows the number of men admitted into hospital at Prome, during the months of November and December 1853, and January 1854, the diseases for which they were admitted, and the results of the treatment.

It is to be observed, that in the table, under the head of strength, the whole regiment is not accounted for. This is owing to the fact, that shortly after the arrival of the regiment at Prome, four companies, Nos. 1, 2, 3 and 5, were sent down to Shoaydong, a town also on the left bank of the Irrawaddy, eight miles below Prome, where they had a separate hospital, while again a party of 250 men, partly taken from the head-quarters, and partly from the companies at Shoaydong, was sent into the Tharawaddy district on detached duty on the 26th of December. The numbers in the table show the strength of the regiment at Prome on the 1st of December, and the 1st of February, and if we assume the average strength during the whole of that period to have been 500, which is considerably above the mark, we find that, in the space of three months, 435 out of 500, or eighty-seven per cent., were admitted into hospital.

It has been already observed, that there was a remarkable difference in the prevalence of disease in the various companies of the regiment, during the first few weeks after their arrival at Prome. This will be at once obvious by reference to the following table shewing the number of men admitted into hospital at Prome from each company, from the arrival of the regiment, up to the departure of the above-mentioned detachment into the district, on the 26th of December.

TABLE VI.

No. of Company.	No. admitted into Hospital.	No. of Company.	No. admitted into Hospital.
I.	5	VI.	37
II.	3	VII.	38
III.	2	VIII.	19
IV.	77	IX.	43
V.	3	X.	72

It is to be observed with regard to this table, that the numbers placed opposite Companies I., II., III., and V., are hardly correct, as after the removal of these four companies to Shoaydong, they had a separate hospital, with the exact

statistics of which we are unacquainted. The number, however, of sick in these companies, up to the 26th of December, we know to have been exceedingly small, and we feel sure, that by estimating an average of twelve admissions into hospital, for each company, during the whole period, we are far above the real number.

Now, if we consider this Table in reference to the order of arrival of the different companies, we at once perceive the truth of a previous remark, that there was a striking difference in the amount of disease in the three detachments in which the regiment arrived at Prome. Thus, it will be remembered the 1st detachment consisted of Nos. 4 and 10 companies, the second of Nos. 5, 7, 8, 9, and the 3d of Nos. 1, 2, 3, and 6. The following Table shows the numbers admitted from each of these detachments, from the date of their arrival up to the 26th of December :¹—

TABLE VII.

Detachment.	Companies.	Strength.	No. admitted into Hospital.	Per centage.
I.	4 & 10	200	149	74·5
II.	5, 7, 8, 9.	about 400	107	26·7
III.	1, 2, 3, 6.	400	73	18·25

Thus, we see, that the per centage of sick in the first detachment, was nearly three times as great as that of the second, and four times as great as that of the third. It may be observed that the great sickness in the first detachment did not break out immediately on their arrival. Only four admissions into hospital took place during the first week of their stay at Prome.

With regard to the detachment which marched from Prome into the Tharawaddy district on the 26th December, it may be interesting to mention a few particulars. The force which left Prome on this date, consisted of 250 men and 6 officers of the 2d Europeans, 40 men and 2 officers of the Madras European Horse Artillery, and detachments of various native regiments. We shall confine our remarks to the European portion. The object of the expedition was to put down the notorious Dacoit chief, Mow-gowng-gee. The expedition

¹ We here estimate the number of sick in Nos. 1, 2, 3, and 5 companies at 12 in each, for the reasons above specified.

marched from Prome, in a south-easterly direction, to a place called Taphoon, about 60 miles distant, where they arrived on the 5th day, December 30th, having marched from 8 to 17 miles a day. Though the march was commenced before daylight every morning, yet, from the badness of the roads, and the real or feigned ignorance of the native guides, who often led the force by most circuitous routes, the new encamping ground was seldom reached before noon or even later, the men being thus exposed for several hours to a burning sun, and many of them not arriving in camp till late in the afternoon, perfectly exhausted. At Taphoon the force established its head-quarters from the 30th of December to the 1st of February 1854, the tents being pitched in an extensive rice-field, surrounded by trees and dense jungle. From this centre, numerous detachments were sent out in different directions into the surrounding country, in search of the dacoits. The men on these expeditions sometimes remained out for several days, often without tents, were subjected to great fatigue, and had to march sometimes under a burning mid-day sun, and sometimes through the chilly fogs of night and morning. The provisions supplied to the force were necessarily very inferior to what the men had been accustomed to in cantonments. They had no bread, butter, milk, and but few vegetables, and subsisted almost entirely on tough beef and biscuit, while the tents in which they dwelt afforded them but little protection from the great heat during the day, and the cold and damp of the morning. The men, too, became dispirited, from their several expeditions being seldom attended with success. The force left Taphoon on the 1st of February, and arrived at Prome again on the 10th. For the first few days after the force left Prome there were no admissions into the hospital of the 2d Europeans, except a few cases of extreme debility from fatigue, but Table VIII. shows the great number of admissions into hospital, and the comparatively great mortality, from the 1st of January up to the 10th of February.

TABLE VIII.

Strength, 250 Fighting Men.	DISEASES.											Total.	Per Centage.
	Apoplexy.	Colic.	Constipatio.	Debilitas.	Diarrhœa.	Dysentery.	Febris Int. Quot.	Do. do. Tert.	Do. Remittens.	Pneumonia.	Tænia Solium.		
Admitted,	1	1	1	2	12	3	71	8	7	1	1	108	43·2
Discharged,	„	1	1	2	8	„	64	6	4	„	1	87	
Died,	1	„	„	„	„	1	„	„	1	1	„	4	1·6
Transferred to Hospital at Prome,	}	„	„	„	4	2	7	2	2	„	„	17	

Thus, in the space of six weeks 43·2 per cent. of the whole detachment had to be admitted into hospital, and 1·6 per cent. died. It may be also observed that a number of the less severe cases of Intermittent fever were treated as out-patients, and are not included in the above Table.

Again, out of the 40 men and 2 officers of the Madras Horse Artillery, both the officers had fever, and 30 men, or 75 per cent., were admitted into hospital, besides several others treated as out-patients. The diseases were similar to those above-mentioned. One of the men died of remittent fever.

The detachments of the native regiments from Bengal and Madras suffered equally with the Europeans.

Lastly, it was observed with regard to the various detachments which composed this expedition, that for many weeks after their return to Prome the number admitted into hospital was far greater from among them, than from other portions of the same regiments.

From the previous Tables (V., VIII.), it is evident that the principal diseases which prevailed among the troops were fever, dysentery, and diarrhœa, but more particularly the first of these. Thus, in Table V., out of the 435 men admitted into hospital, 328 were on account of various forms of fever. Of these 328,

4 were continued fever.

105 were remittent fever.

And 219 were intermittent fever.

Again, in Table VIII., out of the 180 men admitted into hospital, 86 were on account of fever, 79 intermittent, and 7 remittent; and of the 30 men admitted from the Madras Horse Artillery, 24 were fever cases.

Now, it is interesting to contrast with these results, the cases of fever which occurred in the same regiment at Calcutta in the hot dry months immediately preceding the rains. During the months of May and June 1853, out of a strength of about 600, there were admitted into the regimental hospital at Calcutta, 209 cases of fever. Of these,

173 were continued fever.

2 were remittent fever.

And 34 intermittent fever.

It is to be observed, that during the hot dry months of May and June at Calcutta, there were 173 cases of continued fever, and only two of remittent, while, in the months of November, December, and January, after the rains at Prome there were 105 cases of remittent fever, and only four of continued, and even these four cases differed remarkably from the continued fever of the hot dry season at Calcutta, and might more properly be classified along with the co-existing cases of remittent fever, the only difference being, that there were no well-marked periods of remission. The continued fever at Calcutta was sthenic, generally demanding copious depletion, while the symptoms of the remittent fever at Prome, were for the most part adynamic, with a tendency to become typhoid, not bearing depletion, but, on the contrary, requiring the early use of stimulants.

Again, cases of intermittent fever were more numerous, after the rains at Prome, than during the hot dry months preceding these at Calcutta. Thus during the months of May and June at Calcutta, only 34 cases of intermittent fever were admitted into hospital, while during the months of November and December, at Prome, there were 154 cases, the strength being nearly the same in both cases.

These differences in the form, type, &c., of the fever at the two periods, may be partly accounted for, by the difference in the season of the year, but there can be little doubt that the climate of Prome, and the other pre-disposing and debilitating causes about to be enumerated, had much to do with the adynamic and typhoid tendency, which the fevers, and indeed all diseases, there exhibited. But this leads us to consider in the fourth place :

IV. *The Causes* to which the diseases just enumerated may be attributed. From a perusal of the tables above given,

it must be at once obvious, that malaria were the proximate exciting causes of disease in the majority of cases, but there were also many other circumstances, which may have served as causes of predisposition, and determining exciting causes, and which it will be useful for us to consider. We shall therefore in the first place, say a few words on the subject of the malaria themselves, and afterwards allude to the other accessory causes of disease.

The nature and origin of malaria or marsh miasmata are still enveloped in mystery, and, indeed, it still remains to be shown that they have a substantial existence. Expert chemists have repeatedly analysed the air of malarious districts, but have never succeeded in demonstrating the presence of any poisonous principle. The general impression, however, is that such a principle exists in the atmosphere in the form of a gaseous fluid. Again, as to the origin of malaria, though the general belief among medical men has been, that they are produced by animal, and more especially vegetable matter, undergoing decomposition, yet the observations of Dr William Ferguson¹ have led many to believe, that malaria and the products of vegetable decomposition are two distinct things, and that though they may co-exist, they have no necessary connection. We cannot help thinking however, that the deductions which have been drawn by Dr Ferguson and others, have been somewhat too hasty. The fact stated by Dr Watson,² that we may, in this country, often have putrefying vegetable matter, without any malarious diseases, is merely a negative argument, and one of little value, for other concomitant circumstances necessary for their production, may in such cases be wanting. Again, though Dr Ferguson has brought forward numerous very interesting instances of malarious diseases being very prevalent in localities, where there was said to be no vegetable matter, either putrefying, or to putrefy, yet we believe, that if we may except the sandy deserts of Asia and Africa, careful examination would shew, that few parts of the earth's surface are entirely destitute of vegetable remains, if not visible to the naked eye, at all events of a microscopic nature. We have repeatedly submitted to microscopic examination the water from the swamps of Burmah, and have found it to Abound in Confervæ, Desmeidiæ, Diatomaceæ, and Infusorial animalcules, and we believe that there are few parts of the world where these are absent. The decomposition of these microscopic beings might suffice to generate malaria,

¹ "On the Nature and History of the Marsh Poison." *Edin. Phil. Trans* 1821.

² Lectures on the Practice of Physic, vol. i., p. 733.

for we know by experiment that air contaminated with so little as $\frac{1}{36000}$ part of hydrochloric acid gas will destroy the life of plants,¹ and the poisonous principle of malaria must exist in even smaller quantity, for while we can detect the presence of $\frac{1}{36000}$ of hydrochloric acid gas in the atmosphere, that of the poisonous principle of malaria we are unable to demonstrate. The probable existence of such beings was perhaps lost sight of by Dr Ferguson in his observations. But, be the origin and nature of malaria what they may, there can be no question, that at Prome, at the period we have been considering, those circumstances, which in most cases, coexist with the production and noxious effects of malaria existed in a high degree. A few of these may be mentioned.

1. The *season* in which the troops reached Prome, was that during which malarious diseases in the tropics are known to be most prevalent, viz.: that immediately succeeding the cessation of the rains, or, as it is called the "drying up" of the rains.

2. The country surrounding Prome abounded in *dense jungle*, and even the sides of the hills, on the summit of which the barracks were built, were covered with copious vegetation. Shortly after the arrival of the troops at Prome, the sides of these hills were cleared, and the brushwood, after drying for some days in the sun, collected and burnt. The propriety of such a step, at this time, seems very questionable, for it has always been found in malarious countries, that clearing the soil, and thereby exposing the earth's surface to the more direct action of the sun's rays, has increased disease, and rendered its character more severe. It may be mentioned too, that disease did not shew itself to any great extent among the troops, until after this clearing had commenced, but of course it would be difficult to say how far this was instrumental in producing it.

3. The country surrounding Prome also abounded in *low swamps* and extensive *rice-fields*. These swamps and rice-fields are liable to great inundations during the rainy season; so much so, that in many places the principal communication between the different villages is carried on by means of boats. In the protracted dryness after the rains, these rice-fields become split up by wide fissures through the soil, often two or three feet in depth. Through these fissures the vapour passes up from the lower portions of the soil; and it has been observed, that the vapours which escape from such fissures are often more noxious than the emanations from a wet marshy ground.² In connection with this, it may be observed,

¹ Traill's Medical Jurisprudence, p. 124.

² Copland's Medical Dictionary, vol. i. p. 758.

that one of the prevailing winds at Prome blew in a direction from some of these rice-fields towards the barracks. Often in the early morning we have observed a cloud of mist wafted along the earth's surface for miles ; and it has been thought that malaria, whatever be their nature, cling to such mists.

4. *The site of the barracks* on the summits of the different hills was such as to expose them to any malarious poison wafted by the winds. Dr Copland remarks, " high grounds, near exposed marshes, are often more unhealthy than the places immediately adjoining, that are on a level with them." We may mention, too, that none of the native Burmese will live on these hills, which are regarded by them as most unhealthy localities.

5. *A high temperature* has always been found favourable to the production of malaria ; and we have already endeavoured to show, that the temperature at Prome was greater than in most parts of India at the corresponding season.

6. The whole of Burmah swarms with myriads of *insects* and *reptiles*, even to a greater extent than most parts of India. How far the decay of their remains may tend to the production of malaria, we know not ; but we have thought the circumstance worthy of observation, as Dr Copland, in speaking of malaria, makes the following statement :—" I have always considered the number of insects and reptiles, with which a place abounds, as more indicative of its insalubrity, than almost any other circumstance." Again, he observes, that a mixture of animal and vegetable matter undergoing decay gives rise to miasms, " much more noxious than those resulting from vegetable matter alone." ¹

Under such circumstances as the above, we are not surprised at the generation of malaria. But, before we leave this subject, one word on the so-called *varieties* of the malarious poison. Is the poison which gives rise to a quotidian ague different from that which produces a tertian ; or this different from that which produces a remittent fever ; or are all these different from that which gives rise to dysentery — or, again, is there only one poison whose effects will vary according to its intensity, and the constitution and predispositions of the individuals exposed ? These are questions of great importance, but of very difficult solution. When, however, we see a large body of individuals placed under the same circumstances, and exposed to the same causes of disease, some of whom are seized with quotidian ague, others with tertian, and others with remittent fever, the presumption is that the same cause has produced different diseases,

¹ Copland's Medical Dictionary, vol. i., p. 758.

according to its intensity, the constitution of the individual, and the predisposing causes to which he may be subjected. Again, as favouring this presumption, we see remittent fevers passing into quotidian, and quotidian into tertian; and we have observed in Burmah, that persons who have had repeated attacks of fever are liable to be attacked by dysentery. The fact already alluded to, that the form and severity of malarious diseases vary with the season of the year, would seem to indicate that these depend on the intensity of the malaria; the malaria, for instance, generated after the cessation of the rains being more intense than at other periods. Again, the constitutional predisposition of the individual would seem to influence the form of the disease produced, under such circumstances as the following, which happened to a medical friend, when surgeon of a vessel anchored in the Hooghley:—A party of the crew slept for a single night on the swampy banks of the river; within a few days almost every one of the party was laid up; some with ague, some with remittent fever, and others with dysentery.

Let us now proceed to consider a few of the predisposing causes of disease among the troops. In considering the predisposing causes of a disease, we must distinguish between the constitutional predisposition of the patient himself, and the causes which may lead to predisposition. Thus, we find, among a body of men, all exposed to the same causes of disease, both predisposing and exciting, that some are far more prone to disease than others. Nothing could have illustrated this better than some of the fever cases at Prome. Thus for instance, one man was admitted into hospital during the months of December, January, and February, no fewer than nine times with intermittent fever, and the same patient stated, that ten years before, he had been admitted into hospital at Meerut, seven times in three months, for the same complaint. Here, then, we have a remarkable predisposition to fever, which can only be explained by some peculiarity in the patient's constitution. Such a constitutional predisposition is well known to be induced by previous attacks of ague, and most of the men had suffered from ague during their service in India. A few of the men, however, who had been in India for nine or ten years without ever having had an attack of ague, were seized at Prome for the first time almost immediately after their arrival.

Among the causes tending to produce predisposition to disease, to which the men were exposed, may be mentioned the following:—

1. *Immigration* to a new country, even in the same latitude, has always been found to predispose to disease.

2. *Fatigue* debilitates the system, and thereby renders it more liable to be influenced by the exciting causes of disease.

3. *Travelling*, independent of great fatigue, has often been observed in India to predispose to disease, and we may expect that it will do so still more, when accompanied by fatigue, exposure to the inclemencies of the weather, and various privations, such as those to which we have found the troops we have been considering to have been exposed. The truth of this remark was forcibly illustrated by the marked difference in the amount of disease, in the three different detachments of the regiment already alluded to, and also by the great prevalence of sickness in the detachment, which was sent out into the district.

4. *Sleeplessness*.—We have already alluded to the fact, that the portion of the regiment which suffered most from disease, after its arrival at Prome, had scarcely slept any during their passage from Rangoon on account of the mosquitoes. Now we know, that want of sleep gives rise to a state of depression of the system greatly predisposing to disease.

5. *Depression of spirits* is well-known to be a powerful predisposing cause of disease, while cheerfulness is one of the best protecting influences against it. European troops in India, with nothing to occupy their minds, can seldom be said to be very cheerful; and this remark applied with double force to Burmah. In fact, there has been such an antipathy amongst our troops to going to Burmah, that *Burmah-phobia* may be reckoned as having been a very strong predisposing cause of disease.

6. *Bad food*.—As might be expected, the troops on going down to Burmah had few of the comparative luxuries to which they had previously been accustomed to in India, and this was particularly the case on their first arrival, and in the detachment sent out into the district.

7. *Bad water*.—We think we can scarcely include this among the causes of disease. The water of the Irrawaddy, which the men drank, though very muddy, yet after filtration through sand and charcoal, we found to be remarkably clear, and free from chemical impurities, containing only slight traces of chlorides, and carbonate and sulphate of lime. It may be mentioned, however, that the detachment sent into the district had to drink the unfiltered water from the native wells, which in many cases was thick and muddy.

8. *Intemperance*.—A small allowance of stimulants was no doubt useful under the circumstances in which the troops were placed; and the substitution of ale and porter for

spirits has always been found beneficial; but many of the men were intemperate, and thereby disposed their systems to the influence of the malaria.

9. *Night duty*.—Exposure to the night air in malarious districts has always been found very dangerous. The malarious poison appears in the night time to be in a state of concentration, while, at the same time, the system is more susceptible of its influence. Many of the men were first seized with fever when on sentry duty at night. We may here allude to the supposed injurious effects of sleeping in the light of the moon. It is a very general belief among old and experienced officers in India, that sleeping in the light of the moon is highly dangerous, producing paralysis of the face, fever, and other diseases. Many of these officers will bring forward cases, which they believe to be perfectly conclusive; but, among the many with whom we have conversed on this subject, we have found none who could bring forward a case in which the injurious effects did not admit of a more ready explanation from other concomitant circumstances, such as the evaporation of the night dew, malaria, &c. We are therefore inclined to disbelieve the baneful influences which have been attributed to the lunar rays.

We shall now mention one or two of what may be called the determining exciting causes of the diseases which prevailed. There is every probability, that a contagious or malarious poison may exist in the system for some time without manifesting itself, until some cause is brought into play which determines its manifestation. Of this nature the following may be enumerated as having been in operation at Prome:—

1. *Chills*.—These are well-known to be powerful exciting causes of many diseases, and in the case of malarious diseases they are no doubt as powerful determining exciting causes. We have seen that during the months of November and December the mornings at Prome were peculiarly chilly, and we may mention that most of the fever patients, who could give any cause for their illness, attributed it to cold, caught during a night march, or from throwing off their jacket on returning from parade in the morning, or from exposure to a cold draft during the night. In connexion with this, too, it may be observed that the walls of the men's barracks consisted only of thin matting, allowing currents of air to pass freely through, and affording but little protection from the cold.

2. *Exposure to the direct rays of the sun*.—We have already called attention to the great daily alternations of

temperature at Prome. Even when the morning was very chilly, the temperature during the day was high, and on no day was exposure to the sun's rays at all pleasant. The most of the men who were necessarily exposed, suffered from cephalalgia, and other symptoms of cerebral congestion, and many, a few hours after, were attacked by fever.

3. *Intemperance*.—Habitual intemperance has been already alluded to as a predisposing cause of disease. There can be no doubt also that individual acts of intemperance may act as determining exciting causes. On their first arrival at Prome, cases of intemperance among the men were not very frequent; but, after a few weeks, ennui drove them to the bottle, and cases of drunkenness were not rare. The liquors, too, which they had often recourse to, were most pernicious, being the native toddy, or fermented juice of the Tari palm, and Sham-shu, a very intoxicating liquid obtained by the Chinese by the distillation of rice.

The great influence of these predisposing and determining exciting causes, is well shown by the remarkable exemption from fever of all the officers, on whom these causes operated in a minor degree. During the first three months there were only two officers attacked by fever, and these were attacked under the following circumstances. On Sunday, November 27th, these two rode down to Shoaydong, eight miles distant, had a late dinner there, and at 11 P.M. started from Prome again by the river, in an open native boat. They were three or four hours rowing up against the current, and having neglected to take their cloaks with them, arrived at Prome, drenched with dew, and very cold. On the Tuesday following they were both attacked by intermittent fever, which lasted for some days. These cases are also interesting as regards the latent period of intermittent fever. In the agues of this country we know that the latent period sometimes extends over nine months, but in the tropics it would appear in general to be much shorter. In the above cases the latent period was less than two days; though, of course, it might be argued, that this had commenced previous to the 27th, and that the exposure to the night air only acted as determining exciting causes; but that this should have happened in both cases is not probable.

Again, the influence of these two classes of causes is shown by the remarkable prevalence of disease, where many of the causes were in operation at one and the same time, as, for instance, in the case of the first detachment of the regiment which arrived at Prome, and in that of the detachment sent into the district.

In my former paper I made some observations on the geographical and geological position, and on the climate of Prome, mentioned a few particulars connected with the arrival of the 2d Bengal European Regiment at that station in 1853, enumerated the diseases which prevailed in the regiment for some months after its arrival, and brought forward a few of the principal causes to which these diseases might with propriety be attributed. I now, in the fifth place, proceed to give a few more detailed observations on some of these diseases.

The great preponderance of febrile over other diseases has already been pointed out, upwards of 75 per cent. of the admissions into the hospital at headquarters, for the first three months after the arrival of the regiment at Prome, and upwards of 79 per cent. in the detachment sent into the district, being on account of this class of diseases. These fevers may be said to have been of two forms, the intermittent and remittent; for, though a few cases of continued fever were noted, yet, as already mentioned, they were very few in number, and closely approximated in characters to the remittent fevers, in all but the absence of a well marked period of remission. The number of cases of intermittent fever during the three months was 219; of remittent, 105; and of continued, 4; while, of the eighty-six cases of fever occurring in the detachment, just alluded to, seventy-nine were intermittent, and seven, remittent.

I shall, in the first place, make a few observations on the intermittent fevers, and afterwards on the remittent, contrasting the characters of the latter with those of the continued fever, which prevailed in the same regiment at Calcutta during the hot, dry months of May and June of the same year.

I. *Intermittent Fevers*.—Of the 219 cases of intermittent fever admitted into the hospital at Prome, 178, or 1·3 per cent., were quotidian, and 41, or 18·7 per cent., tertian; and of the 79 cases in the detachment 71, or 89 per cent., were quotidian, and the remainder, tertian. It must be observed, however, that a few of the quotidian cases might be called double quotidian, and a few of the tertian cases presented the form of what is called the double tertian, but care was taken to distinguish between these latter and quotidians. Again, a very few of the cases noted as tertian passed into the quotidian form, while a considerable number, about 5 per cent., of the quotidian cases, under the influence of treat-

ment, became tertian, before a complete cure was effected; and again, two or three cases of decided quotidian intermittents at first were observed to pass into the remittent form. The above proportion of tertian to quotidian cases is very different from what we find laid down in books on the subject. Thus, Dr Watson, in his lectures,¹ observes, "the tertian is by much the most common." Dr Copland says, "The most common of these is the tertian, which is considered the primary type of fever."² In the article, "Intermittent Fever," in Tweedie's Library of Medicine, the author states, "The quotidian but rarely occurs, and that a too hasty observation has confounded it with the double tertian form."³ Again, we find the following sentence in notes which we took from a clinical lecture by Dr Christison, March 19, 1850:—"Tertian is the most frequent, and hence may be regarded as the type." Among the intermittents which are met with in this country, the tertian is no doubt the most common form, but we believe this is seldom the case in the intermittents of India. As corroborating the results obtained by myself, I may mention those which have been lately published by Mr Waring of the Madras Medical Service.⁴ Out of 240 cases noted by this gentleman,

174 or 72·5	per cent. were quotidian,
3 or 1·25	„ double quotidian,
47 or 19·58	„ tertian,
6 or 2·5	„ quartan,
10 or 4·16	„ irregular.

It would be quite unnecessary to give any detailed history of these cases of intermittent fever, which only differed from ordinary cases of intermittent in the unusual tendency which many of the cases exhibited to a state of great prostration. Many of the cases, indeed, exactly coincided with the characters of Dr Copland's third species of intermittent fever, which he designates, "ague, with oppressed power."⁵ Thus, in the cold stage there were often no rigors, but only a feeling of chilliness, with or without slight horripilations. This feeling was accompanied or followed by great nausea, tenderness at the epigastrium, sometimes vomiting, a quick, small pulse, headache, pains in the back, moderate thirst, and dry, sallow skin. During the intermissions, too, there was great debility, a loaded tongue, sallow skin, morbid excretions,

¹ Vol. i., p. 723.

² Dict. of Pract. Medicine, vol. i., p. 935.

³ Vol. i., p. 219.

⁴ Indian Annals of Medical Science, October 1853.

⁵ Dictionary of Practical Medicine, vol. i., p. 936.

and headache. The following observations, however, may not be without interest, as bearing upon the hour of the commencement of the paroxysm, the frequency of certain symptoms and complications, &c., and the best mode of administering the quinine.

In the first place, I shall speak in reference to the *quotidian* intermittents. Of 115 cases of quotidian intermittents which came more immediately under my own care, I took careful notes, and from these notes have constructed a table,¹ of which these are the results, as bearing upon the following points:—

1. *The hour of commencement of the paroxysm.*

In 1 case the paroxysm commenced at					4 A.M.
1	...	...	...	...	5 ...
2	...	...	...	...	6 ...
4	...	...	...	...	6½ ...
4	...	...	...	...	7 ...
9	...	...	...	...	8 ...
3	...	...	...	...	8½ ...
15	...	...	...	...	9 ...
23	...	...	...	...	10 ...
19	...	...	...	...	11 ...
5	...	...	...	...	noon.
8	...	...	...	...	1 P.M.
9	...	...	...	...	2 ...
6	...	...	...	...	3 ...
1	...	...	...	...	4 ...
1	...	...	...	...	5 ...
1	...	...	...	...	6 ...
1	...	...	...	...	midnight.
2 hour of commencement not determined.					

The hours noted, are those at which the paroxysms commenced before admission into hospital, or before treatment. After the commencement of treatment, the paroxysms, if not at once checked, became gradually later in their hour of accession. It will thus be seen, that in 86 out of 113 cases, or in 76 per cent., the paroxysms commenced between midnight and noon (inclusive of the latter), and in 27 cases, or 24 per cent., between noon and midnight. The most frequent hours of commencement were 9, 10, and 11 A.M.; in 74 cases, or 65.5 per cent., the paroxysms commenced between 8 A.M. and noon inclusive. After these, the most frequent hours were 1, 2, or 3 P.M., 23 cases, or 20.3 per cent., occurring at one or other of these hours. These were undoubted cases of quotidian, notwithstanding Dr Shapter's doubts if the paroxysms of true quotidian ever commence after noon.¹ Of

¹ Owing to its great length, the table has not been published.

the remaining 16 cases, in 12 the hour of commencement was before 8 A.M., and in 4, after 3 P.M. It will be observed, that in one of the cases the paroxysms commenced at the very unusual hour of midnight. This man attributed the attack to a cold draught which blew upon him through the door of the quarter-guard, in which he was a prisoner, but it is worthy of remark, that in the case of the same patient, when he had ague nine years before, the paroxysms also came on at midnight, without any such cause being in operation.

We find that the above results correspond with the statements laid down by most writers on intermittent fever. Thus Dr Copland remarks,² "The quotidian usually begins in the morning." Dr Watson observes,³ "The paroxysms of the quotidian ague begin in the morning;" while Dr Shapter, in Tweedie's Library of Medicine,⁴ goes so far as to say, that it is doubtful if the disease can ever be considered a true quotidian, if it commences after noon, or during the night; but we have just seen, that in upwards of 20 per cent. of our cases, the paroxysms commenced between 1 and 3 P.M. inclusive, and we may mention that Mr Waring, of the Madras Medical Service, has recently recorded, from observations made on the intermittent fevers prevailing among the Burmese at Mergui, results very different from any of the above. He found the most frequent hour for the commencement of the paroxysm to be 2 P.M., and out of 240 cases the paroxysm commenced—

Between noon and midnight, in 156 cases, or 65 per cent.

Between midnight and noon,

(including latter hour), in 67 cases, or 28 per cent.

Irregularly, in 17 cases, or 7 per cent.

Mr Waring's results refer to all the species of intermittents; but, we have already seen, that 72½ per cent. of his cases were quotidian.

2. *Presence and severity of rigors.*—In order to form some idea on this matter, I have adopted a somewhat arbitrary classification of the cases, under the heads of severe, moderate, slight, or absent. We find then, that—

In 28 cases, or 24·3 per cent., the paroxysms commenced with *severe* rigors, lasting generally from one to two hours.

¹ Tweedie's Library of Medicine, vol. i., p. 219.

² Dictionary of Practical Medicine, vol. i., p. 935.

³ Lectures, vol. i., p. 723. ⁴ Vol. i., p. 219.

In 50 cases, or 43·4 per cent., the rigors were *moderate*, lasting from one half to one hour.

In 13 cases, or 11·3 per cent., the rigors were *slight*, or lasted only from five minutes to half an hour.

In 24 cases, or 20·7 per cent., there were no rigors.

We thus see that in upwards of 32 per cent. of the cases, the rigors were either absent or very slight, and we have already stated, that this has been observed to be characteristic of a low, adynamic form of intermittent. In these cases in which the rigors were absent, the hot stage was preceded only by a feeling of chilliness over the surface of the body, sometimes accompanied by creeping sensations, at other times by a feeling of numbness. Sometimes it was general over the surface of the body, at other times confined to the extremities, sometimes it lasted for several hours, but generally only for one or half an hour. It may be mentioned, also, that those cases, in which the rigors were absent, were generally men with the most debilitated constitutions. In 24 per cent. the rigors are noted as severe, but, as a general rule, the intensity of the cold stage bore no relation to the severity of the rest of the paroxysm. In four of the cases, though the fever returned every day at the same hour, it was only preceded by rigors every second day, the fever in these days coming on either at once, or being preceded only by slight chilliness. These have been classed with the cases in which the rigors were moderate, though, perhaps, with more propriety they should have been designated double tertian fevers, yet the other characters of the fever were precisely similar on each day. Of 240 cases of intermittent, treated in Burmah by Mr Waring, in 124 there was a distinct cold stage, while in 116 there was not.¹

3. *Headache* was an almost constant accompaniment of the hot stage. In one case only was it noted as entirely absent. This was the case before alluded to as peculiar in consequence of the fits of ague coming on at midnight, and in this case, there was scarcely any hot stage, perspiration succeeding almost immediately to the cold stage. Of the other 114 cases, in 9 the headache was noted as very violent; in 77, severe; and in 28, slight. The headache generally subsided or disappeared entirely during the third stage. In many cases, however, it remained rather severe during the whole of the intermissions, and in two of these cases it was ultimately relieved by copious epistaxis.

¹ Indian Annals of Medical Science, October 1853.

4. The fourth column in the table is intended to show the frequency of *enlargement of the liver and spleen*. It may be mentioned, that in almost every case in which the spleen was carefully examined by means of percussion, it was found to be considerably enlarged during the paroxysms, the enlargement subsiding spontaneously during the intermissions, whether quinine was administered or not. Those cases only, however, have been particularly noticed in which the splenic enlargement was considerable, permanent, and attended by pain or great tenderness, forming the subject of complaint by the patient, and sometimes requiring for its relief local depletion or counter-irritations. This was the case in 22 out of the 115 cases. The liver, as well as the spleen, was almost invariably slightly enlarged, and tender on pressure during the hot stage, owing, no doubt, to congestion of the portal system; but in nine cases there were symptoms of inflammatory action, the enlargement being considerable, permanent, and attended by pain and great tenderness, requiring for their relief local depletion and counter-irritation. Three of these nine cases corresponded with those in which there were also symptoms of inflammatory action in the spleen. The enlargement of these abdominal organs was, no doubt, in many cases the cause of the vomiting during the paroxysms, from their pressure on the stomach, while in others they seemed to give rise to a spasmodic cough, from their pressure on the diaphragm.

5. The fifth column indicates the frequency of such abdominal symptoms, as *nausea, vomiting, diarrhœa, &c.* All the cases were attended by more or less nausea during the paroxysms, but in 35 out of the 115 patients, or in 30.4 per cent., this symptom was particularly severe. In 28 out of these 35 cases, the nausea was accompanied by vomiting, the vomited matter being sometimes almost pure bile; 11 of these 28 cases corresponded with those already mentioned, as exhibiting symptoms of inflammatory action, either in the liver or spleen. The vomiting generally came on towards the end of the first stage, lasted during the greater part of the second, and subsided in the third. Sometimes, however, there was vomiting throughout the first or cold stage, and in one or two cases the paroxysms were ushered in by vomiting before even the rigors commenced. In two cases the vomiting continued during the intermissions, being apparently aggravated by the substitution of the pulvis cinchonæ for quinine. In 3 cases there was great flatulence, with severe abdominal pains. In 5 cases there was diarrhœa; in 4 of

these 5 cases there were also symptoms of hepatitis ; in the fifth, there were none.

6. In the sixth column I have noted the occurrence of *pulmonary complications*, which were by no means frequent. In 2 cases there was slight bronchitis, characterized by a wheezing cough, slight mucous expectoration, with sibilant, and a few moist rales. In 2 cases there was a severe spasmodic cough, with a feeling of great oppression about the chest, which symptoms invariably appeared at the commencement of each paroxysm, and subsided towards its termination. In one case there was pharyngitis, which came on the third day, and was easily subdued.

7. The *urine* in four or five cases in which it was carefully examined, was invariably found to be scanty, dark-coloured, acid, of high specific gravity, and containing no albumen, during the paroxysms. No unusual deposit of lithates was found during the intermissions, or in convalescence.

8. In the eighth column is shown the occurrence of *nervous complications*. Pains in the back and loins were by no means uncommon, but in 5 cases they were peculiarly severe, and formed the subject of great complaint by the patient. In one case the paroxysms were invariably accompanied by severe pains in all the joints. In another there were severe deep-seated pains in the bones. In one patient, during two separate attacks, the hot stage was always accompanied by severe cramps in the feet and calves of the legs, these parts remaining very tender for some days after the paroxysms had been checked. In another case, the paroxysms were always attended by violent neuralgic pain confined to one spot situated about an inch behind the lobe of the right ear. This man stated, that the same distressing symptom had accompanied previous attacks of intermittent fever in Bengal. It was generally much relieved by an opium plaster.

9. *Cutaneous Eruptions*.—In one case, during the second paroxysm, an eruption of urticaria came out over the arms and thorax, disappearing next day, and followed by a herpetic eruption round the lips, which continued for some days. This same patient had a complication of organic diseases, hypertrophy of the heart, liver, &c., and it was observed, that, during the hot stage, the pain in the cardiac region was always very much increased.

10. *Epistaxis*.—In 3 cases, two of which were double quotidiens, there was copious epistaxis. In all these cases there had been violent headache, to which the epistaxis gave great and immediate relief.

11. As regards the *premonitory symptoms*, those most frequently observed, were yawning and extreme lassitude for from half-an-hour to several hours before the commencement of the cold stage. In a few cases the patients felt dull and listless, for several days before the first paroxysm. In some cases these rigors were preceded by great chilliness, and creeping sensations for some hours, while in not a few cases, there were no premonitory symptoms whatever. In several cases, the paroxysms came on during a convalescence from remittent fever, or previous attacks of intermittent.

12. The next column shows the *duration of the paroxysms* in the cases in which this was accurately determined. This was done in 95 out of 115 cases, with the following results—

In 1 case the paroxysm lasted 2 hours.

2 cases	...	...	3	...
2	...	...	4	...
14	...	...	5	...
14	...	...	6	...
20	...	...	7	...
27	...	...	8	...
4	...	...	9	...
6	...	...	10	...
1	...	...	12	...
3	...	...	14	...
1	...	...	16	...

In estimating the duration of the paroxysms, the third stage was scarcely included, but the duration was counted from the commencement of the rigors until the full establishment of perspiration. We thus see that the ordinary duration was 7 or 8 hours; the longest, 16 hours; the shortest, 2; and the average, $7\frac{2}{3}$ hours. This is somewhat under the duration laid down by most writers. With regard to the duration of the paroxysm, Dr Copland, speaking of intermittents generally, remarks, it "varies from 4 to 16 hours, the common length of it being about 6 or 7," while that of the quotidian "continues the longest."¹ Dr Watson says, "The average duration of the paroxysm the quotidian is 10 or 12 hours;"² and Dr Jos. Brown says, "It will be very near the truth, to estimate the mean length of the whole paroxysm at 16 hours."³ But this estimate would appear to be rather above the mark.

13. The next column shews the number of days each patient remained in hospital after the last paroxysm; and it was drawn up, in order to form some idea of the degree of

¹ Dict. of Pract. Med., vol. i., 935.

² Lectures, vol. i., p. 723.

³ Cyclopædia of Pract. Med., ii., p. 221.

debility produced in the different cases, by considering the length of time, which elapsed before the patient was able to return to his duty. After his discharge from hospital, each patient was in general excused from duty for two days.

3 Patients were discharged on the 1st day after last paroxysm.

17	...	...	...	2d	...	...
21	...	...	...	3d	...	...
44	...	...	...	4th	...	...
10	...	...	...	5th	...	...
12	...	...	...	6th	...	...
2	...	...	...	7th	...	...
1	...	...	...	9th	...	...
1	...	...	...	10th	...	...
1	...	...	...	12th	...	...
3	...	...	...	15th	...	...

Most of the patients were discharged before the fifth day, and all, except eight, before the seventh. The average stay was $4\frac{2}{15}$ days. Those detained in hospital longer than the usual period, had some organic disease in addition to the fever.

The remaining portion of the table has reference to a very important point in the treatment of intermittent fever, viz., the best way of administering quinine, so as to prevent a return of the paroxysms. Some have recommended the administration of the quinine during the paroxysms, but this is a practice which few have ever followed. It has been a matter of considerable question, however, whether the quinine should be given in one large dose, or in repeated small doses during the intermissions. Dr Home of Edinburgh, from his experiments, pronounced in favour of the repeated small doses, as also Dr Barker of Dublin.¹ Dr Brown, in the *Cyclopædia of Practical Medicine*,² recommends two grains every three hours, or four every six, during the intermissions; but he allows, that in those cases in which "life probably depends on the prevention of a paroxysm," it should be given in much larger doses, such as a scruple. Dr Watson³ of London is also favourable to the repeated small doses, amounting to 12 grains in the 24 hours, which plan, he says, he has found most successful, though, at the same time, he acknowledges, that a "very few paroxysms have occurred after the patient has begun to take the medicine." He also urges this plan on economical grounds, it being our object, he says, to make the cure "as cheap as possible." On the other hand, we have practitioners recommending large doses. Dr Elliotson gave a large dose just after the paroxysm, and smaller repeated doses during the remainder of the intermission,

¹ Dr Watson's Lectures, vol. i., p. 765.

² Vol. ii., p. 220.

³ Lectures, *loc. cit.*

amounting, in all, to 20 or 30 grains in 24 hours.¹ Dr Copland recommends a full dose, 6 to 8 grains, immediately after the fit, or shortly before its return, or a large dose followed by smaller doses every three or four hours.² Dr Shapter, in Tweedie's Library of Medicine,³ remarks, "Some physicians have administered it to the extent of 20 grains at a dose, and have by this means succeeded in putting an immediate stop to the disease."

Dr Christison, in his Dispensatory,⁴ says, the intermittents of the Tropics require 36 or 40 grains on an average; and, in a clinical lecture delivered in Edinburgh (March 19, 1850), he stated, "It is better to give a large dose at once, such as 36 grains, which has been shown to be the average amount required in India." Dr Christison informs me, that his calculation, that 36 grains was the average dose necessary for the cure of tropical intermittents, was deduced from reports on the febrifuge virtues of quina, made by medical officers of the Madras army, at the request of the Medical Board, and published in the Madras Medical Reports for 1831.

In America, the medium dose is stated by Dr Watson to be eight grains.⁵

Continental practitioners seem to be also in favour of the repeated small doses. Thus Rayer, in his article on fever, speaking of French practitioners, says, that though sometimes 5, 10, 20, or even 30 grains are given at one dose, yet the great majority of practitioners, in place of giving one large dose, divide it into several, which are given at intervals of one or two hours, during the intermissions.⁶

In Italy, Dr Watson says, the physicians find small doses inadequate, and are in the habit of giving 12, 24, or even 30 grains at a time.⁷ I found myself, however, during a protracted residence in the north of Italy, that the general practice consisted in administering repeated small doses. On the other hand, we find a German physician, Dr Pfeufer of Heidelberg, recommending the administration of a single large dose, in preference to the repeated small ones.⁸

In India the practice by repeated small doses has been, and still is, the most general; and I myself shall never forget the look of astonishment with which an apothecary of some standing in the Indian service regarded me, when the "new assistant-surgeon" ordered a scruple dose of quinine. The attention of the profession in India, however, is being now called to the superiority of the treatment by large doses,

¹ Lectures, Lond. Med. Gazette, vol. x. p. 237.

² Vol. i., p. 943.

³ Vol. i.,

⁴ Christison's Dispensatory, p. 774.

⁵ Lectures, vol. i., p. 766.

⁶ Diction. de Medecine et Chirurgie, tom. viii., p. 145.

⁷ Lectures, loc. cit.

⁸ British and Foreign Med. Chir. Review, April 1850.

and principally owing to the advice of the late superintending surgeon Corbyn, who, in a published annual report on European troops,¹ states, that he has long been convinced of the efficacy of this mode of giving quinine, and mentions the results of the experience of several medical officers, to whom he had recommended the practice. Of these, Dr Mackinnon, who had been in the habit of giving half-drachm doses of quinine at the termination of the sweating stage, says, "I have never seen it fail to put a stop to the disease at once." Dr Mactier speaks equally favourably of the practice.

On my first arrival in India, I had resolved to put to the test of experiment the practice recommended by my former preceptor, Dr Christison; and I was not a little gratified in afterwards finding, by the published report of Dr Corbyn, that results, equally favourable with my own, had been obtained by other observers. The result of my observations, then, on the 115 cases, goes to prove that the practice most effectual in at once checking the paroxysms of ague, is that of administering one large dose of quinine during the third or sweating stage. The usual dose given was 20 grains in a draught, with a few drops of sulphuric acid to increase the solubility of the salt. Generally this was followed by a few 2-grain doses, twice or thrice a-day, *per precauzione*, as the Italians say; but I believe that this is hardly necessary. In no case, even in those in which there had been violent headache and other symptoms of cerebral congestion during the paroxysm, did I observe any unpleasant symptoms from the physiological action of the drug. Many of the patients complained of slight buzzing sounds in the ears, but I believe that more or less of this symptom is necessary for the sure success of the medicine; at all events, when it occurs, it is a sign that there is no use of pushing the medicine further. In 95 of the 115 cases, this treatment by the one large dose was adopted. In 56 of these 95 cases, or 59 per cent., the paroxysms were at once checked, there being no return after the administration of the single large dose of quinine. In 36 cases, or 37·9 per cent., there was only one paroxysm; and in 3 cases, or 3·15 per cent., two paroxysms, after the quinine. In all the cases, moreover, in which there were any paroxysms subsequent to the administration of the large dose of quinine, these were much milder than the preceding ones, often not occurring, until after the intermission of upwards of 24 hours, or being unaccompanied by rigors in the cold stage; while, in several instances they appeared to be owing to costiveness of the bowels; for it seemed necessary for the

¹ Indian Annals of Medical Science, vol. i., October 1853.

successful administration of quinine by any plan, that the bowels should be freely moved.

Again, in 16 out of the 115 cases, the ordinary plan of treatment was followed by repeated small doses of two or three grains of quinine, during the intermissions. In not one of them were the paroxysms at once checked; five of them had one paroxysm after the commencement of the quinine; 7 of them had two; and 4, three. Moreover, if we may reckon as any indication of the inveteracy of the fever, as I think we are fairly warranted in doing, the number of paroxysms which have preceded the commencement of treatment, the 95 cases, in which the paroxysms were almost at once checked by the one large dose, were, on the whole, more inveterate than the 16, in which the other plan of treatment was adopted. Thus we find, by another column in the table, that the average number of paroxysms before treatment, in the 95 former cases, was $2\frac{1}{2}$, or rather more than $2\frac{3}{4}$, while the average in the 16 latter cases, was only $2\frac{1}{2}$. The above facts will speak for themselves. For the success of the treatment, it is necessary that the large dose be given during the third stage, and as near its commencement as possible. It is far from being so effectual, when given during the intermissions between two paroxysms, or a few hours before the expected commencement of a paroxysm, as is recommended by some writers. Thus, in the 4 cases which remain of the 115, the large doses were given during the intermissions: in not one of them were the paroxysms at once checked; 2 of them had two subsequent paroxysms, the other two had one, the average number of paroxysms before treatment in the 4 cases being two. Lastly, I always gave instructions that the quinine should be given, as soon as the patient began to perspire freely after the hot stage.

Again, in answer to Dr Watson's other argument in favour of the repeated small doses, that it is the cheapest, we would reply that we believe such is not the case. Not only is the plan of treatment above recommended the most efficacious in checking the paroxysms, it is also the most economical as regards the expenditure of quinine. This, too, is a point of the highest importance, when we consider the immense expense the purchase of quinine must cost our Indian government annually, and the chances there are of the supplies of the drug at some future period running short. We have already stated, on the authority of Dr Christison, that the average amount of quinine found necessary to check the paroxysms of ague in India was about 36 grains, and we believe that this quantity is often greatly exceeded. The contrast, however, between

the two different plans of treatment, as regards the expenditure of quinine, is very striking.¹ In 92 cases treated by one large dose given during the third stage, the average quantity required to check the paroxysms was only $23\frac{3}{4}$ grains, while in those treated by repeated small doses, the average quantity required for the same purpose, was almost double, or $45\frac{1}{4}$ grains. In addition to the advantages of the plan of giving quinine just recommended, on the grounds of its greater efficacy and economy, there are others which may be mentioned. Thus, it enables the patients to return to their duty much sooner than the old plan—a matter of no small importance in military practice; and it gives less trouble to the apothecaries and hospital attendants.

As regards the treatment pursued during the paroxysms, I have nothing of much consequence to mention. Eight to twelve leeches were applied to the forehead in those cases in which the headache was very violent, or over the liver or spleen when there were symptoms of inflammatory action in these organs; but even these were applied only when they appeared absolutely necessary, and with a sparing hand, owing to the adynamic tendency of the fever already alluded to. In those cases in which depletion of any kind appeared contra-indicated from the debilitated state of the system, great relief to the headache was derived from cutting the hair short, and applying cold lotions or the cold douche. In all cases diluent drinks were freely administered, and repeated small doses of a saline diaphoretic mixture, each dose containing about $\frac{1}{2}$ th of a grain of tartarised antimony. Purgatives, generally calomel and compound jalap, were administered in most cases soon after admission into hospital, unless contra-indicated by the state of the bowels or great debility. Free action of the bowels appeared to be necessary for the success of the quinine. In several of the cases in which the first dose of quinine was unsuccessful, this appeared to be owing to the bowels remaining constipated, notwithstanding the exhibition of purgatives. Dr Mackinnon, however, states that he gave the large doses of quinine “without any reference to the state of the bowels.”² An emetic (pulv. ipecac. \mathfrak{z} j. ant. pot. tart. gr. j.) was given in many cases at the very commencement of the paroxysm, and generally with the effect of shortening its duration and diminishing its severity. Opiates given during the hot stage were seldom followed by the beneficial results, ascribed to them by Dr Lind.

¹ Three of the 95 cases are here excluded, in consequence of the powder of cinchona having been partially substituted for the quinine, which would interfere with the calculations.

² Indian Annals of Medical Science, *loc. cit.*

After the paroxysms had been checked by the large dose of quinine, a few small doses of quinine or powdered cinchona were sometimes given for a day or two, to prevent the possibility of a relapse, strengthen the system, and increase the appetite; but what was found as effectual a remedy for this purpose was the decoction of the Indian plant, chiretta, (*agathotes chirayta*) with the liquor arsenicalis,—a fluid ounce of the former, to five drops of the latter, given two or three times a day. In the case of the native sepoys, who are more easily influenced by medicines than Europeans, I in most cases found the chiretta alone sufficient for checking the paroxysms, and in very few cases was it necessary to resort to quinine. The liquor arsenicalis, though not nearly so powerful as quinine in checking the paroxysms of intermittent fever, appeared to be an admirable substitute for it, when once the paroxysms had been checked; and its substitution for quinine, under these circumstances, tended still farther to economise the latter valuable drug,—a point of great importance in any public service or establishment. I believe that even in the most inveterate cases of intermittent fever, 25 grains of quinine properly administered should very seldom fail to be sufficient for effecting a cure. With regard to the liquor arsenicalis it may also be stated, that in the case of certain patients who exhibited a remarkable proneness to fever, this medicine, in frequent small doses after the paroxysms had been checked by quinine, seemed to preserve a longer immunity from subsequent attacks than either quinine or cinchona, though the only certain preventive in such cases was a complete change of air. Again, it has been found, in some cases of ague which have been cured by quinine and suffer a relapse, that quinine is not equally effectual a second time, and that then the liquor arsenicalis will generally prove effectual. The superiority of the sulphate of quinine over the crude cinchona was very striking. In several cases in which this was substituted for quinine, it appeared to give rise to distressing nausea and vomiting, and from its bulk it could never be given in doses sufficiently large, to correspond with the quantity of quinine necessary for the most successful treatment of ague. Estimating that bark will yield 2 per cent. of sulphate of quinine,¹ 20 grains of the salt would correspond to 1000 grains, or upwards of 2 ounces of bark,—a quantity next to impossible to take at one dose.

In addition to the 115 cases of simple quotidian, two cases

¹ Christison's Dispensatory, 2d ed., p. 770. Neligan's Mat. Medica, 2d ed., p. 385-6. The small quantity of amorphous quinine existing in the bark is not taken into account.

of *double quotidian* came under my notice. In one of these there were two paroxysms in the day, commencing at 10 A.M. and 10 P.M., and lasting six or seven hours. Twenty grains of quinine were given in the third stage of the second paroxysm, and there was no return. In the other case, there were three paroxysms, commencing at 9 P.M., 9½ A.M., and 10 P.M., and lasting seven or eight hours. Eight grains of quinine were given in four doses between the second and third paroxysm, and 20 grains in the third stage of the third paroxysm. Both of these patients suffered from violent headache, which was relieved towards the termination of the paroxysms by copious epistaxis.

I now come to consider the cases of *tertian* intermittent. I have already stated, that these bore but a small proportion in number to the cases of quotidian intermittent, and I may observe, that with the exception perhaps of the four cases above mentioned, cases of double tertian were not confounded with quotidian. On the first arrival of the regiment at Prome, scarcely any cases of tertian ague occurred for some weeks, but towards the end of November and in December, the proportion of tertian cases increased, and, as we have seen, 41 cases were admitted into the hospital at Prome up to the end of January, and 8 cases were admitted out of the detachment sent into the Tharawaddy district. Of course, we refer here only to those cases of a tertian type *ab initio*, and do not include those cases already alluded to, as originally quotidian, and lapsing into tertian under treatment. Twenty-three cases of tertian intermittent came under my own care, and I shall now state, as briefly as possible, a few observations drawn from our notes of these cases, bearing upon some of the points already dwelt on, in connection with quotidian intermittent.

1. *Hour of Commencement of Paroxysm.*

In 1 case this was				In 2 cases this was			
			6 A.M.				noon.
1	...	...	8½ ...	1	...	...	1 P.M.
1	...	...	8 ...	1	...	...	1½ ...
4	...	...	9 ...	2	...	...	3 ...
3	...	...	10 ...	1	...	...	not determined.
6	...	...	11 ...				

While the paroxysms of the quotidian intermittent are generally described as commencing in the morning, those of the tertian are said usually to appear at noon;¹ and certainly as far as our limited statistics go to prove the matter, the proportion of the cases, in which the paroxysms commenced in the hours immediately preceding and following noon, is

¹ Copland's Dict. of Pract. Med., vol. i., p. 935. Watson's Lectures, i. 723.

greater in the case of the tertian, than in the quotidian cases. Thus, in the case of the tertian, 12 out of 22 cases commenced between the hours of 11 A.M. and 3 P.M. inclusive, or 54·5 per cent., while of the 115 cases of quotidian only 47 cases or 40·8 per cent. commenced within the same period.

2. *Rigors*.—In 19 of the 23 cases, or 82·6 per cent., the paroxysms commenced with rigors, generally severe; in 4 cases there were none, and the cold stage consisted only in a feeling of chilliness over the surface of the body. The proportion of cases in which the rigors were absent, is very similar to what we found to be the case in the quotidian form.

3. *Headache*, generally severe, was an almost constant symptom during the hot stage. In one case only was there none.

4. *Enlargement of the spleen*.—In all the cases which were examined with care, this organ was found more or less enlarged during the paroxysms, but in only one case was this enlargement permanent and attended by much pain.

5. *Nausea and vomiting* were frequent symptoms.

6. *Pulmonary symptoms*.—In three of the cases there was a severe spasmodic cough during the paroxysms, probably owing to the pressure of the enlarged spleen upon the diaphragm. In one case there was slight pharyngitis.

7. *Urinary symptoms*.—In one case there were severe pains, resembling those produced by the passage of a stone from the kidneys down to the bladder—great pain in the region of the kidneys stretching down the thighs, with scanty, high-coloured, scalding urine. No gravel, however, could be detected in the urine.

8. *Administration of the quinine*.—The observations we have already made, on the best mode of administering the quinine in the quotidian intermittents, apply with equal force to the tertian. Here also it was found, that the administration of one large dose at the commencement of the third stage was not only the most efficacious in at once checking the paroxysms, but also the most economical as regards the expenditure of quinine. The truth of this will appear from the following results:—In 18 out of the 23 cases this treatment was followed, and in 14 cases, or 77·7 per cent. the paroxysms were at once checked, while in the remaining 4 cases only one paroxysm followed the administration of the quinine. In all these 4 cases, too, the subsequent paroxysms were very slight; in one case there were no rigors, and in two the want of success from the quinine was probably owing to the bowels remaining very costive. On the other hand, of the remaining 5 cases, in which the quinine was given in repeated small doses during the intermissions, one had three

paroxysms subsequent to the commencement of treatment, another had two, and two had one; in one case only of the 5 were the paroxysms at once checked. As regards the consumption of quinine in the treatment by the large doses, it was found, that the average amount necessary to check the paroxysms was only $25\frac{5}{7}$ grains, while in the treatment by repeated small doses, the quantity necessary for the same purpose amounted to 37 grains. Here then was a difference of 11 grains in the average amount, according to the two modes of treatment, and we believe that with larger data the contrast would be shown to be still more striking. It may be also observed, that those cases treated by the one large dose, appear on the whole to have been more inveterate than the others, if we may judge of the inveteracy from the number of paroxysms which preceded the treatment. The average number of these in the first 18 cases was $2\frac{1}{2}$; in the last 5, only 2.

One case of *double tertian* came under my notice, in which the paroxysms, though daily, commenced at 8 A.M. and 6 P.M. in the alternate days.

The following statements will, I think, demonstrate to all the importance of studying the mode in which quinine may be administered most economically in intermittent fevers. I have taken considerable trouble to learn the amount of quinine annually sent out to our Indian possessions, and have ascertained, that, during the three years 1851, '52, '53, there were sent out to the three presidencies—

3,804 pounds	avoirdupois	of disulphate of quinine.
12,690	do.	do. cinchona bark.
5,050 ounces	do.	amorphous sulphate of quinine.

Now, putting aside the cinchona and amorphous quinine, we shall suppose that three-fourths of the 3804 pounds of the disulphate were employed for arresting the paroxysms of intermittent fever. Three-fourths of 3804 pounds would be 2853 pounds, or 19,971,000 grains. Now, according to Dr Christison's calculations from the Madras reports, that it requires on an average 36 grains of the disulphate to cure a tropical intermittent, the above quantity might be expected to cure 554,750 cases. But, supposing the average quantity found necessary in each case not to exceed on an average 25 grains, which, as we have seen, was found sufficient in the severe intermittents of Burmah, the same number of cases might be cured by 13,868,750 grains,—thus saving 6,102,250 grains, or 13,948 ounces avoirdupois. Now at the present selling price of quinine in bulk, about nine shillings an ounce, 13,948 ounces would amount in value to £6276, 12s., which sum would have been the difference in the expense

between the two modes of giving quinine, for the three years, supposing that either one or other of the modes of giving quinine had been exclusively adopted, or, in other words, the difference in the expense of the two modes of treatment would have amounted to upwards of £2000 sterling per annum.

Another point worthy of consideration, in an economical point of view, in our military hospitals in the East, would be whether the *amorphous* quinine might be advantageously substituted for the crystallized disulphate. From the mother liquors from which the disulphate of quinine has been crystallized, a substance has been obtained, presenting the character of an organic base, and which has been named chinoidine. The quantity obtained varies, but seldom exceeds 3 per cent. of the amount of disulphate which has previously been obtained from the mother liquor. From this chinoidine *amorphous* sulphate of quinine is obtained in quantities varying from 10 to 60 per cent., according to the quality of the bark which has originally been employed, and the mode of obtaining it which has been followed. The bark known in commerce as the "monopoly bark" of the Bolivian government yields it in largest quantity. Amorphous quinine is isomeric in chemical composition with the alkaloid of the crystalline disulphate, but it is impossible to obtain it, either separately or combined, in the crystalline form. Dr Christison observes, in the second edition of his Dispensatory (p. 979), that amorphous quinine "never has come much into use in this country;" but adds, "were its supposed virtues substantiated, it would be important in an economic point of view." But we have already seen, that during the three years, 1851, '52, and '53, 5050 ounces avoirdupois were exported to India, or, on an average, 1683 ounces per annum; and I am informed by the Messrs Bullock of this city, that they supply upwards of 2000 ounces annually for home consumption. In India, some practitioners prefer the amorphous to the crystalline disulphate, and it has been thought by some to be more rapidly assimilated into the system, so as to produce its physiological action. A single dose of four grains has been said to produce all the symptoms of cinchonism. Now, the amorphous sulphate can be obtained much cheaper than the crystalline, or, on the large scale, about 5s. an ounce. During the three years, 1851 to 1853, we have seen that 3804 pounds avoirdupois of crystallized disulphate were sent out to India, and, at 9s. an ounce, this quantity must have cost £27,388, 16s. Supposing, then, that the amorphous sulphate could be obtained in sufficient quantity, and had been substituted for the crystallized, 3804

pounds avoirdupois of the amorphous salt, at 5s. an ounce, would have cost only £15,216, or there would have been a saving, during the three years, of £12,172, 16s. Experiments, however, are still wanting on the comparative value of the crystallized and amorphous quinine, but the subject is one which is of high importance, and certainly merits investigation. I may observe, that the amorphous sulphate of quinine is very conveniently administered in the form of solution.¹

II. We now come to consider the cases of *remittent fever*. From the arrival of the troops at Prome in October, up to the end of January, 105 cases of remittent fever were admitted into hospital at head-quarters, 5 of whom died. From the detachment of the Fusiliers sent into the Tharawaddy district, 9 cases were admitted, of whom 1 died, and of 8 cases from the detachment of the Madras Horse Artillery, 1 died. The disease was most prevalent and severe on the first arrival of the troops, immediately after the rains, and gradually decreased both in the number of cases, and in severity, as the air and ground became drier, till in February it almost completely disappeared. Thus—

In November	there were	48	admissions of	remittent	fever.
In December	...	48	...	...	...
In January	...	9	...	...	...

while all the 5 fatal cases at Prome occurred during the month of November. This greater frequency and severity at first, may in some measure be attributed to the fact of the men having but newly arrived in the country, but it was probably principally owing to the morbid influence, which induced the disease, being generated more sparingly and in a less concentrated state as the soil became drier, and being ultimately only sufficiently powerful to produce intermittents. We have no hesitation in maintaining, that the exciting cause in these remittent and intermittent fevers was one and the same, differing only in their power. Many of the cases of intermittent closely resembled cases of remittent, except in their being a distinct intermission, in place of only a remission, and I have myself observed cases, at first decidedly intermittent in their character, pass into the remittent form, and even ultimately prove fatal. Case III. illustrates this.

¹ A solution is prepared on the large scale by Messrs Bullock of Conduit Street, Hanover Square, five fluid ounces of which contain one ounce of amorphous sulphate of quinine, and about 25 per cent. of spirit. Five drops of this solution contain a grain of the quinine. This solution has been found to keep perfectly well in India. The only objection to it, perhaps, is that it is not quite so portable as the disulphate. To the kindness of the Messrs Bullock I am indebted for the above information, relative to the manufacture of the amorphous quinine.

This remittent fever, as we have already repeatedly had occasion to observe, was essentially *adynamic* in its character, with a tendency to become even typhoid. It belonged, without doubt, to that form of remittent fever which Dr Copland very appropriately designates "*the adynamic or malignant remittent*," and which he adds, "is one of the severest and most fatal of endemic fevers," and one of "the scourges of inter-tropical countries."¹ I propose, in the first place, to give a few details connected with the causes, symptoms, treatment, and *post-mortem* appearances of this remittent fever, as I observed it in Burmah; secondly, to bring forward a few illustrative cases, and in the third place, to contrast with it the characters of the continued fever observed in the same regiment at Calcutta, during the previous dry season.

I. Description of the Remittent Fever prevailing at Prome after the Rainy Season of 1853.

1. *Type*.—This was essentially asthenic, few of the cases bearing any amount of depletion, the bad effects of which were well evidenced in two of the cases afterwards to be detailed. In one of these the venesection undoubtedly favoured, if it did not produce the fatal result, while the other would probably have terminated fatally, but for the timely use of stimulants. It was observed that the pulse, though always quick and often full during the febrile exacerbations, was invariably soft and easily compressible, and towards the termination of fatal cases, it became weak or imperceptible at the wrist, while typhoid symptoms supervened, the condition of the patient exactly resembling that of patients labouring under European typhus at an advanced stage. The fever was remittent, but in the nature of the remissions there was considerable variety; these in some cases being well marked, or even approaching to intermissions, while, in most cases, they were slight, and in a few the fever might almost be said to have been continued. In young and robust recruits who had but recently arrived in India, the fever at first was observed to be more sthenic, with a tendency to become continued, and the delirium was less typhoid, but even these cases ultimately lapsed into the prevailing low typhoid condition.

2. The *causes* of the fever may be considered under the heads of predisposing, exciting, and determining exciting causes. All these causes have already been dwelt on, and therefore we shall now merely allude to them. Among the

¹ Copland's Dict. of Pract. Med., vol. i., pp. 948-953.

predisposing causes may be mentioned *bad food*, such as mouldy flour, old biscuits, tough beef, and want of vegetables, with many other of the ordinary necessities of life; *fatigue* from travelling, and those other influences which seem to operate after a journey in predisposing people to disease; *low spirits*, arising from the bad reports of the climate, from the knowledge of the numbers who had fallen victims to it, and from the wives and families of the men having been left behind in India. A torpid condition of the bowels and debility from previous attacks of intermittent, or any other cause, were no doubt also predisposing causes. Among the determining exciting causes, or those which appeared directly to induce the disease, may be mentioned exposure to the cold damp night air, exposure to the heat of the sun, the sudden alternations of temperature, individual acts of intemperance, especially from strong liquors, such as "shamshoo," a chill produced by throwing off the clothes during perspiration after parade, or by a deficiency of bed-clothing, &c. The exciting cause, in all instances, was undoubtedly malarious emanations from the soil. Dr Chambers has attributed remittents to two principal sources, viz., marsh miasmata, and "sudden vicissitudes of atmospheric temperature, precipitating some other deleterious principle evolved from hidden sources."¹ Both these causes were in operation at Prome, as we have already seen. I should be inclined, however, to consider the former as the one exciting cause, and the latter as only a predisposing, or perhaps sometimes a determining exciting cause. We have no evidence of the generation of an "other deleterious principle" in the atmosphere; and indeed, as we have already stated, the substantial existence of malaria themselves has never yet been demonstrated. The sudden alternations of temperature, however, may act in this way; the sudden diminutions of temperature may condense the malaria, and thus present them in a more concentrated form to the system, while, at the same time, it predisposes this to be affected by them. We have already stated our belief, that the malarious poison which gives rise to the remittent forms of fever, was the same as that which produced intermittents, differing only in their power or degree of concentration. Thus the remittents were most numerous shortly after the cessation of the rains, a period in which we know that the causes of malaria are in greatest operation, and decreased as the air and soil became drier. Thus during November there were 48 cases, in December also 48, but in January only 9; moreover, the cases not only diminished in numbers as the

¹ Copland's Dict. of Pract. Med., i., p. 946.

season became drier, they also decreased in severity, until, in the month of January, they appeared gradually to pass into intermittents. Lastly, several cases were observed in which the fever, at first decidedly intermittent, passed into the remittent form with all the usual adynamic symptoms.

3. *Premonitory Symptoms.*—Among these were observed listlessness, a feeling of heaviness, nausea, want of appetite, anxiety, lassitude, pain at the epigastrium, pains in the loins and limbs, headache, slow, small, sometimes irregular pulse, coldness of the skin, and chilliness for one or several days before the commencement of the attack. At other times the febrile symptoms came on at once or were only preceded by a feeling of coldness for about half an hour. Rigors were never observed, yet the attack generally commenced with a feeling of great chilliness, lasting for several hours or whole night. Sometimes along with this chilliness, there was severe vomiting. In a few cases the fever was not even preceded by chilliness, but commenced with a burning heat of the skin. In one case it commenced with severe cramps in the lower extremities, which continued during all the exacerbations of the fever, subsiding during the remissions. Other cases, again, commenced as intermittents, which, from the intermissions becoming less marked, passed into remittents.

4. *Symptoms during the attack.*—In considering these, we must distinguish between those of the exacerbations, and those of the remissions. The exacerbation, whether preceded or not by a premonitory stage of chilliness, generally commenced in the forenoon of the day or early in the afternoon, subsiding towards evening or in the early part of the night, the remissions being generally most complete early in the morning. Sometimes, however, the exacerbations came on towards evening and lasted all night, the remissions being then most complete in the forenoon, while, in a few cases, there were two exacerbations in the course of the 24 hours, commencing about 9 A.M. and 9 P.M. These last cases were the most severe. The following were the principal symptoms during the exacerbations:—The skin was warm and dry, with sometimes a feeling of roughness. The pulse varied from 90 to 120, was generally at first full, but sometimes from the first small, and always so latterly, and invariably soft and easily compressible. The tongue was dry, with a white, sometimes yellowish fur, and a bad taste was complained of in the mouth. There were also great unquenchable thirst and parched lips, tenderness at the epigastrium, and sometimes pain with increased dulness on percussion in the region of the liver; often vomiting of dark

grumous looking matter, mingled with bile, and costiveness. There was almost invariably severe headache; this was seldom of the acute throbbing character of the headache in the continued fever of the dry season in Calcutta, but the patients complained rather of a feeling of tightness or constriction round about the head. Inability to sleep was almost constant. Pains in the loins and limbs were very common; sometimes there were aching pains in the joints, and in one case severe cramps in the muscles of the lower extremities. The urine was scanty, high-coloured, of high specific gravity (1024 to 1030), acid, not coagulable by heat and nitric acid; albumen was tested for in numerous instances, but never detected. The first exacerbation was generally the longest, lasting in some cases for 28 or 20 hours, but generally after 12 or 16 hours the symptoms remitted to a greater or less extent, the headache and thirst becoming less, the pulse falling to from 70 to 84, and becoming less full and softer, the skin cooler, with sometimes a slight moisture, or even a considerable perspiration, while, at the same time, combined with a great amount of languor, there was a general feeling of greater ease. This remission generally lasted for 6 or 8 hours, and was then followed by another exacerbation; the remission being always more complete, the more closely the fever assumed the intermittent form. About the fourth paroxysm in most cases, delirium with more or less loss of consciousness, supervened. This delirium was of a low wandering character, though in one or two cases of young and robust patients it was at first rather acute, yet even in these it soon merged into the low typhoid character. Other typhoid symptoms about the same time showed themselves. The tongue became dry, hard and brown, or almost black, and the teeth covered with brownish scales; the pulse small and weak, and the skin flaccid and yellowish. There was dorsal decubitus and often deafness. This last was not observed to be a favourable symptom, as it has been in typhus, by Dr Alison.¹ There was coma more or less profound; the pupils were sometimes contracted, at other times dilated, but contractile; there was great prostration, and subsultus tendinum, with, in many cases, hicough, vomiting, or fetid breath. This last sometimes exactly resembled the odour of a dead body, and was then regarded as an almost fatal symptom. In this state, the patient exactly resembled one in an advanced stage of European typhus fever. In several cases at this period, a remarkably sudden change for the worse was observed; the pulse at the

¹ Lecture, Edin. Univ., 16th April 1849.

wrist became imperceptible ; the extremities, cold ; the lips, livid ; and the breathing laboured, with cold, clammy sweats, fetid breath and perspiration, great restlessness, low muttering delirium, and extreme prostration. After two or three hours the breathing became sterterous, and in 20 or 30 minutes more, death closed the scene. In one of these fatal cases, in which copious depletion had been practised, there were observed for some hours before death, on the skin of the chest and arms, numerous purple petechiæ, exactly like those sometimes seen in typhus.

The above is the description of a severe case. When the case did not terminate fatally in the above-mentioned manner, amendment was generally observed after the fifth exacerbation, which usually subsided in very copious perspiration. No critical lateritious deposit nor albumen was ever observed in the urine. The following were the ordinary symptoms of amendment:—The tongue began to clean and grow moist at the edges, the sordes disappeared from the teeth, the thirst diminished, while the appetite gradually returned. The pulse remained slow and soft, and acquired strength, and the skin continued cool and moist. Sleep returned, and the strength was gradually but slowly recovered. Headache might continue for some days, being then sometimes ultimately relieved by epistaxis. Such, then, was the ordinary course of symptoms, both in the fatal cases, and also in those which recovered. Some cases, however, presented slight modifications, a few of which may be mentioned. Thus, in some young and robust patients, particularly recruits, who had but recently arrived from Europe, in the early stages of the fever, there was a considerable amount of vascular excitement, with symptoms of determination of blood either to the head or the abdominal viscera. In these cases, the pulse was at first full and of tolerable strength, the skin burning, and the delirium raging and acute ; but, as already mentioned, even in these cases, these symptoms gradually merged into others of an adynamic, typhoid character. Again there were others, particularly the men more advanced in years, and those who had been debilitated by a long service in India, by previous disease, or by habits of intemperance, in whom there was very little vascular excitement at all, even during the exacerbations, the pulse, though quick, being very small and weak, there being no great heat or even sometimes coldness of the skin with a yellowish tinge, and often severe hiccough and vomiting, with great prostration of all the vital powers. In such cases the chief indications of the exacerbations consisted in increased restlessness, vomiting,

headache, or wandering delirium. These cases, with severe vomiting and yellow skin, resembled somewhat the yellow fever, and, indeed, were by some mistaken for this. Again, in many cases, and particularly in those last alluded to, the remissions were not well marked, even from the commencement of the attack, though it may be observed that this was generally the case after the fourth or fifth exacerbation; and lastly, though I have stated that amendment or the reverse generally followed the fifth exacerbation, yet there were not wanting cases in which improvement commenced after the second or third, or not until after the seventh or eighth exacerbation.

5. *Post-mortem Appearances*.—All the fatal cases were carefully examined after death, and the following are the principal morbid appearances which were observed:—

a. The *body* was emaciated, with considerable lividity of the general surface, more particularly of the lips, extremities, and depending portions.

b. *Head*.—The veins on the surface of the brain, and sinuses at its base, contained dark fluid blood, but were not abnormally congested. In one case, however, the veins on the surfaces of the cerebellum were remarkably congested, forming a striking contrast to those on the cerebrum. Congestion of the minute vessels of the pia mater was generally found; sometimes slight, at other times considerable, and in one case with one or two specks of extravasation. The vascularity of the substance of the brain was not increased. The fluid in the ventricles was sometimes increased, at other times normal in quantity, while, in other cases, it was even diminished. On the whole, then, there was but little found in the morbid appearances of the brain after death to account for the cerebral symptoms exhibited during life.

c. *Thorax*.—The lungs were more or less congested in the lower and posterior portions, and generally there was a small quantity of serous fluid in the pleural cavities and in the pericardium. The substance of the heart was flaccid, and easily torn. Its right cavities were generally empty, while its left were full of blood. In one or two cases the cavities on both sides contained a small mass of decolorized lymph, but generally speaking the blood was fluid, and of a dark pitchy colour.

d. *Abdomen*.—All the abdominal organs were very much congested. The liver was congested, somewhat enlarged, and remarkably soft and friable. The spleen was increased, sometimes to from three to five times its normal size, while its texture was softened, but rarely diffuent. It often closely

resembled the typhus spleen of Europe. The kidneys were congested; the stomach and intestines were much congested, more particularly the ileum, which, in most cases, presented a dark livid hue.

6. *Treatment*.—During the premonitory symptoms, especially when there was great nausea without vomiting, an emetic appeared to give great relief; and in a few cases, indeed, it would seem to have checked the attack altogether. But, generally speaking, the patient was not seen until after the fever was fully established. From what has already been said with regard to the type of the fever, it must be obvious that it was necessary to exercise great caution in having recourse to depletion. All the cases that had been freely bled, exhibited the most aggravated typhoid symptoms, and most of them died. Venesection, therefore, was never put in force after its bad effects were observed in the first few cases, even in the instances of young robust recruits with more or less acute symptoms; for even in them, low, adynamic, typhoid symptoms were sure to supervene after a time; and though the bleeding might give some temporary relief, it was certain to aggravate, if not induce the subsequent typhoid condition. When the headache was very severe, and the pulse full, a few leeches, eight to twenty, were applied to the temples at the commencement of the attack; the hair was cut, or the head shaved, and cold lotions applied to the head, or the cold douche kept up for ten minutes at a time: this last often gave great relief. As soon as possible after the commencement of the attack, a purgative of calomel and jalap, or of colocynth, antimonial powder and calomel, was administered, so as to ensure free motion of the bowels. After this, a saline antimonial mixture was given at repeated intervals, and powders containing two or three grains of calomel and antimonial powder, with the object of promoting the secretions of the skin and liver, both of which were obviously interrupted. When typhoid symptoms showed themselves, stimulants and counter-irritants were had recourse to, such as wine, brandy, carbonate of ammonia, effervescing draughts, sinapisms to the abdomen, feet, and thighs, blisters to the back of the neck and scalp, turpentine enemata, &c. But in the treatment of this fever, as in that of intermittents, quinine was undoubtedly the sheet-anchor. This was generally given in repeated small doses during the remissions; but I think there could be no doubt, that here, as in intermittents, the best way of administering it was in one large dose at the very commencement of a remission. After this treatment was had recourse to at an early stage of the fever, and depletion avoided, not a single

fatal case occurred out of about 80 cases ; but during the first fortnight, before this treatment was adopted, and when bleeding was practised rather largely, 5 out of about 25 cases died. Nevertheless, we think it but right to mention, that some practitioners, who had the same means of judging, still advocated copious depletions ; but the above facts appear to me, to offer most conclusive evidence against the propriety of such a practice. There can be no doubt that, in the treatment of many of the fevers of tropical countries, depletion is absolutely necessary ; but still there can be as little doubt, that in India, as elsewhere, the treatment of fever must vary most materially at different times and in different places ; that at one place, and at one time, the very opposite treatment may be required from that which will be necessary at others, and that the prevailing type of the fever must never be lost sight of. Here the prevailing type was indubitably asthenic, and consequently depletion was counter-indicated. The beneficial effects of quinine in these cases confirm, in some measure, the extraordinary results which have been published by Mr Hare, surgeon in the Bengal Medical Service, and which at one time excited considerable sensation among the medical profession in India. The principal feature in Mr Hare's treatment of remittent fever, consisted in the administration of large doses of quinine, from one to two drachms daily. The more severe the fever, the more frequently was the scruple dose administered, till complete cinchonism was produced. He waited for no remission before giving the quinine, not regarding this medicine as an antiperiodic. "Fevers," he says, "destroy life by an accumulation of blood in the veins of the brain and abdominal viscera, and quinine has the power of stopping these accumulations." But if this be the action of quinine, we might expect it to be equally serviceable in the treatment of many of the continued fevers of this country ; but in these we have ourselves seen it employed, and signally fail.¹ We believe that it is only in those fevers which are intermittent or remittent, that quinine is of any service ; and, therefore, to say that it acts as an antiperiodic, probably expresses its true action as well as our present knowledge admits—an opinion, by the way, which is confirmed by the fact, that quinine is also of service in various other periodic complaints.

II. We now proceed to give a few *illustrative cases* of the above described *remittent fever*.

CASE I. *Remittent Fever—Depletion—Typhoid Symptoms—Death.*

Private A. M., æt. 24, admitted into hospital at Prome, November

¹ See Dr Bennett's cases in *Edinburgh Monthly Journal*, 1852, vol. i., p. 355.

5, 1853, at 1 P.M. Fever of two days' duration, but for some days previously had complained of listlessness and want of appetite. On admission pulse above 100, and full. Skin hot and dry. Tongue dry, parched, and covered with a whitish fur. Great thirst. Bowels confined. Violent headache.

App. Hirud. xii. temp.

Sumat. mist. sal. diaph. \bar{z} j 2da. q. q. hora.

Vespere.—Much in same state. Great headache. Bowels confined. Hair to be cut close and cold applied.

App. Hirud. xii. temp.

\bar{R} . ext. colocynth co. gr. vj. Cal. gr. iij. Pulv. Antim. gr. iv. M. Div. in Pill. ij. stat. sumend.

Contin. mist. sal. diaph.

Nov. 6.—Did not sleep much, but perspired a little, and this morning appears better. Pulse 88, of moderate strength. Headache and thirst less severe. Only one motion of bowels.

\bar{R} . Magnes. Sulph. \bar{z} j. Vin. ant. gutt. xxx.

Aq. \bar{z} iv. M. Ft. haust. st. sumend.

Contin. Mist. sal. diaph. et Lot. frigid. cap.

Vespere.—Pulse has risen again this afternoon to above 100, and headache and thirst have greatly increased, with occasional wandering delirium. Tongue red at edges, with a white fur along centre. Bowels have been freely moved.

App. nuchæ cuc. cr. ad \bar{z} xii.

Nov. 7.—Dosed a little during the night and perspired slightly. This morning skin hot and dry. Pulse 96, rather full but soft. Headache less severe. Great thirst. Bowels open. Is very restless.

Contin. Mist. Sal. Antim. Lot. frigid. cap.

Body to be sponged with cold water. Acidulated drinks.

1 P.M.—Pulse 100, rather full, but soft. Headache not so severe as yesterday. Has been perspiring profusely since sponging of body.

Venæsectio ad \bar{z} xvj. Blood presented no buffy coat.

Vespere.—Less headache. Pulse 120, and weak. Cold, clammy sweats.

Nov. 8.—Passed a quiet night, but has perspired profusely, and is very weak. Skin is still moist and cool. Less thirst. Tongue covered with a light brownish fur. Two or three motions of bowels during night.

Contin. Mist. Sal. diaph. Arrow-root.

Vespere.—Is very weak, and has been very restless all day, with occasional subsultus tendinum. Pulse 100, small, weak. Does not hear well. Complains of no pain, but has hardly slept since admission. Skin warm and moist.

Hab. haust. c. tr. op. gut. xx. vin. ant. gutt. xxx. ex. mist. camph. \bar{z} j.

Nov. 9.—Slept a little after the draught, and appears somewhat refreshed. Complains of no pain, but is still deaf and inattentive to what is passing around. On speaking to him he assumes a foolish expression, with his eyeballs fixed in one position, but puts out his tongue, when asked. Occasional subsultus tendinum. Tongue moist,

with a whitish fur. Bowels not moved since yesterday. Is very weak. Pulse 100, small and thready.

App. nuchæ. Emp. vesic. 6 × 4.

Omit. Mist. Sal. Ant. To have sago.

Noon.—Has suddenly become worse. Pulse at wrist almost imperceptible. Extremities cold, clammy, and livid. Lips very livid. Tongue covered with a thick brown fur, and gums and teeth with a large quantity of brownish sordes. Is very restless, and is with difficulty kept in bed. Has occasional delirium, but generally answers rationally when spoken to. Pupils natural. On the backs of his hands and forearms, and also over the upper part of the chest, are a number of circumscribed purple petechiæ, about $\frac{1}{16}$ in. in diameter.

Head shaved, and Tinct. Lyttæ rubbed into scalp. Sinapisms to epigastrium and calves of legs. Enema Terebinth.

Did not rally at all, but continued to sink. Extremities became colder and more livid. About 1 p.m., breathing became laboured, and ultimately stertorous, and twenty minutes after, he expired. He answered rationally up to the commencement of stertorous breathing. The *post-mortem* appearances were these which have already been described. Great congestion of all the abdominal organs. Slight congestion of the arachnoid. Blood dark and fluid. Some blood in the left cavities of the heart, right cavities empty.

Remarks.—Though this and the following case were admitted under my care, I may state that I do not hold myself responsible for their treatment. The above case illustrates, in a lamentable manner the injurious effects of extreme depletion and withholding of stimulants.

CASE II. *Remittent Fever—Depletion—Typhoid Symptoms—Recovery.*

Private W. G., æt. 28, admitted at Prome, November 5, 1853, with fever of four hours' duration, but had been feeling out of sorts for some days before. Pulse 100, full, but soft. Tongue with a yellowish fur. Great nausea and thirst. Bowels confined. Headache, but not severe.

Hab. Pulv. Ipecac. ʒ c. Ant. Tart. gr. j.

Post. horas ij. haust. sennæ ʒiv.

Mist. sal. Ant. ʒj. 2 ā q. q. hora.

Lot. frigid. capiti.

Nov. 7.—Perspired freely after the emetic, and all yesterday was much better and almost free from fever. This, however, has increased during the night, and the headache is much more severe than it has been yet. Pulse 104, full. Skin hot and dry. Great thirst.

App. cucurbit. cr. nuchæ, ad ʒx.

Hab. haust. Magnes. Sulph. ʒj., Vin. Ant. ʒss. ex. aq. ʒiv.

Contin. Mist. sal. Ant. et Lotio. frigid.

Vespere.—Headache continues. Pulse 100 and full. Skin hot and dry.

App. cuc. cr. ad. ʒxii. nuchæ.

Nov. 8.—Pain in head greatly relieved, but complains of giddi-

ness. Pulse 120, soft. Great thirst. Tongue with a white fur. Bowels rather confined. Skin cooler.

℞ Ext. Col. Co. et Pil. Hyd. ā ā gr. v. M. Div. in Pill. ij.
St Sumend.

Contin. Mist. Sal. Antim.

Vespere.—Febrile symptoms have increased during the day. Has had no motion of bowels, and complains of pain and tenderness of abdomen.

Sinapism. abdomini. Hab. Ol. Ric. ʒj. c. Tr. Opii gutt. x.

Nov. 9.—Is better again. Pains in abdomen gone, and has no headache, but still complains of giddiness, and is restless. Pulse 100, soft. Tongue with a white fur. Great thirst. Bowels freely moved.

App. nuchae. Emp. Lyttæ 6 × 3.

Hab. 3tia q. q. hora. Cal. gr. v. Pulv. Ant. gr. iij. c. Camph. gr. j.

1 P.M.—Headache has increased, and skin is warmer, but moist. Pulse 96, and soft.

Venæsectio ad. ʒxii.

Perspired profusely and was very faint after the bleeding. Blood presented no buffy coat, and did not coagulate firmly.

9 P.M.—Still continues very weak. Pulse 100, very small and weak. Skin moist. Extremities cold and clammy.

Omit. Mist. Sal. Antim.

Hab. Quin. Sulph. gr. x. repet. post horam; et cras mane.

Warm Sago.

Nov. 10.—Slept some, and feels easier. Pulse 100, but very soft and weak. No headache. Skin cool and moist. Feels very weak.

Quin. Sulph. gr. v. 3tia q. q. hora.

Noon.—Quinine was discontinued, as patient was complaining of buzzing sounds in ears. Pulse exceedingly weak and often difficult to count. Extremities cold and clammy. Tongue with a brownish fur.

Ordered warm sago with port-wine (ʒss.) every 2 hours.

Nov. 11.—Pulse has considerably improved, but is still very weak. Tongue dry and brownish at base, but at edges is red and moist. No buzzing in ears. Feels much exhausted from want of sleep.

To continue wine and sago.

℞ Sp. Ammon. aromat. ʒvj. Tinct. Card. Co. ʒj.

Aq. ʒij. M. Sumat. ʒss. 3â q. q. hora.

Vespere.—During day was feverish for some hours, and wine was discontinued. Pulse improving.

Hab. Tr. Hyosey. ʒj. ex. Aq. Menth. ʒj.

Nov. 12.—Did not sleep well. Pulse 96, and has improved considerably in strength. Tongue red and moist at edges, but with a dense brown fur over the centre and tip. Great thirst. Bowels confined.

Ol. Ricini ʒiv. Haust. efferv. c. Tr. Aurant. 2da q. q. hora.

Sago and milk. Port-wine ʒv.

Vespere.—Haust. c. Tr. Hyosey. ʒj.

Nov. 13.—Slept well, and feels much refreshed. Pulse down to

70, and improving in strength. Less thirst. Tongue as yesterday. Bad taste in mouth. Bowels open. No headache. Is very feeble.

R Tinct. Gent. Co. et Tinct. Card. Co. ā ā ʒjss.

Quinae Sulph. gr.xii. aq. Menth. ʒix. M.

Sumat ʒj. mane et vesp.

From this period he continued gradually to regain his strength. His tongue grew cleaner. His appetite returned, and on November 28th, he was able to return to his duty.

Remarks.—Here then was another case exemplifying the injurious effects of venesection, which in both cases, it may be observed, was had recourse to at a period when it was certainly counter-indicated by all the symptoms of the case. This case, but for the employment of stimulants, would no doubt have terminated in a similar manner to the former.

CASE III. *Intermittent Fever passing into Remittent—Typhoid Symptoms—Death.*

Private P. M., æt. 22, admitted January 24, 1854, in camp at Taphoon. Young and robust, and but recently arrived from England. Had been much exhausted by the fatigues and privations during the expedition into the Tharawaddy district, already described. Fever of three days' duration, intermittent, quotidian. The first two days he had no rigors, but to-day the fever came on with severe rigors at 11 A.M. Skin hot and dry. Pulse 100, full but soft.

Ordered Mist. Sal. Ant.

Vespere.—Pulv. Ipecac. Co. gr.viii. c. Pulv. Antim. gr. iv.

Jan. 25.—Perspired freely during the night, and this morning is quite free from fever and headache. Pulse slow and soft. Skin warm and clammy. Tongue furred. Bowels costive.

Hab. Pulv. Jal. Co. ʒj. c. Cal. gr. iv. et post horas ij. Quinae Sulph. gr. x.

Vespere.—Has had another paroxysm to-day, preceded by no rigors, but accompanied by great headache. One motion of bowels.

Hab. Pulv. Ipecac. Co. gr. v. Pulv. Antim. gr. iij. Cal. gr. j.

Jan. 26.—Perspired freely last night but slept none, and this morning is still somewhat feverish. Complains of slight headache. Pulse 84, soft. Skin clammy.

Hab. Pulv. Cinch. ʒss. ex. aq. Menth. ʒj.

Vespere.—Had another paroxysm to-day, coming on at 11 A.M. No rigors. Bowels confined.

Hab. Cal. gr. iij. Ext. Col. Co. gr. v. Pulv. Antim. gr. iv. in Pill. ij. Mist. Sal. Antim.

Jan. 27.—Perspired freely during night, but has slept none, and has been very restless. Pulse 84, small and soft. Slight headache, and pains all over body. Skin clammy.

Tongue furred, two motions of bowels.

Hab. Pulv. Cinch. ʒss. ex Aq. Menth.

Repet. post horas ij.

Vespere.—Another paroxysm came on in the afternoon with violent headache.

Pulv. Antim. gr. v. c. Cal. gr. j.

Jan. 28.—Perspired freely in early part of night, but has been very restless and slept but little. This morning pulse quick, small and soft. Skin dry and rather warm. Tongue parched and furred at base. Great thirst. Bowels open. No headache, but complains greatly of inability to sleep.

Hab. Pulv. Cinch. ʒss et repet. post horas ij. c. Pulv. Op. gr. j. Contin. Mist. Sal Ant. Haust. acidul.

Vespere.—Has continued feverish all day, and slept none.

Hab. Tr. Op. gr. xxv. ex Mist. Camph. ʒj . et repet. post horas iij. nisi dormiat.

Jan. 29.—Slept for some hours after second draught, but has been very restless during the greater part of the night, and still continues so. Complains much of being unable to sleep and feels exhausted. Tongue with a dry brownish fur at base. Pulse 80, very weak. Skin warm and moist.

Hab. st. Tr. Op. ʒss . ex Mist. Camph. ʒss . arrow-root and portwine.

Vespere.—Restlessness and heat of skin increased somewhat during the day. Skin is now cool and clammy. Pulse 76, weak. Tongue furred.

Hab. st. Quinæ Sulph. gr. x. ex Sp. Vin. Gallic ʒss . et aq. ʒij .

Brandy and warm water every hour.

Jan. 30.—Very restless all night, and did not sleep longer than ten minutes at a time. A good deal of low wandering delirium; pupils are contracted. At present he is lying on his side asleep. Pulse 78, weak.

4 P.M.—Did not sleep long in the morning, but has been very restless all day, and quite sensible. At present he has suddenly fallen into a semi-comatose condition. Breathing laboured. Lies on his back, and does not answer when spoken to, but yet appears to know what is said to him, putting out his tongue when asked to do it. Tongue dry and brown. Skin cool. Pulse quick, but very small and soft. Pupils contracted.

App. Capit. Abras. Emp. Lyttæ.

Enema Terebinth.

To have ʒss brandy in warm water every half hour.

5½ P.M.—Hab. Omni hora Ammon. Sesquicarb. gr. iij.

Sp. Aeth Sulph. gutt. x. Sp. Vin. Gal. ʒss . aq. ʒj .

7 P.M.—Sinapisms to soles of feet.

7½ P.M.—Sinapisms to abdomen.

These remedies were of no avail. The coma became more profound, and the breathing more laboured, and at last stertorous; while the pulse got weaker, and the skin colder, and about 8½ P.M., he expired. No convulsions before death.

Post-mortem appearances corresponded with those already described. There was less congestion of the abdominal organs, and this was the case before alluded to, as peculiar on account of the veins on the cerebellum being much congested, while those on the cerebrum were normal.

Remarks.—This was an instance of well-marked intermittent fever passing into the remittent form. It is to be observed that this was the only fatal case of remittent fever, in which depletion was not had recourse to, and that it occurred in the expedition into the Tharawaddy district, the fatigues and privations attendant upon which we have already shown to have tended greatly to debilitate the constitution, and render it less able to withstand the onset of disease. Owing also to the supply of quinine in camp being almost exhausted, we were unable to administer it in such doses, and so often as we could have wished.

CASE IV.—*Remittent Fever.*—*Cure.*

Private J. E., aet. 21. Robust; only one year since arrival in India. Had five febrile exacerbations in all. Complained of great chilliness all night of November 20, 1853, followed by febrile symptoms on morning of 21st. Pulse 92. Great headache, thirst, &c. Furred tongue. Worst in afternoon, remission towards evening.

Nov. 22.—Second exacerbation.

Nov. 23.—Third exacerbation—very severe, coming on about noon. Pulse 100, full, and rather strong. Skin dry and very hot. Face flushed, great headache, occasional vomiting, pain in stomach. Was now admitted into hospital. Treated with purgatives, saline antimonials, 8 leeches to temples, cold lotions, &c.

Nov. 24.—Fourth exacerbation still more severe. Similar symptoms to yesterday, with delirium, deafness, great restlessness. With difficulty kept in bed. Face flushed. Dorsal decubitus. Pupils dilated, but contractile. Pulse 100, rather full, and of some strength. Is hardly conscious, but puts out his tongue when asked. Tongue dry, and with a white fur. Lips parched.

Abradatur caput. Emp. lyttæ nuchæ. Cold lotions to head, and tepid sponging of body.

Vespere—In a profuse perspiration.

Hab. quinae sulph. gr. v. 3tia q. q. horâ.

Nov. 25.—Very weak. Pulse 100, and weak and small. Tongue with a slight brownish fur at base. Vomiting. Pupils dilated. Had a fifth exacerbation this evening from 9 to 12 p.m., but slight. After this the febrile symptoms gradually disappeared, and the quinine was continued for two or three days. Under tonic treatment he gradually regained his strength, and on Dec. 12 returned to his duty.

Remarks.—Here was a case in which the patient's habit of body and the symptoms, in the first instance, seemed to demand depletion more than any of the preceding, but which did well without it. Even in this case, the acute symptoms in the outset soon merged into those of an adynamic character. The tepid sponging of the body appeared to be of great service in inducing perspiration.

CASE V.—*Remittent Fever.*—*Cure.*

Private Jos. C., aet. 24. Robust, and only one year in India. Was seized with fever early in the morning of Nov. 20, which had continued for nearly 36 hours, when he was admitted into hospital, on the evening of the 21st, in a high fever, complaining of violent head-

ache and great thirst. Face flushed. Pulse 100, full, and of moderate strength. Tongue with a white fur. Bowels confined. Hair was cut, and cold lotions applied to head, and 20 leeches to the temples. A purgative of calomel and extract. coloc., and repeated small doses of calomel and Dover's powders. Low diet and acidulated drinks.

Nov. 22.—Had a slight remission during night, but skin continues warm and dry, and pulse quick.

23.—Had a second exacerbation yesterday, with remission in night-time. Skin cooler, pulse 96, and soft.

Quinæ sulph. gr. ij. 2 ā. g. g. hora.

24.—Had a third exacerbation yesterday, with high fever, violent headache, and restless delirium. Urine dark, of high sp. gy.; not coagulable. Experienced great relief from the cold douche over-head. Had a remission during night, which continues.

Contin. quin. sulph., ut antea.

25.—Remission continued all day yesterday; but had a fourth exacerbation during the night, of short duration and less severe.

Contin. quin. sulph.

26.—Had a fifth exacerbation last night, which has subsided towards morning in copious perspirations. Urine not coagulable. Is very feeble. After this had no return of the fever. Gradually regained his appetite and strength, and returned to his duty on the 8th of December.

CASE VI.—*Remittent Fever.*—*Cure.*

Corporal J. W., aet. 28. Had only two exacerbations in all: one on the 3d and the other on the 4th of December 1853, with remissions towards evening. The exacerbations presented the usual characters, and during the remissions there was slight perspiration. On admission he had a purgative, and saline antimonials during the exacerbations. At the commencement of the first remission he got 10 grains of quinine, and 2 grains every third hour afterwards. The same treatment was followed in the remission after the second paroxysm.

Remarks.—This case was one of many others, which well exemplified the beneficial effects of quinine, given in the manner already recommended.

CASE VII.—*Remittent Fever.*—*Cure.*

Private D. A., aet. 26. Had three exacerbations in all. The first came on with a feeling of great chilliness on the evening of November 7th, 1853, and continued for twenty-eight hours. Had a remission all the 9th; but in the evening had a second exacerbation, lasting till 4 a.m. of the 10th. Had a third exacerbation in the afternoon of the 10th, lasting till the morning of the 11th.

The characters of the exacerbations and remissions corresponded with those already described in the preceding cases, the only thing remarkable being that the patient always complained of severe aching pains in the joints during the exacerbations, which disappeared during the remissions.

The treatment consisted in purgatives, saline antimonials, cold to the head, &c., with quinine, 5 grains every three hours, commencing with the second remission.

Remarks.—This case also exemplified the benefit to be derived from quinine. On comparing the four last of these cases with the two first, the conviction must be forced upon every one, that copious sanguinous depletions were counter-indicated in those fevers.

III. We shall now proceed, as briefly as possible, to contrast with the remittent fever we have just been considering, the characters of the *continued fever* which prevailed in the same regiment at Calcutta, during the previous hot, dry, season. The cases of continued fever in the regiment were almost confined to the hot, dry months of April, May, and first part of June. They gradually became less frequent after the commencement of the rains, about the middle of June.

1. *Type.*—This fever was essentially sthenic in type, and attended by a greatly increased vascular action, with a tendency to local determinations of blood, and almost invariably demanded copious depletion. These characters were, as might be expected, best marked in young, full-blooded recruits, who were also the most liable to the disease. The fever, in fact, presented most of the characters of that which has been described under the term of “inflammatory fever,” or the “synocha” of Cullen, and, in most respects, corresponded with what is known as the “seasoning fever” of Europeans in tropical climates.

2. *Causes.*—There is but little probability that malaria had anything to do with the production of this fever. Many malarious fevers, no doubt, often put on an inflammatory, continued form; but the peculiarity of this fever was, that it was confined to the hot, dry season, under circumstances the least favourable to the generation of malaria. The exciting cause of the fever appeared to be the excessive heat, the thermometer ranging daily from 92° to 100° Fahr. in the shade; and during the night seldom falling below 84°. This was no doubt aggravated by a number of individuals occupying the same apartments in the barracks, and thereby increasing the closeness and temperature of the air. Incautious exposure to the direct rays of the sun was the cause to which, in many cases, the disease was referred by the patients themselves. The great heat might act by rarefying the atmosphere, and thereby impeding respiration and the due oxygenation of the blood; while in the case of direct exposure, it might produce local determinations to the brain. Among

the causes which appeared to *predispose* to the disease may be mentioned early age, a robust, plethoric habit of body, the use, or rather the abuse of spirituous liquors, a costive condition of the bowels, and great fatigue, from the excessive drilling to which the men were subjected; while chills, individual acts of intemperance, &c., appeared to act as determining exciting causes.

3. *Premonitory Symptoms*.—In some few cases the patients complained of listlessness, lassitude, want of appetite, furred tongue, costive bowels, and slight headache for one or several days before the commencement of the attack; but in many cases, especially those which appeared to originate from exposure to the direct rays of the sun, the attack came on suddenly without any premonitory symptoms.

4. *Symptoms during the fever*.—This commenced generally with a feeling of chilliness; sometimes so slight as scarcely to attract attention, at other times almost amounting to rigors. In some cases there was great nausea, and even vomiting. After this the skin became hot, often burning, and dry, and the face flushed. The pulse rose to from 100 to 120, and was full and hard. There was violent headache, with throbbing of the temples, ringing in the ears, and *muscæ volitantes*. The tongue and lips were dry and parched, the former with a thick, white, or yellowish fur. There was a complete loss of appetite, and the patients complained of a bad taste in the mouth and unquenchable thirst. There was often tenderness in the hepatic region, with increased dulness on percussion. The bowels were confined. The urine was scanty, often scalding, dark coloured, of high sp. gy., acid reaction, depositing on cooling crystals of lithic acid, and not coagulable by heat and nitric acid. There was great restlessness, *pervigilium*, and, after a time, dorsal decubitus, acute raging delirium, contracted pupil, insensibility, lividity, coma. The blood drawn separated entirely, on standing, into serum and coagulum, the latter often buffed.

The above symptoms, which were always most severe during the heat of the day, generally reached their climax about the seventh or ninth day, at which period they either began to amend, or death soon ensued. In the fatal cases, death was preceded by acute delirium, coma, dyspnœa, stertor, &c. In those which recovered, the amendment was generally ushered in by a copious critical perspiration. After this the pulse fell, the skin became cooler, and remained moist. The urine became more copious and paler, and deposited abundance of lithates; the tongue became cleaner, the thirst diminished, and strength was gradually regained.

5. *Post-mortem appearances*.—The following morbid appearances presented themselves after death :—

A. *Head*.—There was great congestion of the veins on the surface of the brain, and of the sinuses at its base. The pia mater was also congested with sometimes minute extravasations. Occasionally there was opacity of the arachoid, with considerable subarachnoid effusion. The quantity of fluid in the ventricles varied.

B. *Thorax*.—The lungs were very much congested. The right cavities of the heart were full of blood, forming a firm coagulum ; the left were comparatively empty.

C. *Abdomen*.—The abdominal organs were much congested, especially the liver and spleen.

D. *Body*.—There was great lividity of the lips, extremities, and all the dependent portions of the body.

6. *Treatment*.—Copious depletion at the commencement of the attack was almost invariably necessary. In the young and full blooded, this was practised both by venesection and the application of leeches to the temples ; in those who had been weakened by a longer residence in India, by leeches alone. The other remedial measures employed were purgatives, such as calomel and jalap, or colocynth, calomel, and antimonial powder ; powders of calomel, and antimonial powder, saline antimonial mixtures, acid drinks, low diet, the removal of the hair from the head, and the application of refrigerating lotions. When delirium and coma supervened, the head was shaved, and a blister applied to the scalp or nape of the neck, a sinapism to the epigastrium, and a turpentine enema administered.

Copious bleeding was no doubt the principal remedy to be depended on in this fever, and the great relief which it afforded in many cases to all the distressing symptoms was really very striking. In order, however, that it might be effectual, it was necessary that it should be practised at the commencement of the attack ; if delayed till the vital powers had become exhausted, it appeared to cause more mischief than good.

One cannot fail to be struck with the great differences between this fever and the remittent fever which afterwards prevailed in the same regiment at Prome. The former was a continued fever, the latter a remittent ; the former was sthenic, the latter, asthenic ; the latter was a malarious fever, the former most prevalent at the season least favourable to the generation of malaria ; the former was benefited by depletion, the latter proved perfectly intolerant of it.

Among the other diseases which prevailed at Prome, may be mentioned :—

1. *Diarrhœa and Dysentery*.—After fevers, the most frequent diseases in the regiment were diarrhœa and dysentery, and the latter may be said to have been the principal cause of the great mortality among our troops in Burmah. But in Burmah, as, indeed, in India generally, these diseases were far more prevalent during the rainy season than at other periods. During the three months, November, December, and January, immediately succeeding the cessation of the rains, there were admitted into the hospital of the 2d Europeans at Prome 17 cases of diarrhœa, and 21 cases of dysentery, and out of the detachment, which remained for six weeks in the surrounding country, 12 cases of diarrhœa were admitted, and 3 of dysentery. The number of cases appeared to diminish as the season became drier, but again greatly increased after the commencement of the rains. In a medical report of H. M. 80th Regt. in Burmah, we find that in 12 months, out of a mean strength of 487, 228 cases of dysentery were admitted into hospital, and 15 of diarrhœa, or exactly one-half of the mean strength were admitted with one or other of these two diseases. From the proportions in the latter instance it seems probable that many cases of diarrhœa have been entered as dysentery, and indeed in some cases it was found a difficult matter to decide between cases of chronic dysentery and diarrhœa. In the cases which we have mentioned from the 2d Fusiliers, all those were entered as diarrhœa, in which the history and symptoms did not afford pretty certain evidence of the existence of inflammatory action or ulceration of the bowel, in which there were merely frequent loose feculent stool, without blood or mucus, and without abdominal tenderness or any great amount of tenesmus. Many of the cases of diarrhœa proved very obstinate, and if at all neglected, they were very apt to lapse into a chronic form of dysentery, and in this way terminate fatally. Both these diseases exhibited a marked tendency to adynamic symptoms, and bore depletion with great difficulty. One of the cases of diarrhœa terminated fatally, and in rather a remarkable manner. The diarrhœa, which had lasted for some days, had been checked by medicine, and the patient was apparently getting better, when, from no apparent cause, symptoms of extreme prostration suddenly showed themselves, the pulse became slow, small and weak, and at length intermittent, the extremities cold, &c., and after two or three hours, death preceded by slight convulsions, terminated the scene. On *post-mortem* examination, the only abnormal appearances found, were considerable congestion of the abdominal organs, especially the small intestine, the lower half of which presented a deep livid hue. The brain, and the heart's

texture and valves, were all normal. All the cavities of the heart contained blood.

As might have been expected from the debilitating influences to which the troops were subjected, the cases of dysentery in Burmah were very apt to become *asthenic*, and were remarkably fatal; yet we observed no well-marked cases of what has been described as "Scorbutic Dysentery," which was so prevalent and fatal in the first Burmese war. Of the twenty-four cases above mentioned, six, or one-fourth, died, and of those cases that recovered, in many the cure was only temporary, the disease exhibiting a strong tendency to return. I believe it was the opinion of most medical officers who had served in Burmah, that after an individual had had an attack of Burmese dysentery, the only chance he had of a permanent recovery was by leaving the country; as long as he remained in it, he was constantly liable to a relapse, and that relapse probably fatal. In addition to these six fatal cases of dysentery, one of the officers was seized with the disease immediately on his arrival at Rangoon, and was unable to proceed on to Prome. He recovered under treatment, and was ordered back to Calcutta by a Medical Committee, but while waiting for a steamer, he had a relapse which proved fatal. The disease in this case, presented a feature which is not unfrequent in Burmese dysentery, namely, copious discharges of pure blood from the rectum, producing very great and rapid prostration. "Hemorrhagic Dysentery," indeed, has been called by some medical officers "the disease peculiar to Burmah," but as far as my experience went, this extreme loss of blood presented itself only in a minority of cases. In only one of the other six cases did it take place. In this case, the disease was found after death to be principally seated in the rectum, this part of the bowel being one mass of ulceration, which, at some parts, almost perforated the walls of the gut, and whose surface was covered with adherent black clots of blood. The excessive hemorrhage both in this and other cases, was no doubt owing to the rapid ulceration having laid open one or more vessels of considerable size. The disease was occasionally remarkably rapid in its course, sometimes proving fatal on the 6th or 7th day; while, at the same time, the local symptoms were comparatively slight; and it was observed, that a few days' illness sufficed to produce the most extensive ulceration of the large intestine. In one case, which proved fatal on the 7th or 8th day, the colon was found in one mass of ulceration from the coecum to the rectum. No positive evidence could be adduced of the disease being contagious, though the other patients in hospital often made use of the

same night stool as the dysentery cases. The causes to which the disease might be attributed, have already been considered, but we would here more particularly mention one, to which in many cases the origin of the disease appeared attributable, and which certainly, in all cases, greatly aggravated it, when already existing. What I allude to are the chills, which the men experienced from the cold, damp morning air, and from the little protection offered by their thin walled hospitals and barracks. It was observed in all the cases, that the symptoms underwent an aggravation from three to six o'clock every morning, and the patients themselves attributed these aggravations, and no doubt with perfect justice, to their having "caught a chill."

All the fatal cases were made the subject of careful *post-mortem* examination, and the following observations may not be without interest:—In all cases the disease was confined to the large intestine. Dr Bleeker of Batavia, who has had most extensive experience in tropical dysentery, and whose recent paper on the subject¹ is one of the most valuable that has been written, observes, that, in scarcely 2 per cent. of his cases, did he find the disease pass the boundary between the small and large intestine. Again, in the large intestine itself, the disease was found to be either generally diffused, or limited to certain localities. In the latter case the localities were two in number, the rectum and the coecum, especially the former. It might exist in one or other, or in both of these, and in those cases in which it was more generally diffused, it was always most advanced in these two localities. In no instance was the disease limited to, or farthest advanced in, the ascending or transverse colon. The ulcers were generally found in various stages of progress. This was particularly noticed in one of the cases, and the appearances which presented themselves in this case seem of considerable importance in reference to the interesting subject of the mode of origin of ulcers in the intestines. The case was that already mentioned, as presenting the hemorrhagic form, and in which the ulceration was found to be principally seated in the rectum. As already mentioned, the ulceration in the rectum was far advanced, at some points almost amounting to perforation; but in the upper parts of the bowel, especially the ascending colon, the disease was observed in much earlier stages. The various stages, by which the disease commenced and progressed, appeared to be somewhat as follows:—1. The earliest stages observed appeared to consist in the formation of a number of vascular spots,

¹ Translated from the Dutch by Theodore Caüter, M.D., Indian Annals of Medical Science, vol. i.

produced by finely injected ramifying capillaries. These spots presented a more or less circular outline, and varied in diameter from $\frac{1}{10}$ th to upwards of one inch in diameter. The larger ones were less vascular in the centre than towards the circumference. 2. Similar spots, with a minute ulcer in the centre. This ulcer, in many instances, was not larger than a pin's head, but presented a remarkably circular and regular outline, impressing one very forcibly with the conviction, that it had been produced by the bursting of a minute pustule or vesicle. I may observe, however, that I was unable to detect any such pustule or vesicle in the centre of any of the vascular patches; but the subject well merits investigation, as it is not improbable that in the mucous membranes, as well as in the skin, there are pustular and other diseases, which may end in ulceration. Dr Bleeker describes the mode of origin of the ulcers as considerably different. He says, a mass of fibrinous exudation, varying in form, is first deposited in the coats of the intestine; that this then softens in the centre, while the superimposed mucous membrane decays, and is broken, establishing an ulcer. 3. These ulcers appeared gradually to increase in size, preserving their even outline, but passing from a circular to an elliptical form, and becoming more or less indurated at their edges. This induration was very great in some of the more chronic cases, approaching in consistence to that of cartilage. 4. The ulcers then appeared to extend still more, until contiguous ones communicated with each other by their edges, forming one large mass of ulceration, with its irregular surface covered with portions of sloughing membrane and adherent clots of blood.

In none of the fatal cases of dysentery, was there observed any complication of disease of the liver beyond congestion. Of 24 fatal cases of dysentery occurring at Rangoon in H.M. 80th Regiment, Mr Taylor found abscess of the liver in 4. Again, Mr Stewart, surgeon, of H.M. 18th Royal Irish, says, that in three-fourths of the fatal cases of dysentery in his regiment in Burmah, the liver was found more or less implicated, from simple engorgement to abscess.¹

As regards the treatment, considering the asthenic character of the disease, it is obvious that copious depletion was counter-indicated. General bleeding was never resorted to, and even leeches were applied more sparingly than is generally found to be necessary in India. In the hemorrhagic cases, in which there was generally severe tenesmus, great relief was always derived, from the application of a few leeches round the anus, but nothing appeared to be of much avail in restraining the hemorrhage. After the removal of

¹ Indian Annals of Medical Science, vol. i.

the leeches, the treatment consisted in the application of warm fomentations to the abdomen, and the administration of repeated doses of ipecacuan, either combined with opium in the form of Dover's powder, with extract of gentian in the form of Twining's pill, or in mucilage of gum arabic, as recommended to me by Dr Mudge of the Madras army. This medicine, whether or not in virtue of its action as a sedative, certainly appeared to be of more service than any other. Laxatives, and emollient and anodyne enemata, were also found of great service. When there were any symptoms of hepatic congestion, blue pill was combined with the ipecacuan, and it was generally observed, that a decided amendment followed the affection of the system by the mercury, if this could be obtained, which, however, was often difficult. In the more chronic stages blisters were applied, and the various mineral and vegetable astringents administered, both by mouth and rectum, but in some cases the whole category of these was tried with but little benefit. When ulceration was fully established, as evidenced by the peculiar flaky appearance of the stools, the nitrate of silver, given in repeated half-grain doses, seemed to be productive of more benefit than anything else which was tried. In cases in which the disease proved very obstinate, or was constantly relapsing, the patient's only chance of safety consisted in a complete change of climate.

I may here briefly allude to a treatment of dysentery which has acquired an Indian notoriety, viz., that of Mr Hare, a surgeon in the Bengal medical service. This gentleman regards dysentery as a malarious disease, and recommends the administration of large scruple doses of quinine. This, with enemata of water thrown up into the colon by means of a long tube, constitutes the principal part of his treatment. His success, according to his own accounts, has been most astonishing; but other practitioners have not met with similar results, and, generally, the practice is not in good odour among our medical brethren in India.¹

2. *Cholera*.—Fortunately this disease did not show itself in an epidemic form, among the 2d Europeans on their arrival in Burmah, and up to the end of January only four sporadic cases occurred. According to the classification of the Medical Board of Calcutta, one of these cases belonged to the *cholera biliosa*, and three to the *cholera spasmodica*. Three of the cases recovered; one died, not from the immediate effects of the disease itself, but, being an elderly man, he sunk

¹ Mr Hare on "Tropical Fever and Dysentery," Indian Annals of Medical Science, Oct. 1853; also a Refutation of Mr Hare's Treatment, a pamphlet by Dr John Macpherson, Bengal army; also *Edin. Medical and Surgical Journal*, July 1854.

three or four days after the attack, under a double pneumonia. The treatment of cholera in India appears to be as diversified and unsatisfactory as it is in Europe. As the castor oil treatment has been the rage with some practitioners in England, so in India there are practitioners who are in the habit of giving a much stronger purgative—croton oil. Its success, however, like that of the castor oil, has not been such as to recommend it to the profession. Other practitioners, such as Mr Barry of the Bengal service, recommended strongly the nitrate of silver.¹ Copious bloodletting, saline enemata, carbonate of soda, inhalations of ether and chloroform, quinine, pills of ox gall, &c., are among the other remedial measures to which we are instructed to have recourse. Calomel, however, appears to be the medicine in which the best Indian practitioners place the most reliance, and perhaps the best way of administering it is in combination with stimulants, such as capsicum and carbonate of ammonia. Dr James Anderson, of the Bengal army, one of the most experienced and talented of our profession in India, recommends the abstraction of a few ounces of blood from the arm, in the first onset of the disease, in robust patients, with the administration of a mustard emetic. This treatment, followed up by repeated small doses of calomel with opium, and the early use of stimulants, both externally and internally, I have myself seen very successful in his practice.

3. *Hepatitis*.—During the three months of November, December, and January, five patients were admitted into hospital on account of this disease, though many of the patients, admitted for other complaints, were found to be labouring under chronic forms of the disease. Three of the above five cases were acute; two, chronic. One of the former died, the patient being thirty-three years of age, having served about twelve years in India, and long led a very dissipated life. On dissection, the liver was found to be enormously enlarged, and the whole of the right lobe was converted into an immense abscess, containing upwards of four quarts of pus. The walls of the abscess, in many places, presented a very ragged appearance, owing to numerous adherent portions of lymph and disintegrating hepatic tissue. At two places the walls were exceedingly thin, one situated immediately below the margin of the right ribs, and the other posteriorly near the mesial fissure. The pus had a reddish tinge, and, on microscopic examination, was found to contain pus corpuscles, a quantity of oil globules and granules, and hepatic cells, undergoing disintegration. An obstinate diarrhoea had been one of the most harassing symptoms in this case, but no traces of ulceration were found either in the small or large intestine.

¹ Indian Annals of Medical Science, vol. i., pp. 116, 451.

4. *Dyspepsia*, in various forms, sometimes associated with hepatic derangement, and sometimes independent of this, was, as might be expected, a very common complaint.

5. *Pulmonary diseases* were very rare. Two cases of pneumonia were observed, one already alluded to, as supervening on an attack of cholera and proving fatal, and the other contracted from exposure to the cold, damp, night air, during the expedition into the district, and also proving fatal. In both cases the pneumonia was double, and in the latter there were found distinct traces of old tubercles at the apices of both lungs. It is worthy of remark, that this morbid appearance is extremely common in the lungs of European troops, dying in India of diseases, with which it has no connection. In the numerous *post-mortem* examinations I witnessed in India, I made a point of always examining the apices of the lungs, and, in certainly the majority of cases, I found small cretaceous nodules, cicatrices, or other traces of old tubercles. From this it appears probable, that the disease is often arrested in its infancy, by the removal of the patient to a warm climate.

6. *Tape-worm* (*tænia solium*.)—I allude to this case merely from the treatment employed, for the disease was not contracted in Burmah, the patient having suffered from it for many years before he left India. He came into hospital at Prome, complaining of emaciation, loss of appetite, nausea, gnawing pains in the stomach and bowels, and debility. He had been treated repeatedly with turpentine, pomegranate, and strong purgatives, but with only very temporary benefit. Having no other anthelmintics at hand, I ordered a number of pods of the Indian Cowitch (*Mucuna prurita*), a common weed in the jungles, to be collected, the hairs to be shaken off, and a tea-spoonful of these, mixed up with a little syrup and tincture of cardamoms, to be given three times a day on an empty stomach. After the fourth dose, a full dose of castor oil was administered, which brought away a number of joints of the *tænia solium*. The treatment was continued for a few days, and on the fourth day the patient said he felt sure he had got rid of the worm, and that he was more comfortable than he had been for years. Three months after, he was quite well, and was gaining flesh. It is to be observed, that the worm was discharged dead, and in detached pieces, and the action of the medicine was in all probability purely mechanical, the animals dying of the excessive torture produced by the hairs. The hairs of the West Indian cowitch (*Mucuna pruriens*) have been found serviceable in lumbricus and ascarides, but in these instances the worms have been expelled alive. Dr Christison, however, remarks that the remedy "has little effect in tape-worm."¹

¹ Dispensatory, 2d. Ed., p. 650.

7. *Rheumatic affections* were not uncommon. During the three months there were admitted into hospital five cases of acute, and three of chronic rheumatism, and slighter rheumatic affections were not uncommon in many not admitted. The prevalence of this disease was no doubt owing to exposure to the cold, damp, night air, while on sentry-duty.

8. *Venereal diseases*.—On perusing the tables, we must have been struck with the very few cases of venereal diseases, which are so common in our regimental hospitals in other parts of the world. During the three months only one case of gonorrhœa, and one of primary syphilis were admitted into hospital. The truth is, the Burmese themselves are not addicted to promiscuous sexual intercourse, and venereal diseases, except in their seaport towns, were almost unknown among them, before our arrival in the country. It is to be feared the same cannot be said now.

9. *Ulcers*.—Several of the men suffered from extensive ulcers, resulting from scratching mosquito bites.

10. *Cephalalgia*, without fever, was a very common complaint during the prevalence of the mid-day sun, especially in the young and robust.

11. *Epilepsy*.—One man was seized with epileptic fits, for the first time, shortly after his arrival at Prome. Mineral tonics, the introduction of a seton into the neck, and regulated diet, checked the fits while he remained in hospital; but they always returned when he was allowed to resume his duty.

12. *Apoplexy*.—Two fatal cases occurred; one at Prome, the other at Taphoon.

13. *Delirium tremens*.—On their first arrival at Prome the troops did not drink to excess, and during the first three months there was only one case of this complaint; but, after a time, ennui drove them to the bottle, and in the month of February, there were three cases of delirium tremens in hospital at one time. The liquors to which they had recourse, were the native 'toddy,' the fermented juice of the Tari palm, a very common tree at Prome, and shamshoo, a very intoxicating liquid, obtained from the distillation of rice.

14. *Debility*.—As already observed, the climate of Burmah appeared to have a most depressing effect upon the constitution. Most diseases exhibited a tendency to adynamic or typhoid symptoms, and independently of disease, the constitution became enfeebled, and many of the men found themselves unable to perform their ordinary duties.

I have now brought these desultory observations to a conclusion, and have only to regret that they are not more perfect. The peculiar circumstances under which many of them were made, when marching through the jungles of Burmah, must plead my excuse.

The first of these is the fact that the United States is a young nation. It is only about 150 years old, and its history is therefore a history of growth and development. The second is the fact that the United States is a large nation. It covers a vast area of land, and its population is one of the largest in the world. The third is the fact that the United States is a diverse nation. It is made up of many different peoples, races, and religions, and this diversity has been one of its strengths.

The fourth is the fact that the United States is a nation of immigrants. It has been built by people from many different parts of the world, and this has helped to create a unique American culture. The fifth is the fact that the United States is a nation of pioneers. It has a long history of exploration and discovery, and this has helped to shape its identity.

The sixth is the fact that the United States is a nation of freedom. It is a country where people are free to express their opinions, to worship as they please, and to live their lives as they see fit. This freedom has been one of the most important values of the United States.

The seventh is the fact that the United States is a nation of progress. It has been at the forefront of many of the most important technological and scientific advances of the modern world. This progress has helped to improve the lives of people all over the world.