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EXPERIENCES IN RELATION TO CHOLERA IN INDIA FROM 1842 TO 1879.

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SYLLABUS.

Introductory.

1. Symptoms of Cholera.
 2. Sporadic Cholera.
 3. Epidemic Cholera.
 4. In Relation to Age.
 5. In Relation to Sex.
 6. The Development of Epidemics.
 7. Diffusion of Cholera.
 8. In Relation to Rivers.
 9. Potable Water.
 10. In Relation to "Poison" and "Germs".
 11. Atmospheric Conditions.
 12. Prevailing Winds and Storms.
 13. In Relation to Season.
 14. In Relation to Natives and Foreigners.
 15. In Relation to certain other Diseases.
 16. In Relation to Animal Life.
 17. Whether Contagious and Infectious.
 18. In Relation to Troops in Motion.
 19. In Relation to Conservancy.
 20. Quarantine by Land.
 21. Encamping Troops.
 22. Precautionary Measures.
 23. Inoculation against Cholera.
 24. Treatment.
 25. Summary.
- Conclusion.

Introductory.—The plan in accordance with which the following remarks have been arranged is this: In the first place, to consider the phenomena of cholera presented

in the individual subject of that malady; in the second, those of an epidemic as a whole; in the third, some points relating to the incidence of particular outbreaks in regiments or other considerable bodies of British troops in India; in the fourth, some measures intended to be precautionary against its occurrence; and lastly, the therapeutic method which seemed most appropriate in dealing with individual cases. But with due consideration for time at our disposal, it becomes necessary to limit the number of points selected for comment, and also that the comments on each be brief, and in a sense fragmentary. The period to which the remarks refer is that from the beginning of 1842 to the end of 1879.

1. *Symptoms or Phenomena.*—Familiar as they are to those of us who have had considerable length of service in India, they are now recapitulated, with the objective view of enabling us the more definitely to realise the precise conditions with which we are about to deal.

Those which are characteristic of cholera are the following: Profuse vomiting and purging, the evacuations like rice water, painful spasms affecting the abdominal muscles and those of the extremities; suppression of urine nearly or altogether complete; the aspect of the patient once seen can never be mistaken, though difficult to describe in words; the sunken bloodshot eye, surrounded by a bluish zone; contracted features, the expression that of despair; restlessness of body; carelessness as to desire for life; intense thirst, the desire being for cold drinks to quench what is expressed by the sufferer as “burning heat” within, while to the hand the surface feels clammy and cold, the tongue and breath also cold. The voice has the distinctive “hollow” tone, little above a whisper, as characteristic in its way as are the indications enumerated; the fingers are corrugated, the entire surface livid, the pulse, at first rapid and small, becomes imperceptible, vomiting and alvine evacuations cease, the limbs are unmoved, vitality rapidly ebbs, and the patient appears literally to fall asleep in death.

The asphyxiated form of the malady was comparatively rarely met with during the period to which these notes refer.

2. *Sporadic Cholera.*—The characters so enumerated distinguish cholera, whether occurring in isolated cases or as an epidemic. On many occasions the former is preliminary to the latter. In 1861, it was so at various stations in Northern India, notably in respect to the 88th

Regiment at Moradabad, and the 42nd at Agra. In 1874, a similar circumstance was recorded. In that year isolated or sporadic cases occurred as nearly as possible simultaneously at stations far apart, namely, Fort William, Lucknow, Thyetmyo, Poonah, Dinapore, and Ferozepore. Whereas in Northern India such cases have their seasonal and irregularly periodic occurrence, in the Gangetic delta they happen at all periods of the year, generally in the absence of apparent cause, but on occasions after errors in respect to food or beverages, and at times as result of saline drastic or depressant medicines. Nor is the occurrence of idiopathic sporadic cases on all occasions followed by an epidemic outbreak, though for the most part it is so.

3. *Epidemic Cholera*.—The simultaneous occurrence of cholera epidemics at places in India far apart from each other has been often noticed and recorded. During the prevalence of a particular epidemic, the degree of its severity has varied at different places within its general area; in 1861 it raged with peculiar intensity at Gwalior, Agra, and Meean Meer, while in Rohilcund it was comparatively mild in type. Neither is the severity of successive epidemics in the same locality alike, although all apparent physical conditions remain unaltered. Thus, in 1841, the district to the west of Cawnpore was very severely affected; whereas in 1842 the type in the same locality was mild. In 1875, certain villages in Central India that had suffered severely on a recent previous occasion remained exempt, while others within the same area were affected; yet, in 1876, those that had then escaped were affected. In Northern India the epidemic of 1852 was comparatively mild; that of 1876 comparatively severe within the same area.

As in the case of yellow fever in the West Indies, so with cholera in India: the occurrence of epidemics is periodic, the apparent conditions of particular localities affected remaining unaltered meanwhile. The duration of intervals between such epidemics extends on certain occasions to several years, and in this sense is more or less defined.

The incidence of particular epidemics is variable; the disease not unfrequently attacks soldiers of the same regiment and spares those of another, or all those located at the same stations, the circumstances and conditions of all being apparently identical. It has on occasions left soldiers exempt, while it attacked their wives and children; in others it has affected the men, leaving their wives and

children exempt—as happened notably in the epidemic of 1867. The occupants of a particular barrack-room may suffer, while those in adjoining apartments escape, as happened in Fort St. George, Madras, in 1870.

4. *Age*.—Statistics relating to the year 1872 record that of 118 children who died by the epidemic in that period only one was under four months of age; that the disease was comparatively rare during the two first years of life; but that the ratio of mortality to attacks was greatest in those of from two to three years old. According to a series of statistics extending over five years,* all ages suffer alike, from that of twenty to thirty and upwards—that constituting the period of a soldier's active life in India. Statistics relating to the intermediate ages are unavailable.

5. *Sex*.—According to general statistics the rate of attack among soldiers in India is 17.40 per 1000 strength; of deaths 7, as against 15.80 and 5 respectively among soldiers' wives. In the epidemic of 1869 the ratio of attacks to strength was 25.7; 26.1 among their wives and children; but, unfortunately, particulars are wanting with respect to the incidence of the malady in each of the two classes so included. On some occasions, so severe has been its rate of incidence among women in India, that there are observers who believe that in the mass their liability to attack is proportionally greater than that of men. But, as shown above, the results of observations relating to this point differed among themselves, and in different epidemics.

6. *Development of Epidemics*.—In 1845, epidemic cholera suddenly occurred in the month of June at Cawnpore; it raged with intense violence during four days, and then ceased with equal suddenness as it had appeared. In 1846, at Kurrachee and some other places, the epidemic outbreak was preceded by cases of diarrhœa and of sporadic cholera. In 1861, the epidemic which prevailed in northern India presented various modes of development in different places. In some it appeared suddenly; in others it was preceded, during variable periods, by diarrhœa and malaise. In some instances, isolated cases of cholera occurred in different parts of a cantonment distant from each other. On occasions, the malady, after prevailing violently for a few days, relaxed in intensity only to recur with increased virulence. In certain instances, communication with in-

* Recorded in *Hygiene of Cholera*, p. 57.

fecting localities could be traced. In others simultaneous outbreaks occurred at places far apart, and in the absence of seemingly possible communication between persons, or with other infected places.

In 1867, cholera appeared simultaneously at Hurdwar and Bijnore, separated from each other by the river Ganges; also at various places far apart, the intervening districts remaining unaffected. In 1869, the epidemic suddenly appeared in Rajpootana, occurring simultaneously at places 300 miles apart. In 1871, the epidemic suddenly and with great intensity occurred in the 18th Hussars at Secunderabad, affecting that regiment alone among the large force there stationed. In 1876, it affected the portions of the Chittagong district that had been inundated by the cyclone of that year.

7. *Diffusion of Cholera.*—On various occasions, notably in 1871, cholera has been restricted within definite limits, notwithstanding that free communication took place between the district affected and those around it. On the other hand, instances are numerous in India, as elsewhere, of an epidemic spreading far and wide; others, in which an epidemic of one period having affected a locality to which a previous outbreak had been restricted, has on the second occasion spread beyond the limits of that district. An occurrence of this kind was recorded in relation to the cholera outbreak of 1827, as compared with those of 1826 and 1825, namely, seventeen years prior to the earliest date properly included in these remarks, but noteworthy with reference to the present analysis.

In the year 1842, cholera prevailed in Lower Bengal, but did not extend northward beyond Cawnpore. [Here the circumstance may be noted parenthetically that, in 1817, the disease in epidemic form extended to Jessore from without, it having, in the first instance, occurred among the troops engaged in military operations in Bundelkhund.] In 1843, it prevailed with great intensity at Agra. During the period from 1840 to 1843, both inclusive, an epidemic current extended gradually down along the course of the Irawaddy to Rangoon, and thence to Moulmein. In 1844, a current of epidemic progressed from the Punjab south-eastward to Delhi, Bengal proper being free except as regards a few localities. In 1845, it extended south-east to Jhelum, Loodianah, Umballah and Meerut, from Peshawur; south-west to Hyderabad, Scinde. In 1846, it prevailed all over the Bombay Presidency; in 1848, at Dacca, Calcutta, Dinapore and Cawnpore, but did not

GEOGRAPHICAL POSITIONS OF PLACES NAMED.

STATIONS.	LAT. N.		LONG. E.	
	Deg.	Min.	Deg.	Min.
Agra ...	27	10	78	5
Allahabad ...	24	47	81	11
Almorah ...	29	35	79	41
Bijnore ...	29	22	78	10
Bellary ...	15	8	76	57
Bhaugulpore ...	24	32	86	21
Bombay ...	18	55	75	53
Calcutta ...	22	34	83	23
Cawnpore ...	26	28	80	23
Chittagong ...	22	21	91	52
Comorin, Cape ...	8	4	77	35
Cudderpah ...	14	0	78	0
Curnool ...	14	54	77	46
Daccan ...	23	43	90	26
Darjeeling ...	27	2	88	18
Delhi ...	28	33	77	16
Dinapore ...	25	38	85	5
Ferosepore ...	30	56	74	38
Ganjam ...	19	22	85	2
Ghooty ...	15	6	77	41
Gondak ...	27	7	82	0
Gwalior ...	26	13	78	12
Hasarabagh ...	23	59	85	24
Hurdwar ...	29	57	78	12
Hyderabad, Scinde ...	25	23	68	24
Jhelum ...	32	55	73	46
Jounpore ...	25	41	82	43
Jubbulpore ...	23	11	79	59
Kurrachee ...	24	51	67	4
Lahore ...	31	34	74	21
Loodianah ...	30	55	75	53
Lucknow ...	26	51	80	58
Madras ...	13	4	80	17
Meean Meer ...	31	30	74	25
Meerut ...	29	0	77	45
Mooltan ...	30	11	71	28
Moulmein ...	12	35	97	58
Moradabad ...	28	49	78	49
Monghyr ...	25	22	86	30
Nursingpore ...	22	56	79	14
Nynee Tal ...	29	22	79	29
Poonah ...	17	54	73	24
Pooree ...	19	48	85	51
Rangoon ...	16	55	76	25
Rohilcund (see Moradabad) ...	28	49	78	49
Salem ...	11	39	78	11
Saugor ...	23	49	78	43
Secunderabad ...	17	26	78	33
Shahjehanpore ...	26	50	83	53
Simla ...	31	6	77	11
Thyett Myo ...	17	35	96	32
Umballah ...	30	21	76	52
William, Fort, Calcutta ...	22	34	83	23

extend northward beyond Agra. In 1849, Behar and Central India suffered, the epidemic reaching Bombay from

the eastward. In 1851, in the south-western parts of Bengal, in the Madras and Bombay Presidencies, and along the western coast. In 1852, over the North-Western Provinces and Punjab, extending to the mountain stations of Almorah and Simla. In 1853, in Dacca and Assam, extending to, but not beyond, Cawnpore. In 1854, in Bengal proper, and in that province only. In 1856, simultaneously at several places around Agra, extending thence to Gwalior in the south, and to Nynce Tal in the north. In 1857, with great violence among the troops besieging Delhi, more especially in the 75th regiment.* In 1859, in Lower Bengal, and to, but not beyond, Cawnpore in that direction; also at Bombay, and along the western coast from Kurra-
chee to Cape Comorin. In 1860, in Bengal, Oude, and Bombay; also in Assam, and thence to Darjeeling. On the same occasion it prevailed with great intensity at Agra.

In 1861, the great epidemic of that year in one region extended along the Grand Trunk Road. It thence branched off, passed over several villages, and attacked others more distant. In some portions of a district it prevailed with great virulence; in others, with less intensity; and villages occasionally escaped attack in the absence of apparent conditions to account for the circumstance. In Rajpootana the epidemic suddenly appeared in the Bhurtpore district; thence it spread in a north-west direction; it also extended south-west to a particular point, where it suddenly ceased. It did not attack the British troops in the Fort of Lahore until three weeks after it had become prevalent among those at Meean Mear, nor could any communication be traced as having taken place between those in the two localities. In Northern India generally, that particular epidemic seemed to be diffused independently of all discoverable conditions.

Official reports with reference to that epidemic in northern India record that it crossed and moved directly contrary to currents of rivers and of wind; that when the wind blew in directions favourable to the course of aerial miasmata, the epidemic did not appear to advance with any particular velocity.

In 1863, cholera prevailed along the valley of the Ganges, extending to Hazarabagh on the one hand, to

* The 75th had been rapidly brought from the hill station of Kussowlie to take its part in actions against the mutinous Sepoys. Other regiments, whose service had been long and continuous at stations in the plains, either escaped cholera, or suffered to a comparatively small extent during the campaign of the Mutiny.

Oude on the other. It prevailed in Bombay also, having been conveyed, as believed, by pilgrims. In 1864, all over Bengal, central and western India, including Bombay. In 1865, along the Malabar coast, in Mysore and Bellary, in Bombay and Scinde. In 1866, in the west of India, Punjab, Cashmere, and Afghanistan; also in Bengal proper. In 1867 it continued to prevail in the Punjab, Cashmere, and Afghanistan. In 1869, in Central India. In 1874-5 the epidemic was unusually diffused over India, the mortality greater in the latter than in the former year.

8. *In Relation to Rivers.*—River deltas in which cholera is endemic, and occasionally epidemic, differ among themselves in respect to geology, the nature and quantity of impurities deposited, the range of temperature and extent of rainfall along their courses; as, for example, those of the Brahmaputra, Ganges, Godavery, Cauvery, Nerbudda, and Indus; so in respect to the course of those rivers and of their respective tributaries. Yet, according to statistics, of 152 outbreaks of cholera in the Madras Presidency, 106 have occurred in places adjoining rivers.

In 1842, and subsequently, troops ascending the Ganges in country boats were suddenly attacked while the boats were moored for the night at particular places, the disease not persisting on their proceeding therefrom. Of such localities, one was near Bhaugulpore, a second near Monghyr, and a third opposite Dinapore. On occasions cholera prevailed along both sides of a river; thus, in 1861 it affected the natives on both sides of the Jumna, near Allahabad; in 1876, on both sides of the rivers in the Narsingpore district of the Central Provinces.

In some instances, the progress of an epidemic has been downwards along a river course; as, for example, in 1842, when cholera so followed the flow of the Irawady from the north; in 1845, from Peshawur, an epidemic current descended by the valley of the Indus, and so reached Kurrachee. In other instances, the progress of an epidemic has been upwards, as against the current of a river; thus, in 1862, cholera having occurred at Taku, extended thence upwards against the Peiho, and so reached Peking. A river has acted as if it were a barrier against the further progress of an epidemic; in 1862, in Rajputana, the course of cholera seemed to be so turned by the rivers Bunass and Chumbul.

9. *Potable Water and Cholera.*—The principle was generally accepted, and acted upon, that a connection existed between the use of contaminated water and the occurrence

of cholera, whether in individuals or communities. But observations made over extensive tracts of country, comprising numerous military stations, presented differences among themselves in respect to the degree to which that connection has existed, or existing has been traced. For example, in 1861, at Calcutta, of nineteen persons who drank water subsequently ascertained to have been contaminated by recent cholera dejecta, five became affected with that disease within three days, while fourteen remained unaffected.

In 1867, cholera spread in several gaols in Bengal, the drinking water of which was declared free from contamination; the epidemic appeared in places where, although the natives drank contaminated water, they had drunk the same water continuously during the preceding twenty-three years, but remained the while exempt from the disease. At Peshawur, in 1869, the native troops used water contaminated with fæcal matter, and escaped; the 104th Regiment obtained its supply from a well declared pure, yet the soldiers belonging to it suffered severely. In 1871, at Secunderabad, cholera became epidemic in the 18th Hussars; while it was so, the soldiers were using the same water supply they had previously employed without evil result. During the prevalence of the epidemic in that regiment, other troops used the same water supply, yet remained unaffected by the disease. In 1872, a similar circumstance occurred at the same station; of various bodies of troops using the same water supply, some suffered from cholera, some did not. Other instances could be given did space permit.

Throughout the long period referred to in these notes, various methods have been applied to potable water with the assigned object of counteracting contamination by choleraic poison. The subject has been much dwelt upon by both army and civil medical officers in India, and by commissions, international and others, the general results being that they doubt if boiling, or filtration, or both combined, are sufficient to counteract contamination with that "poison".

Various methods of purifying water for barrack use have been used in India; among them the native plan by means of *strychnos potatorum*, lime, sand and gravel, charcoal and sand, magnetic oxide of iron and sand, filtration by means of double casks, according to the method of Dr. Lind and others.

10. *In Relation to "Poison" and "Germs"*.—In India,

during the period now referred to, chemical and microscopical investigations relative to cholera were actively conducted, more especially in the concluding decade of it. So far the results of those investigations were declared to be negative in respect to the former; while with reference to the latter they were expressed after this manner: No special fungus has been detected in choleraic matters which had not also appeared in other media; there is no specific germ to be found in the atmosphere of localities where cholera prevails that can be connected with the production of cholera. The nature of the generating principle of cholera has evaded all investigation; it is only known by its effects; the presence of a cholera poison has been assumed; the disease is only known to us as a phenomenon; there is not a jot of evidence to prove that there is a causative entity which gives rise to the phenomena—such was the conclusion arrived at as a result of observation and inquiry up to the end of the year 1879.*

11. *Relation to Atmospheric Conditions.*—In 1843, at Agra, the month of June was characterised by unusually severe thunderstorms and heavy rains; in July cholera of virulent type occurred in the 39th Foot, and continued onwards through the greater part of August. In 1845, at Umballa, the seasonal rains suddenly ceased, the sky became clear, the sun bright: simultaneously with the change cholera occurred. In the same year, at Madras, the epidemic of cholera was attended by a hot land wind by day, with heavy rainfall in the evening. In 1846, at Kurrachee, the violent epidemic in the 78th Regiment was attended by a moist and stagnant state of the atmosphere. In 1848, during the prevalence of a similar epidemic in the upper provinces of Bengal, there was a seasonal deficiency of rain. In 1854 the epidemic was attended by low barometric pressure and temperature, with rain and constant movement of the atmosphere. Similar differences characterised subsequent years.

12. *In Relation to Prevailing Winds and Storms.*—In 1849 cholera reached Bombay from the eastward, the south-west monsoon at the time prevailing in full force. The epidemic of 1856 appeared to be unaffected by the

* *Germs.*—Their presence bears the same causative relation to cholera as infusoria and other minute organisms which exist in myriads in the muddy waters around and beyond Saugor Island bear to the storm wave which, under the influence of the cyclone, sweeps over and devastates huge tracts of Lower Bengal; or which the motes that similarly exist in the clear still atmosphere bear to the destructive hurricane.

direction of the prevailing wind. In July, 1860, at Ganjam, cholera advanced against the south-west monsoon. In 1865, in Bengal, it advanced against the same monsoon. In 1869-70 it traversed the Madras Presidency in opposition to the prevailing wind. In 1873, at Thyet Myo, the 45th Regiment was severely affected at the same time that the occupants of the native town and gaol, both situated to windward, were exempt; as were also the Royal Artillery and their followers, all of whom were situated to leeward of the 45th. In 1869 epidemic cholera in the gaol at Jounpore suddenly ceased on the occurrence at that place of a storm in the month of August. In 1871, at Secunderabad, the occurrence of a dust storm heralded the disappearance of the epidemic from the 18th Hussars. But in 1845, at Meerut, cholera of very virulent type attacked the 10th Foot immediately after the occurrence of a hurricane, an officer, and the wife of an officer, being its two first victims. In 1846 a similar occurrence happened to the 88th Regiment at Kurrachee. In 1861 at Meerut; in 1867, at Meerut, Peshawur, and Hurdwar. But in 1872 instances occurred in which the outbreak of cholera was neither preceded by atmospheric storms nor other perturbation.

13. *In Relation to Season.*—In 1842, cholera occurred in Bengal in April, and continued throughout the remainder of the year. In 1843, at Agra, in July and August. In 1844, at Peshawur, in November. In 1849, at Bombay, in August. In 1850, at Bombay and in Central India, during the rainy season (June, July and part of August). In 1852, at Almorah, Dehra, Umballah, in May to July; Moradabad, in September. In 1853, in the eastern parts of India, through the winter or cold season. In 1855, at Dinapore, in May; and at no other station throughout that year. In 1861, at Meean Meer, the intensely severe outbreak made its first appearance on 2nd August. In 1863, at Madras and lower part of the Gangetic tract in the early months of the year. Bombay, Agra, Hazarabagh, and Gondah in July; Central Provinces in October and November. In 1864, Central and Western India, in March. In 1867, in the Punjab, in May. In 1869-70, at Thyet Myo, among British infantry in the hot weather (May and June) of each year; Royal Artillery, in the rainy season (July and August), the Indian troops and native Burmese escaping on both occasions. In 1871, at Secunderabad, it appeared on 25th May. In 1872, at Meean Meer, on 31st July. In 1873, as in 1869-70, among the British infantry during

the hot weather; Royal Artillery during the rains. In 1875-6, in the Central Provinces, during the rains (July and August). The sudden occurrence of one or more deaths in the European inhabitants of Calcutta in February, or early days of March, is painfully familiar to residents in that Presidency capital.

14. *In Relation to Natives and Foreigners.*—In 1843, at Agra, the 39th Regiment, and white soldiers of the East India Company's Artillery were severely affected, while the native troops in their immediate vicinity were so in a very slight degree. In 1848, at Dinapore, cholera raged in the 80th Regiment, but in a mild form among the Sepoys and in the native bazaar. In 1853, at the same station and in the surrounding district, it affected the British troops more severely than those of native regiments. In 1861, at Meean Meer, the first person attacked was a native, but the epidemic fell entirely upon the white troops, the Sepoys and the native population remaining almost completely exempt. In 1867, at Shahjehanpore, the British troops suffered severely, so did the native population, but the Sepoys only in a slight degree. In 1871, at Secunderabad, the 18th Hussars suffered; so did a few native residents; the epidemic spared all the other troops, British and native; but having ceased in the Hussars, it attacked the native general population. In 1872, at Lucknow, the British troops suffered, the Sepoys and their native followers remaining exempt. Various other illustrative instances could be given did time and space permit.

15. *In Relation to Certain Other Diseases.*—In 1853, epidemic cholera in Calcutta was followed by the prevalence of a form of fever to which the name of "typhoid" was then given. In 1861, on the other hand, when cholera prevailed at Delhi, the more usual endemic diseases were below their average. In 1869, at Madras, cholera was preceded by "an unhealthy wave"; wounds and ulcers manifested an unusual tendency to become gangrenous. In 1877, cholera and diarrhoea prevailed together in the Wynaad.

In 1844, at Ghazepore, the 29th Regiment suffered severely from fever, the attacks attended by a degree of prostration similar to the collapse of cholera. In the same year, in The Buffs at Meerut, severe attacks of fever often lapsed into cholera. In 1856, at Peshawur, various cases of the severe form of fever prevailing speedily ran into collapse similar to that of cholera. In 1861, at Lahore, Umritsur, and Agra, cholera and intermittent fever

prevailed simultaneously. In 1869, they did so at Peshawur, Umritsir, and various other places. On the banks of the Ganges, however, there was no proportion between the intensity of a malarious epidemic and one of cholera; each attained its climax at a different season of the year from the other. Occasional instances have been observed in which the subject of cholera has presented the yellow tinge of the surface and the black vomit characteristic of yellow fever in the West Indies. Others are familiar, in which the cold stage of intermittent fever lapses into the collapse of cholera, and no less so with "secondary fever", to which the convalescent from cholera so frequently succumbs.

This aspect of the general subject is of sufficient importance to justify the addition of some further illustrative examples, namely: In 1869, at Ghooty, fevers and cholera prevailed simultaneously. In 1872, at Secunderabad, the first person of 18th Hussars attacked was a soldier affected with intermittent fever; in that year also, an epidemic of fever immediately succeeded one of cholera in the majority of military stations in the Bengal Presidency, more particularly at Allahabad, Meerut, Meean Meer; also at Peshawur and Mooltan.

Nor are observations to the same effect confined to the period to which this paper is properly limited; similar remarks are recorded in the years 1477 and 1575. Ancient Hindoo writers allude to similar occurrences in reference to the disease "Jiwar-antishar", believed to have been cholera. Even Hindoo mythology gives prominence to the existence of a similar empirical belief in relation to certain other diseases, personified respectively under the figures of "Oola Beeby"* and "Seetala".

16. *In Relation to Animal Life.*—In June, 1846, it was observed that for some days previous to the outbreak of cholera in the 86th Regiment at Kurrachee, carrion birds, usually numerous around barracks, disappeared; while the epidemic prevailed, some of the dead were buried on the sea-shore, the dearth of wood rendering it impracticable to provide coffins for them; their graves were left untouched by prowling animals (hyænas and jackals), by which such places had on previous occasions been attacked.

Concurrently with the epidemic in South Canara and Malabar in 1869, the coasts were strewn with dead fish.

* Called also "Mahamararee".

At Lucknow, in 1872, the horses of the 19th Hussars suffered from an affection precisely like cholera, then prevailing among the soldiers of that regiment. In 1875, at Delhi, while cholera was epidemic among the troops, seventy-five cats were reported to have died from an affection presenting all the characters of that disease. In the past history of cholera similar examples are somewhat abundantly recorded. [In relation to plant-life, results of observations made in India are not available. Those made elsewhere are on record, showing in some instances the coincidence of blights in cereals with outbreaks of cholera.*]

17. *Whether Contagious and Infectious.*—During the period to which these notes refer, different opinions prevailed among medical officers in regard to contagion and infection, according to the ordinary significance of those expressions: the opinions in question being the outcome of individual experience. Thus, in 1843 and 1844, while cholera prevailed severely in the Buffs at Allahabad, soldiers affected were placed promiscuously in wards, nor did an instance occur in which occupants of adjoining beds were seized by the malady. In 1848, during the outbreak among British troops at Cawnpore, no medical officer or hospital attendant became affected. In 1861, at Meean Meer, the mortality among the soldier orderlies employed in hospitals was great, but medical officers and native attendants altogether escaped. In 1865, during the epidemic in the Madras Presidency, a large proportion of medical officers and of hospital attendants succumbed. In 1875, of sixty-seven hospitals in India in which cholera sick were treated, no attendant was attacked in fifty-nine.

18. *In Relation to Troops in Motion.*—During the same period the occurrence of cholera in bodies of troops on the line of march was so frequent as to point to the act of travelling being itself a predisposing cause of the malady. This liability was recorded to be greater in the Madras Presidency than elsewhere in India; and in that Presidency, most of all in the districts of Bellary, Cuddapah, and Kurnool, the ratio of mortality greater among large bodies than in small. On occasions the attack has occurred while meeting and in contact with bodies of pilgrims; on some it has clung to troops so situated; in others it has ceased on their emerging from the masses of pilgrims. On the one hand, under such circumstances troops affected have

* *Hygiene of Cholera*, p. 167.

been the means of conveying the epidemic to the civil population; in others, the epidemic has extended from the civil population to them.

19. *In Relation to Conservancy.*—During the period under review, the general result of experience confirmed the belief that insanitary conditions of places or persons favour the occurrence of cholera in them; that wherever sanitation was neglected, there cholera, having originated or been introduced, became concentrated and intensified. But experience pointed to the conclusion that insanitary conditions are not, under all circumstances, and by themselves alone, the originating cause of cholera. For example: in 1856 the ravages by the disease were very great at Meerut, a station noted for the excellence of its sanitation; while at Saharunpore, a peculiarly dirty city, few persons suffered. In 1861, at Allahabad, the Wellington Barracks, situated in the worst locality, were exempt; while those situated in more favourable localities were affected. In that year the 52nd Regiment, occupying barracks sanitary in themselves and in situation (in the King's Mews), suffered severely, while the crowded and dirty city of Lucknow was exempt. In 1867, at Lucknow, Meean Meer, and Morar, occupants of localities close to filth pits, and otherwise objectionable, escaped, while those in more "sanitary" positions were affected.

20. *Quarantine by Land.*—Experience showed that in Indian cantonments the strict application of quarantine was impossible. In the Punjab, the people concerned declared that they preferred the cholera to the restrictions implied in that measure. In 1869, it was declared to have failed at the stations to which it was applied. In 1872, some of those in which no quarantine was observed escaped; at others to which it was applied cholera raged violently; for example, at Roorkee strict quarantine was observed, yet cholera occurred there for the first time during seventeen years. In 1875, while cholera was at a distance of forty miles from Salem, Madras Presidency, quarantine was applied in the direction of the point affected, but the epidemic suddenly occurred in that town.

21. *Encamping Troops.*—According to official records, the method of removing troops into camp, and of changing camp grounds during cholera epidemics, was adopted with good results at Madras so long ago as 1774; in the West Indies, during the prevalence of yellow fever, from a still earlier date. Adverting to the period proper, embraced

in the present paper.* In 1843, at Agra, the 39th Regiment was moved from the infected barracks into camp at Rambagh; within a week after that move had been made, cholera ceased in the regiment. In 1848, the 1st European Fusiliers at Cawnpore, and 31st Regiment at Umballah, were moved into camp from infected barracks with the result that in both corps the disease ceased. In 1861, when cholera raged violently among British troops at Meean Meer, a portion of them were marched across the river Ravee and encamped at Shadera: the epidemic thereupon ceased in that particular portion, but continued to prevail among the soldiers left in cantonments. At Umritsur, on the same occasion, no case occurred among the men of the 94th Regiment after they had been moved into camp. At Meerut, with regard to the Royal Artillery and 8th Hussars, and at Agra, with the 42nd Regiment, the move into camp was similarly successful, although the rainy season prevailed at the time.

But not on all occasions was the movement of British troops into camp so successful. In 1845, cholera occurred in the 31st Regiment at Umballah. The effectives were sent into camp during the prevalence of the rains; their tents got blown down, the men, their clothes and bedding were rendered completely wet; during the succeeding night cholera occurred violently among them. In 1856, at Meean Meer, a body of European artillery were marched from infected cantonments to camp; cholera did not appear among them while encamped, but on their return to barracks, forty-eight hours thereafter, cholera attacked some of their number. In 1867, similar measures were adopted at various stations, at some successfully; at others the disease was not checked; while at a few, "evils took place little, if at all, less than cholera itself."

22. *Precautionary Measures.*—Throughout the period referred to in these notes, rules and regulations, the joint result of experience on the part of the higher medical, military and civil authorities in India, have been issued from time to time; whenever cholera threatened or actually attacked British troops, those regulations were most carefully carried out by regimental officers, military and medical, such additional details being supplemented as

* When in 1817 cholera attacked the forces under the Marquis of Hastings, operating between Saugor, Jubbulpore, and Munoola, Central India, the epidemic ceased on the force being moved to the high ground of Gwalior. On that occasion the epidemic seems to have extended from Benares, Allahabad, and Mirzapore.

became necessary by individual conditions. A resumé of such regulations is given in the volume on *The Hygiene of Cholera* already mentioned. In them stress is laid upon the necessity for the early administration of remedies, and full instructions given as to the means by which that measure is to be provided for.

The codes of rules thus alluded to have reference, respectively, to troops in transit by railway and on the march; in cantonments; to conservancy of camps; and to the management of soldiers' families during times of epidemics.

23. *Inoculation against Cholera.*—During the period under notice no case was recorded in which cholera was communicated to man by means of inoculation; that is, by punctures accidentally received while performing autopsies. The blood and evacuations had often been similarly brought in contact with a recent wound without producing evil results.

There is on record only one form of "inoculation" intended to be protective against cholera as having been adopted during that period. This happened between the years 1862 and 1864, at Calcutta, when, at the instigation of Dr. Honigberger, inoculation was performed, the material inoculated being a preparation of Quassia, generally believed to be the simple infusion of that wood. For the time being success was said to follow the process. Within a few months thereafter the subject had passed into oblivion.

24. *Treatment.*—The result of general experience was that only in the early stages of attack by cholera did success seem to reward medical treatment, except in comparatively rare instances; hence arrangements existed regimentally both in barracks and in hospital with that object. Of various methods used, the following epitome represents that which, personally, I was led to consider the most appropriate: namely, calomel, concentrated stimulants, including sulphuric æther, and ammonia, together with carminative tinctures in a suitable vehicle. Diluted medicinal hydrocyanic seemed on occasion to allay gastric spasms, and so enable the stomach to retain those remedies. Frictions to the limbs: *iced* water in small quantities (ice itself not obtainable in the earlier years of the period), warmth externally. The vital powers having shown signs of restoration, they were encouraged by means of continued dry warmth externally, and hot restoratives, medicinal and alimentary, within; these continued till convalescence was

established. Except in the very earliest stage of the malady, opium was omitted. Its use was considered to increase liability to secondary fever.

25. *Summary*.—A careful survey of the data so adduced seems to me to support the deductions therefrom as follows, namely:—

1. That the symptoms or phenomena in an individual case of cholera are definite and characteristic.

2. In certain instances sporadic cases of cholera have immediately preceded an epidemic of that malady; in others, no epidemic has followed.

3. In some instances the sphere of an epidemic was more or less definitely restricted; in others, there seemed to be no definite limit. Outbreaks have occurred simultaneously at places far apart. Their respective degree of incidence has varied.

4. The period of life presenting the greatest liability to attack by cholera would seem to be twenty years and upwards.

5. Varieties have been presented in different epidemic outbreaks in regard to the relative liability of the sexes to cholera.

6. In certain instances the outbreak of an epidemic has been sudden; in others gradual. In some it has quickly culminated and disappeared; in others more slowly, and persisted during longer periods. In another class of instances, an epidemic having moderated in prevalence or mortality has suddenly recurred with increased intensity.

7. The diffusion of epidemics has taken place in various directions, without apparent reference to lines of traffic, or to prevailing winds. The directions recorded include eastward, south, south-west, north, and west.

8. A large proportion of epidemic outbreaks have occurred in places adjoining rivers. In some instances the progress of an epidemic has been downwards along the river course; in others, upwards against the current. The progress of an epidemic has been apparently stopped by the occurrence of a river in its line of progress.

9. Evidence differs in regard to the relation assigned to contaminated water in the causation of a cholera epidemic. Illustrative examples, *pro* and *con*, are given in the text.

10. The observations recorded on the subject of specific "germ" and "poison" in relation to cholera had negative results.

11. Atmospheric conditions during epidemics of cholera

have been various, except with the general existence of an increased hygrometric state.

12. Neither prevailing winds, nor the occurrence of storms such as prevail in India, have had apparent influence on the occurrence or cessation of cholera epidemics.

13. The months of the year during which cholera epidemics were most prevalent included those from March till November. In Bengal, during the earlier part of the year; towards the south-west during the later; in Western India, June, July and August.

14. On many of the instances recorded, British troops suffered more severely during particular epidemics than did the Sepoys or native populace.

15. Observations seem to confirm native belief in the existence of a connection between cholera and the maladies recorded in the text.

16. The occurrence of disease, and of certain unusual phenomena in various classes of the animal kingdom, have been observed during the prevalence of cholera in man. Observations on plants wanting.

17. Certain instances are given indicative of cholera being contagious in those enumerated; others are given which point to this property not being constant under all circumstances.

18. Troops on the line of march are shown to be in an especial degree liable to be attacked by epidemic cholera. They may become infected from the general population, or may be the means of communicating cholera to them.

19. Imperfect conservancy is shown to favour the occurrence of cholera; but instances are recorded in which troops occupying barracks in most "insanitary" positions suffered little, or altogether escaped, while those in more "sanitary" barracks suffered severely.

20. Quarantine has failed at stations in India to which it has been applied; it has at others proved impracticable.

21. The practice of moving troops affected with cholera into camp dates from the eighteenth century. In certain instances the measure has proved successful; in others not so. Minute instructions regarding this measure exist.

22. Minute rules relative to precautionary measures against cholera among troops have also been published.

23. Inoculation of various kinds had negative results.

24. A particular method of treatment, deemed to be relatively successful, is detailed in the text.

Conclusion.—The particulars now submitted have been selected from among such as came directly within my own

knowledge while serving in the capacity of a regimental surgeon in India, or were recorded in official documents which came under my cognisance as an administrative medical officer in that great Dependency. They are here related in the form of bare narrative, such conclusions being drawn therefrom as the data presented seem to justify and support. This being so, I would venture to express a hope that, notwithstanding the high antiquity of the period referred to, the remarks I have dared to formulate may be accepted as a contribution to the literature of what has heretofore proved to be the most extensively fatal and intractable scourge by which, during the greater part of the present century, British soldiers in India, together with their wives and children, have been from time to time afflicted.
