

Original Articles.

CHOLERA IN BENGAL: PAST AND PRESENT.

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At the October session of the Standing Committee of the Office Internationale d'Hygiene Publique, I was asked the following questions:—  
(1) Is Bengal nowadays the endemic home of cholera, as it used to be in the past?

available. (1) Hirsch's Handbook of Geographical and Historical Pathology," 1883, Vol. I; (2) Macpherson's "Annals of Cholera," London: 1872; (3) "Report on Epidemic Cholera Morbus in the Presidency of Bengal in 1817 to 1819" by James Jameson, Calcutta: 1820; (4) "Report on Epidemic Cholera in Madras" by W. Scott, 1824; (5) "Report on Cholera Epidemics from 1817 to 1872" by James L. Bryden, Calcutta: 1874; (6) The Annual Reports of the Sanitary Commissioner with the Government of India; and (7) "A Treatise on Asiatic Cholera" by C. Macnamara.

Hirsch says: "In the year 1817 there began the epidemic extension over India of a disease which

MAP I.



Copy of Scott's map showing the progress of epidemic cholera in 1818 and 1819. The portion cross-shaded is that always shown in old reports of the Sanitary Commissioner with the Government of India as the home of endemic cholera from which all epidemics start.

(2) Does Bengal still spread epidemic cholera throughout India and thence to the rest of the globe?

This article is an attempt to answer this serious indictment.

*Past History of the Disease.*

Concerning the cholera of the last century there is a considerable amount of literature

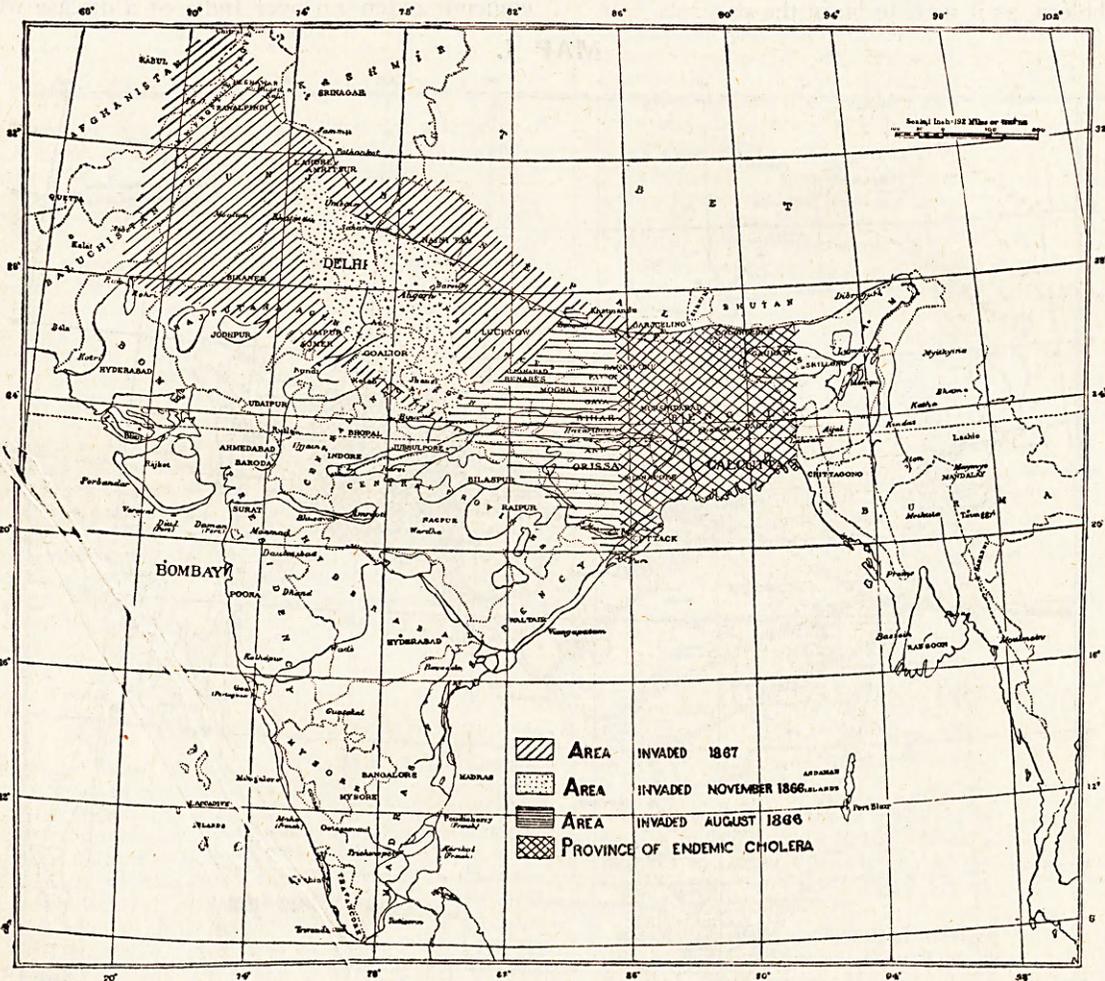
had previously been known as an endemic in a few districts of the country. In that and the following years it overran the peninsula and crossing the borders of its native territory it penetrated to almost every part of the habitable globe." He goes on to give a full history of four great pandemics 1817-1823, 1826-1837, 1846-1849 (which remained so late as 1854 in the islands of the West Indies), and 1865-1875 (a pandemic

which was noticeable for the rapidity with which it spread to Europe and the Western Hemisphere). This last epidemic commenced in the lower Ganges basin in 1863 and leaving India in 1865 was widely spread in North and South America in 1866, reaching Guadeloupe directly by ship from Marseilles, and to Halifax in Nova Scotia by ship from Liverpool.

Scott traces the spread of the 1817 epidemic from Bengal through the peninsula to Ceylon which was reached in January 1819. Map I is a copy of the map which illustrates his report.

its natural territory in lower Bengal, by what Bryden terms 'the epidemic highway,' across the Central Provinces, and southward through the Deccan and Bombay Presidencies towards Madras territory, which in a longer or shorter space of time is occupied. Nor does cholera terminate with the extreme southern limit of the peninsula. In all true epidemic invasions, from 1818 down to 1870, it has been carried on to the neighbouring island of Ceylon. In this southern progress of cholera a period of two years may elapse (as in the latest invasion) before the epidemic has

MAP II.



Cunningham in the annual report of the Sanitary Commissioner with the Government of India quotes Scott's narrative as follows:—

"The history of the epidemic advance of cholera in 1818, as detailed in Scott's narrative, is, in point of fact, the history for all time of the mode in which the Peninsula and Southern India are invaded. In every new invasion there are sure to be some minor differences as to the rapidity of movement of, and the extent of country covered by cholera, but the main facts are unalterable. The broad truth in regard to invasion to be borne in view is that the great body of cholera which invades Southern India leaves

travelled its southern course from Bengal to Ceylon, or, as in 1818, the whole journey may be completed in six or seven months. The epidemic of cholera that left Bengal in the spring of 1818 reached Ceylon in January 1819; but, with all the facilities for rapid communication introduced during the last half century, we find that the great body of moving cholera in the last epidemic invasion which fell upon the Central Provinces in the spring of 1868, did not reach Ceylon until May 1870."

Jameson's history of the 1817-1820 epidemic is quoted by Bryden. "There was universal cholera in the endemic province in the first six

months of the year 1817. In May and June it occurred to an unusual degree in Nuddea and other districts. It did not attract notice until August when the rapidity of its progress and general extension caused great alarm.

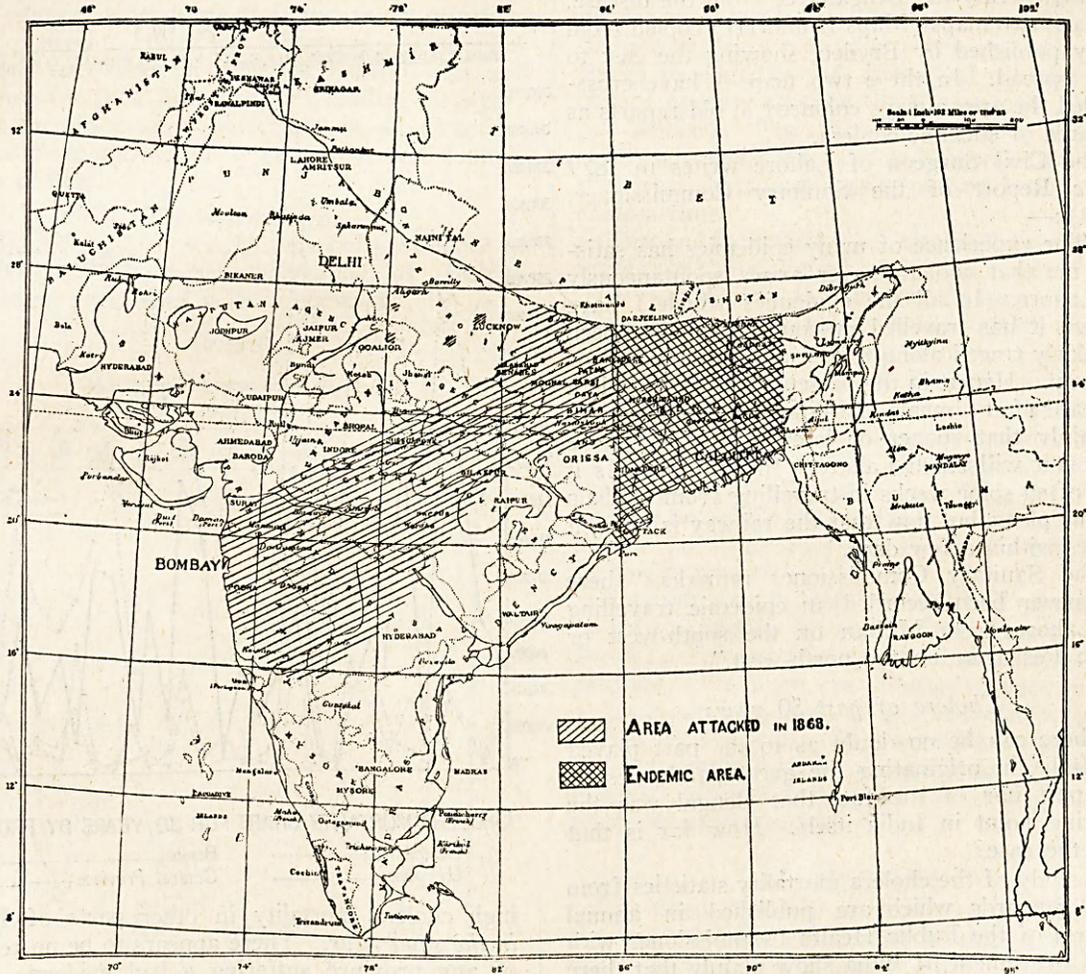
"Facts prove that cholera broke out at remote places at one and the same time. A month before Jessore was attacked the disease was epidemic in Bihar and Dacca. In August it raged in Chittagong. In the autumn of 1817 cholera was epidemic from Sylhet in the east to Cuttack and Puri and extended west nearly to Allahabad.

"In the winter of 1817-1818 cholera remained

outbreaks 1855-1858 and 1859-1862 with this epidemic of 1817-1820 described by Jameson is perfect."

Bryden, Cunningham and other writers regard the 1817-1820 epidemic as the starting point of endemic cholera in Bengal. The disease was known in India before then. In the Nidán of Susruta a disease called *Vishuka* is described which is typical of acute cholera. Hippocrates, Galen and Celsus are witnesses to the existence of cholera. The dark ages are barren of records but Gasper Correa, a Portuguese physician, in "Lendas da India" (1503) records that 20,000

MAP III.



dormant, but in March 1818 it broke out in Allahabad and reached Lucknow in April and May. In fact, it advanced steadily west on a front of 300 miles. It then took a south-west direction to almost every town and village of Bundelkhand and Saugur, thence this southerly stream headed to Bombay. The northern branch passed from Oudh to Agra and Delhi in August 1818. There was a northerly extension to Nepal. In 1821 the disease reached the Persian Gulf, Syria and Asia Minor and in 1823 appeared on the Caspian and Mediterranean coasts."

Bryden remarks on this:—"The parallel of the

men of the army of the king of Calicut died of "a disease sudden-like which struck with pain in the belly so that a man did not last out eight hours." He reports further that there was an epidemic in Goa in 1543 which was known as *moryxy* and by the Arabs as *hachaiza* (haiza). It must be remembered that at this time no Europeans knew anything of the Indian continent, and the disease may well have had a widespread existence. In 1774, Dr. Paisley, writing in Madras, says: "This dangerous disease *cholera morbus* is the same we had in Tricomalee." In 1770 it was endemic in Arcot and Travancore,

and in April 1783 it was supposed to have killed 20,000 in Hardwar (Macnamara).

Bryden, who was the statistical officer with the Sanitary Commissioner, published his voluminous report in 1874 and gives a clear description of repeated instances where cholera spread from what he terms its "epidemic home" in Lower Bengal across India by two main routes described by him as the northern epidemic highway up the Ganges valley to Afghanistan and Persia, and the southern epidemic highway across the Central Provinces to Bombay, Madras and Ceylon.

In no single year during the period 1817-1872 did cholera spread in the reverse direction and in no single year was Bengal free from the disease. I attach two maps (Maps II and III) copied from many published by Bryden, showing the east to west spread. In these two maps I have cross-shaded the area always coloured in old reports as the area of endemic cholera.

The Civil Surgeon of Lahore writes in 1879 (*vide* Report of the Sanitary Commissioner, 1879):—

"The experience of many epidemics has satisfied me that cholera never arises spontaneously in Lahore. In all the epidemics which I have known it has travelled up-country and has been regularly traced along the Grand Trunk Road or railway. Hence, in the present day when cholera is heard of at Umbala or Phillour, we know pretty certainly that sooner or later during the same season it will reach Lahore. In former years it was often some weeks in travelling from Umbala to this place, but now that the railway is open, it comes within a few days."

The Sanitary Commissioner remarks "there has never been recorded an epidemic travelling to Lahore from Multan on the south-west or from Peshawar on the north-west."

#### *Cholera of past 50 years.*

There can be no doubt as to the part played by India in originating the great pandemics of the past nor of the fact that Bengal was the starting point in India itself. How far is that still the case?

A study of the cholera mortality statistics from 1899 onwards which are published in annual reports of the Public Health Commissioner with the Government of India show plainly that there is little change in the situation.

I have put the figures into Graph No. 1, illustrating separately the mortality of Bengal, United Provinces, Central Provinces and Bombay.

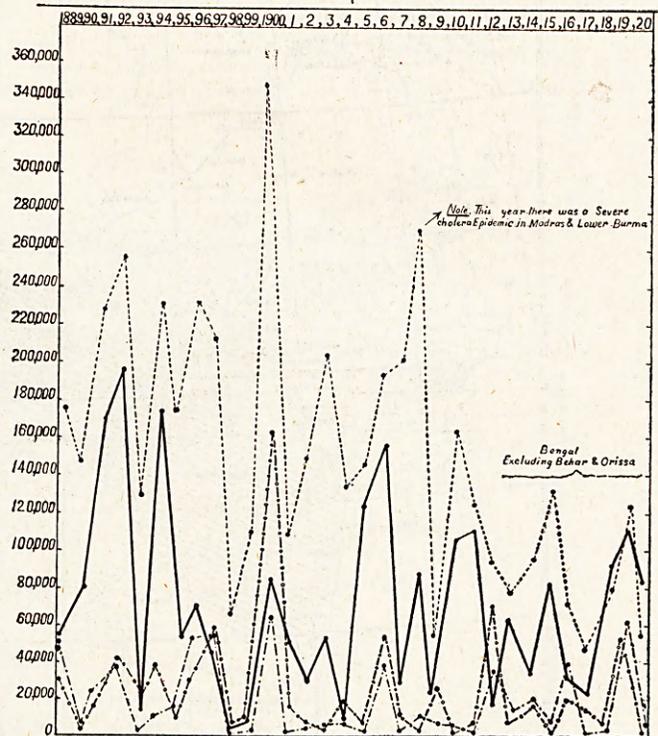
The Bengal curve shows that no single year of the period under review has shown a mortality of less than 40,000 persons in Bengal. The years 1892, 1900 and 1908 are notable epidemic years, and there are many years of smaller epidemics. The curve also shows the wide variation from year to year, and it is noteworthy that there appears to be no tendency for the mortality of one year to influence that of the next. The worst

epidemic year, 1900, was preceded and followed by years of comparative health. An examination of the United Provinces curve shows that there is a definite correlation with that of Bengal.

The year 1900, which was a famine year, is particularly interesting as the United Provinces is not so much influenced as Bombay, and this epidemic seems to have followed what Cunningham and Bryden in the old reports called the "southern epidemic highway" through the Central Provinces to the west coast of India. In the years 1892 and 1894 the northern epidemic highway through the Ganges valley was followed.

It would seem that during the past 50 years a high cholera mortality in Bengal coincides with a

Graph No. 1



CHOLERA MORTALITY CHART FOR 30 YEARS BY PROVINCES

Bengal .....  
U. Provinces .....  
Bombay .....  
Central Province .....

high cholera mortality in other parts of India in the same year. There appears to be no record of any province suffering a bad epidemic in a year when Bengal cholera was moderate. Can we avoid the inference that Bengal is the culprit? If it is, the district cholera mortality returns should show repeated movements of epidemics from East to West. In the days before railways such epidemic movements were easy to trace. Bryden reports how epidemics left Bengal and infected a near-by area; this area became a seat of epidemic next year and spread forward north-west and south with great regularity. Now the movement is more rapid. The report of the Sanitary Commissioner for India (1900) says that in the later months of 1899 and in the early

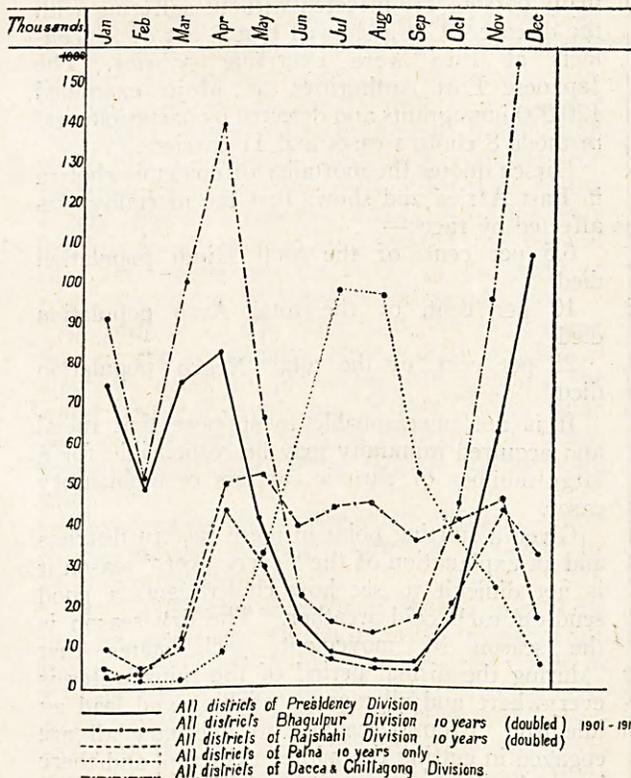
months of 1900 cholera was severe in Bengal and Assam, but that in April that year epidemic cholera broke out in widespread fashion, appearing in the Khyber and at Cabul in June, and in Kashmere in August. The epidemic was at its highest by June in the United Provinces, and in July in the Punjab. The quick jump to the Khyber and Cabul is reasonably explained by the rapidity of railway travel and we know of the considerable efflux of Cabuli traders from Calcutta in the spring. Increased facilities for trade and the fondness which Indians have cultivated for railways and movement have altered the situation, and it cannot be shown that cholera sweeps steadily west from Bengal, and it is doubtful whether other parts of India are not establishing endemic centres of their own. The much bigger attendance at religious festivals—so well known for their influence in spreading cholera—and the dispersal of infection in all directions from these must in many cases reverse the direction of flow.

*The endemic area.*

Graph No. 2 shows the seasonal prevalence of cholera in the various divisions of Bengal. Seasonal prevalence is very constant.

Graph No. 2

Monthly mortality curve for combined 21 years  
1900 - 1920.



The most easterly parts of the province are the Chittagong and Dacca divisions. Here the months of maximum mortality are the two dry, cold, winter months of December and January. There is a secondary peak in April.

The curve of the Presidency division follows the Dacca curve very closely.

The curve of the Patna division shows a complete reversal of seasonal prevalence. There is only one peak, and that is in the monsoon months of August and September. In the four cold weather months there is no cholera. This conforms to the seasonal incidence of the United Provinces.

The curve of the Rajshahi division which is that part of Bengal Proper north of the Ganges conforms fairly well to the curve of South-East Bengal.

It is in the Bhagulpur division, between Rajshahi and Patna, that the change of seasonal incidence takes place. The curve for the whole division shows a transition stage, and when one comes to statistics of individual districts the change appears between the Purnea and Bhagulpur districts. The Purnea district is liable to severe spring cholera, and in Bhagulpur and further west the summer rainy season is the worst cholera time.

This line is precisely that marked by the earlier writers as the western limit of the endemic area.

It is noticeable that in this division not only does the seasonal incidence change, but the endemic cholera of Eastern Bengal changes to epidemic. In 1900 there was a violent April epidemic in Purnea followed by a less explosive but none the less severe epidemic in Bhagulpur which lasted through the summer. In all, some 60,000 fatal cases occurred. The next year there were only 862 deaths in the two districts combined. Such a wide variation from year to year is not found in Bengal proper.

It is not easy to trace by statistics movements of cholera month by month from east to west. It can be done some years from one district to the next and even from one division to another, but I have not been able to get correlation tables except by selection. Still we have enough evidence to show that the Bengal delta is still the home of endemic cholera and this still spills over to the western districts.

*The present day.*

The latest monthly epidemiological report of the Health Committee of the League of Nations states that Java, the Malay States, Indo-China, the Philippines and Siam, all countries where cholera might reasonably find an endemic home, have a few sporadic cases only, and the rest of the habitable globe is free. Yet India is reporting many thousands of deaths each month. Why is it that cholera should attack these countries and fail to establish endemicity, whilst Bengal has been highly endemic without a break for over 100 years? Why should Bengal be the endemic home and not Madras or Bombay?

We know that the cause of cholera is the vibrio of Koch. We know that it is a delicate organism which can withstand cold but not heat, desiccation or sunlight. Greig's experimental work

proved that rice-water stools containing as they do a pure culture of the cholera vibrio, even if kept in the dark, become sterile in four days. How then does infection persist through the rains in Eastern Bengal? Graph 2 shows the cholera mortality curve typical of Eastern Bengal districts. From June to October very few cholera deaths are reported. These are the rainy months when Eastern Bengal is mostly under water except for the raised villages. Yet year after year as soon as the land dries up cholera re-appears in mild epidemic form. If there have been tornados and tidal waves bringing salt water into the rivers and tanks, then as in 1876 and 1897 the cholera assumes fulminant epidemic proportions. After the devastating cyclone of 1897 the Chittagong district suffered 21,000 deaths from cholera in the following 12 months. These Eastern Bengal districts where cholera is so persistent have a heavy rainfall. December and January are the only dry months. They are fertile and support in comfort a population of 800 to the square mile. This density of population must be a factor.

An account of the Faridpur district is found in a book by the late Major J. C. Jack, I.C.S., entitled "The Economic Life of a Bengal District." He gives the following figures illustrating economic conditions:—

Classified as living	Families.
In comfort ..	.. 167,139
Below comfort ..	.. 96,294
Above indigence ..	.. 63,969
In indigence ..	.. 14,706
Total	342,108

Though a certain number of families are described as living in indigence, yet these by dint of menial subsidiary employment are far removed from starving point, and famine,—that great associate of epidemic cholera,—does not occur in these Eastern Bengal districts.

#### *Drinking water supplies.*

The Eastern Bengal districts are entirely agricultural; towns hardly exist and the villages are more groups of hamlets than close-packed villages as in Upper India. The land is the latest part of the delta formed, and is flooded in the rainy season. The villages or hamlets, therefore, are all built on artificial mounds. Major Jack writes:—"The south-west part of the Faridpur district is a vast marsh, yet in the last century population has flocked to this basin to such purpose that this dismal swamp now contains 800 people to the square mile. For 8 months of the year the country is a lake 700 square miles in extent, whose surface is broken only by the village clumps and by the narrow strips of land which mark the course of the streams; in the other four months large parts dry up and enable crops to be grown or gathered. When a village is first founded a tank is dug and the earth from it heaped up until banks are raised above flood level." This tank serves all domestic uses,—bathing,

cooking, and washing clothes, as well as drinking water. In some of the better class hamlets a second pond is reserved for drinking water supplies.

With such a water supply it is easy to understand how an epidemic can spread. It is less easy to explain why endemic cholera persists.

Can it be a matter of chronic carriers and a community with a high degree of acquired immunity sensitized by the onset of the cold season which lowers their none too abundant vitality? The existence of the carrier has been proved by Greig and others, but the existence of the chronic carrier analogous to the enteric carrier is denied by some. Greig has proved that the mucous membrane of the gall-bladder is sometimes severely affected, and I have personally isolated a vibrio—indistinguishable from the cholera vibrio—from a man suffering from recurrent colic, from whom no history of a cholera attack could be elicited.

To theorise is fatally easy. To establish a theory such as I have enunciated would need a prolonged spell of field work in the endemic area, examining alvine discharges of great numbers. It might be that during the off season, from May to October, the vibrio is attenuated by conditions of temperature and humidity and becomes a normal inhabitant of the bowel of immune persons. This is again theory, but we do know that many persons are infected without suffering with the disease. Greig showed that 6 out of 27 contacts at Puri were excreting vibrios. The Japanese Port Authorities at Moje examined 120,000 immigrants and detected by bacteriological methods 8 cholera cases and 11 carriers.

Hirsch quotes the mortality of epidemic cholera in East Africa and shows that the mortality was affected by race:—

6.5 per cent. of the total Hindi population died.

10 per cent. of the total Arab population died.

25 per cent. of the total Negro population died.

It is not unreasonable to suppose that racial and acquired immunity may be responsible for a large number of chronic carriers or ambulatory cases.

Given a starting point in these eastern districts and an explanation of the "carry over" season it is not difficult to see how cholera gets a good send-off each cold weather. The dry season is the season of movement. Jack states that "during the dismal period of the rains water is everywhere and all men go afishing and lead an idle life. From December to February all are engaged in cutting the winter rice crop, and there is much emigration and immigration of hired labourers who are hired, lodged and fed for a week or more."

This movement and aggregation of labour is a factor to be considered. Much labour comes from the north-west, i.e., the neighbouring

districts of Nadia and Jessore. These labourers returning in February certainly take cholera with them.

Calcutta has had yearly and monthly a high cholera death-rate for many years. Rangoon, though outbreaks frequently occur, has not suffered to anything like the same extent. Similarly, Singapore, Bangkok and other eastern ports have never suffered such continuous endemicity, though the factors of mean winter temperature, humidity and soil moisture are every bit as suitable as in Calcutta.

Similarly, the disease, though frequently introduced into the West Indies and Central America, has never established an endemic home as it has in Eastern Bengal.

Therefore there must be some epidemiological factor peculiar to Bengal and Calcutta which fixes the disease here. Racial susceptibility, density of population, economic conditions have all been discussed above. The Indian,—from Hirsch's records,—seems to be much less susceptible than the Negro races. Jack's book shows that the economic condition is good. Density of population is undoubtedly a factor, but I believe the main one to be the habits and religious customs of the people.

In Bengal every man and woman takes a daily bath in the open,—winter and summer,—standing in the water well above the knees and at intervals completely immersing the whole body. A single cloth of some size is worn by both sexes, and it is the common practice to wash this garment at the same time in the same water. In nine cases out of ten the water for drinking and cooking is derived from the tank in which all wash. If a crowded community contains one cholera carrier, there is a daily re-infection of the water. Should a case die of the disease the body itself is in all probability prepared for funeral rites and washed on the banks of the pond or river; the clothes of the deceased person also.

In addition to the daily bath, the Hindu section of the community during their ceremonial ablutions drink of the water. In Calcutta the water of the Hooghly and Tolly's Nullah being part of the sacred Ganges is drunk by many, though there is piped water of good quality available.

That carelessness in regard to drinking water is the cause of endemic cholera is supported by the following facts:—

(1) The home of endemic cholera is in those districts where water supplies are from rivers and tanks, and where wells are not used, such as Lower Assam and South Eastern Bengal. As recorded in the *Gazetteer* of the district of Chittagong, in the two years where rivers and tanks were filled with salt water during a tornado, there immediately followed an epidemic of cholera and the cause given is the shortage of drinking water.

(2) The reports of the Health Officer of Calcutta show that those wards which border on

the River Hooghly or Tolly's Nullah have year by year the highest cholera mortality. In his annual reports the Health Officer includes a "black list" of those wards with the highest cholera mortality, and Wards V, XXV, and XXIII, which are riparian, invariably figure in this list. He says in his report for 1922 that "the heavy incidence of the disease on Hindus whose religion enjoins bathing in the river and Tolly's Nullah corroborates his view that a large proportion of the cholera of Calcutta is water-borne. Besides the tanks and river the unfiltered water-supply intended only for flushing drains is freely used by the ignorant and careless for domestic purposes."

#### *Summary and Conclusions.*

1. India may still be regarded as the home of cholera and deltaic Bengal may still be considered the endemic home where endemic cholera is just as regular and severe as ever.

2. That there is a fair body of evidence to show that cholera in the rest of India is dependent on cholera in Bengal, but owing to increased facilities for and rapidity of travel, it is not so easy to trace the spread.

3. Why deltaic Bengal is the endemic home of cholera is not proved. It is obvious that density of population, conditions of humidity of air and soil, and of winter and summer temperature are suited to the requirements of the infecting agent, and that the notorious carelessness of the people regarding their drinking water favour its spread; but we want to know to what extent the "chronic carrier" exists.

4. That the deltaic region of Bengal is the place where cholera should be attacked. Of all preventable diseases cholera is the easiest to tackle, and could we get to grips with it in this region, we might ultimately wipe it off the earth.

5. I suggest intensive vaccination in a selected district and a very rigorous propaganda campaign. If this is successful, to extend it throughout the province.

6. It is our very obvious duty to take the most stringent measures at our ports and frontiers to prevent the spread of the disease.

#### PRELIMINARY OBSERVATIONS ON ACQUIRED DISEASES OF THE HEART AND AORTA AS MET WITH IN BENGAL.\*

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THE observations I have recorded in this paper are based upon a series of 446 cases examined by me during the course of hospital and private practice in this city, extending over a period of ten years. From the table containing the statistics of the different varieties of cases it will be

\*Being a paper read at a meeting of the Medical Section of the Asiatic Society of Bengal on the 11th of March, 1925.