Globalization, Environment and Epidemic Disease: Cholera in 19th Century Asia

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Introduction

We were surprised to see the enigma of SARS in the winter of 2002-2003. The newly emerging SARS originated in South China, spread first to Hong Kong, Taiwan, Singapore and Viet Nam, then reached Canada, America and Europe. By the time the SARS epidemic had finally run its course, it had caused about eight hundred deaths. We were relieved that the damage from SARS was contained on a rather small scale, but there is still a possibility of it reemerging.

Since the early 1990s we have been more conscious of the resurgence of infectious diseases. Of course, newly-emerging diseases such as HIV/AIDS or BSE had appeared earlier. But we have recently come to fear that old infectious diseases like malaria or tuberculosis could come back as well. Recently there have been many occurrences of avian influenza. A great potential for a new type of influenza weighs heavily on us. We have been reminded of the 1918 ‘Spanish Flu’, the most devastating epidemic disease in history. In total around 40 million people died throughout the world. If a new type of influenza breaks out under present conditions, the death toll will be much greater than in 1918.

The process of globalization has accelerated greatly since the 1970s. For example, the number of international air passengers increased from 75 million in 1970 to 409 million in 1996. International tourist arrivals increased by more than 50% between 1990 and 2000. This phenomenon has been caused by many factors, including borderless economic activities, tourism and labor migration. The recent revival of infectious diseases is believed to be closely related to this process of globalization. We should also take into account environmental change, which occurs on a global scale. Human interventions into natural environments invite newly-emerging zoonoses. Furthermore, global warming will intensify the damage of malaria by stimulating activities of the anopheles mosquito.

We are now facing very difficult problems of governance in the sphere of global public health. How to tackle potential epidemic diseases is the most pressing task. Collaboration among governments, cooperation between government and international organizations, and coordination between government and non-governmental organizations are all necessary.

Before going into the modern period, we will briefly examine historical experiences of great epidemics that occurred during the pre-modern period or the early modern period. During the first half of the 14th century plague epidemics occurred throughout the Eurasian continent. The Mongolian empire had integrated diverse economic spheres into the world economy by the 13th century. Trade between the eastern and the western halves of the Eurasian continent by both maritime and overland transport had
become very active. It is inferred that plague epidemics were caused by the globalization process at that
time. The plague was transmitted from the central part of Asia to Europe and China. It invaded Western
Europe from the Mediterranean coast, then moved northward along trade routes. Although the details
are not well understood, China must also have suffered from plague epidemics at that time.¹

In the 16th century devastating epidemics like smallpox, measles, and influenza assaulted
indigenous peoples in the new continent [Americas] after the start of Spanish colonization. The most
important factor is that the new world was connected with the old world for the first time, and became
integrated into the disease pool of Eurasia.² The population of the American continent declined
substantially. It is estimated that the population in central Mexico decreased from about 6 million in
1548 to around 1 million in 1608.³ On the other hand areas around the Indian Ocean where the
Portuguese conducted commercial activities did not meet any epidemiological disasters. Rather the
Portuguese suffered from the local diseases encountered on the East African coast.⁴

A little more than one hundred years ago a similar nexus between globalization and epidemic
diseases occurred in Asia. From the middle of the 19th century to the interwar period international trade
between Asia and Europe increased significantly, and Intra-Asian trade picked up as well. Further, the
movement of labor from India and China to Southeast Asia accelerated following the growth of trade.
During this period some Asian regions faced very severe ‘health crises’. These were particularly
rampant from the 1870s to the 1910s. A typical case was South Asia, where population growth was
stagnant due to repeated outbreaks of famines and epidemics. During the same period epidemic diseases
such as cholera and plague occurred frequently in East Asia. Although the damage caused by epidemics
was not as serious as in South Asia, the scars of epidemics remained.

In this paper we will highlight the above-mentioned situations of frequent epidemic diseases in
both South Asia and East Asia during the advance of globalization from the late 19th century to the early
20th century. In particular we will focus upon cholera, a disease that symbolized globalization in this
period. In the following analysis we will conduct some comparisons of the human damage wrought by
cholera epidemics between South Asia and East Asia.

1. Globalization, Environment and Cholera in South Asia (1870s-1910s)

(1) ‘Deterioration of Disease Environment’ Thesis

The period from the beginning of the 1870s to the end of the 1910s can be called ‘the age of famines
and epidemics’ in British India. The population growth rate was very low (0.37%) due to the many
mortality crises such as famines and epidemics.⁵ Eleven famines occurred during the second half of the
19th century. At least three (1876-78, 1896-97, and 1899-1900) out of the eleven were great famines,
resulting in millions of deaths. For example, it is estimated that about 5 million people died in the 1876-78
famine, though one estimate puts the total at 8 million. Apart from famines, epidemics such as cholera,
plague, smallpox, malaria and influenza arrested population growth. Cholera was the most prominent
infectious disease, killing about 15 million people from 1817 to 1865. Another 24 million died of this
disease from 1865 to 1950. Plague caused about 10 million deaths during the period between 1896 and
1934. Malaria was the greater killer, doing more than any other disease to check population growth. The
most important famine disease in South Asia was malaria. Epidemic malaria was the worst culprit in
raising the famine mortality rate. But, after the beginning of the 1920s the population growth rate rose
above the 1% level because of the disappearance of mortality crises like famines and epidemics (Figure 1).

According to the nationalist interpretation, devastating famines and epidemics were caused by
colonial exploitation and the concomitant agricultural stagnation. Heavy land revenue, the forced
commercialization of agriculture, the tendency toward monoculture, and the loss of land by peasants led to
the amplified damage of famines and epidemics. But does this explanation match the reality? If we look
at this period using recent studies, we find in the 1871-1920 period ‘growth’ rather than ‘stagnation’. 
During this period, the real burden of land revenue was being lessened, the commercialization of
agriculture did not lead to the decline of food production, and the process of losing land by peasantry did
not occur on a large scale. Thus, the nationalist interpretation is not convincing in explaining the
economic historical process.

Why did famines and epidemics occur so often, leaving huge casualties? Were famines and
epidemics only natural disasters? Or were these phenomena related to the economic historical process?
The period from the 1870s to the First World War saw a certain measure of economic growth in British
India. The improvement of transportation, the development of infrastructure, and the incorporation of
the territory into the world economy promoted the export of agricultural products and the
commercialization of agriculture. This process probably generated income growth in many rural areas.
Therefore, the Indian economy in this period was not stagnant, although income distribution was
possibly becoming more unequal and the standard of living of the lower strata may have become
unstable. Why, then, despite modest growth, did this period see many famines and epidemics? This is
certainly a paradoxical situation (Table 1).

Most of the famines resulted from the failure of the southwest monsoon. Drought had been a very
common phenomenon in South Asia since ancient times. We should ask why famines caused such
extensive damage in this particular period. From the 1860s to the end of 1920s India continued to export
foodgrains, with the exceptions of the great famine years. There was not an absolute food scarcity in this
period. Of course, there was certainly very severe local food scarcity when serious droughts occurred.
Nevertheless, the development of the railways must have prompted a movement of foodgrains from
surplus areas to areas of scarcity.

We should notice that famine became a more class-based phenomenon in this period. We need to
examine changes in the vulnerability of the lower classes to famines. The mortality rates among
agricultural laborers, rural artisans and marginal peasants who belonged to lower castes were much higher
than in the other classes. A typical case was agricultural laborers who owned no land, usually being
employed to work on the land of others. At times of drought, therefore, they lost their employment, and were then unable to purchase food.\textsuperscript{10} This is the failure of food entitlement theorized by Amartya Sen.\textsuperscript{11}

While there was a certain degree of agricultural growth, the real wages of agricultural laborers hardly increased during the period.\textsuperscript{12} It means that agricultural growth did not have a trickle-down effect on the lower classes. The fact to be noted is that real wages were drastically reduced during times of famine. Although agricultural growth occurred, the food entitlement of the agricultural laborers and rural artisans may have become unstable during this period.

We need to analyze the specific causes of death in order to understand why famines brought about high levels of mortality. We find that more deaths were due to disease than to starvation. Such diseases as cholera, smallpox, diarrhea, dysentery and malaria, when combined with famine, produced large-scale mortality. The most important famine disease in South Asia was malaria. We call it ‘epidemic malaria’. Epidemic malaria was the worst culprit in raising the famine mortality rate.

Epidemic malaria did not necessarily occur along with famine. However, epidemic malaria most often occurred when the nutritional deficiencies of rural poor after famine coincided with a proliferation of Anopheles – vector of malarial parasite – caused by heavy rain. Plasmodium falciparum took many lives in conditions of reduced human resistance to disease resulting from malnutrition along with drastic changes in environmental conditions, including heavy rains.\textsuperscript{13}

We have examined changes in the crude mortality rate in the United Provinces between 1873 and 1948. We found that there were seven mortality crises before 1920, occurring in 1879, 1894, 1897, 1905, 1908, 1911 and 1918. Many mortality crises resulted from disease. The most dangerous was epidemic malaria, which often broke out in the United Provinces. Recent Studies by T. Dyson, A. Maharatna, O. Saito and myself have shown that such famine-malaria nexuses were also seen in the other provinces.\textsuperscript{14}

We can attribute the basic cause of frequent epidemics in this period to ‘the deterioration of the disease environment’. The disease environment refers to an environment in which people are exposed to disease-causing germs, vectors or hosts. The deterioration of the disease environment means that there is a greater possibility of human beings suffering from infectious diseases.\textsuperscript{15}

Firstly, as already pointed out, while the development of the railways speeded movements of foodgrains, it also increased the impact of epidemics. The increased movement of people necessarily involved disseminating some infectious diseases over wide areas. For example, the eastern part of the United Provinces was a source of labor supply to industrial cities like Calcutta or Bombay. Many migrant laborers came and went between village and city. This labor movement was the basic cause of the high plague mortality in the eastern United Provinces in the early 20\textsuperscript{th} century. Migrant laborers returned to their villages with plague bacillus.\textsuperscript{16} This causal relationship can be applied to the cases of cholera, diarrhea and dysentery. Even malaria, a seemingly endemic disease, fits with this causal relationship. During the early decades of the 20th century in India, there was an appreciable increase in labor mobility.
that was brought about by industrial development and plantation agriculture. The high incidence of malaria on tea plantations should be understood within such a context.\textsuperscript{17}

Secondly, urbanization started with the commercialization of agriculture and a certain degree of industrialization in the late 19\textsuperscript{th} century. This made urban hygienic conditions worse, resulting in the prevalence of cholera and plague in the cities.\textsuperscript{18}

Thirdly, environmental changes caused by developmental activities like railway, road and canal construction made the disease environment worse. The most typical case was the effect of canal irrigation on the prevalence of malaria. The spread of canal irrigation in the western part of the United Provinces led to the expansion of waterlogged areas, leading to the proliferation of the \textit{Anopheles} vector. When epidemic malaria occurred, high fever mortality was concentrated in the Doab area, which was the most canal-irrigated area in the United Provinces.\textsuperscript{19}

Human movement, urbanization and environmental changes were among the factors that aggravated the disease environment, worsening the human misery caused by famines and epidemics. These factors were primarily caused by colonial development activities, and it was the period from the 1870s to the First World War when colonial development was most intense (Figure 2).

The earliest proponent of the above-mentioned hypothesis was Ira Klein. He emphasized the detrimental effect on the peoples’ health of the economic development during the British period. We need to refine his hypothesis by introducing recent studies on economic history in the British period. For example Klein rightly captured a very important factor which amplified the death toll in cholera epidemics in central India during the late 19\textsuperscript{th} century. He emphasized the arid ecology and lack of water in explaining the huge mortality caused by cholera in the central part of India. When the railways were being built there, many construction laborers rushed into the area. And after completion of the railways, of course, many passengers passed through central India.\textsuperscript{20} The scarcity of water became more acute, making the conditions related to the fecal-oral route of cholera infection much worse. This causal relationship was stronger in the South Asian climatic conditions than in any other regions.

Recently economic historian Tirthankar Roy claimed that we should take into account factors of resource constraint such as water scarcity more seriously in order to explain the low level of well-being of the people during the late British period. It was also pointed out that this factor was neglected by the commonly accepted interpretation of economic development during the British period.\textsuperscript{21} In the same way we need to introduce the factor of resource constraint into epidemiological causation in explaining the high level of mortality in South Asian epidemics. I will take up the case of cholera in the following section to think about this point.

\textbf{(2) Cholera and Water Supply in British India}

Mortality data became available only after the late 1860s. Based on these vital statistics, D. Arnold showed the change in fatalities caused by cholera in British India. According to his table, we find that
cholera deaths continuously increased from 146,998 in the 1865-1870 period to 444,923 in the 1891-1900 period (Table 2). As far as the period from 1874 to 1968 is concerned, the average annual cholera mortality rate was highest in the 1874-1899 period (Table 3). Although we do not have any data on mortality before the late 1860s, we can assume that cholera mortality increased during the second half of the 19th century. The development of the railway accelerated throughout this period. The route miles soared from 838 in 1860 to 23,672 in 1900. The numbers of passengers substantially increased from 19 million in 1871 to 183 million in 1901.

We also have to pay attention to the increased number of pilgrims resulting from the development of the railways. As is generally known, pilgrimage was one of the most important factors in the propagation of cholera throughout India.\textsuperscript{22} Here I quote just one passage from the preceding study. ‘Even more dangerous from an epidemiological viewpoint than the annual pilgrim traffic were the Kumbh melas held at Allahabad and Hardwar every twelve years and the intervening Ardh Kumbh melas. As many as three million pilgrims at a time participated in these festivals, living in crowded and insanitary lodgings or encampments, bathing \textit{en masse} in the sacred Ganges and sipping its holy water --- conditions that were almost ideal for cholera transmission.’\textsuperscript{23}

The damage caused by cholera epidemics was different from one place to another, especially depending on the availability of water. We will look at a case in the Central Provinces. The Central Provinces were located in the center of Indian sub-continent. ‘Central India became a transport hub, the terminus of the great trunk lines linking coastal ports. Specifically, it became the juncture for the Great Indian Peninsula and East Indian Railways, joining Bombay and Calcutta, and for lines from Delhi to Madras.’\textsuperscript{24} There were some places where the mortality rate of cholera was very high. On the other hand there were other places where mortality rate was low. Look at the following observations. These citations are taken from the report written by S.C. Townsend, who was the Sanitary Commissioner of the Central Provinces. He investigated the 1868 cholera epidemic in the Central Provinces.

We find that the highest rate of mortality occurred in the trap formation; that the disease also visited with great severity villages along the banks of the Nerbudda, the Hirun, and the Pureyat rivers, that traverse the wide alluvial tract of the Jubbulopore district; and that, on the other hand, the proportionate number of villages attacked, and the ratio of mortality, were comparatively low in the metamorphic tracts of Kuttunghhe, in the Seonee district, and the tracts of the same formations and of the sandstones that are found in the district of Jubbulpor.\textsuperscript{25}

Cholera fell with the greatest severity in the villages in the trap formation, where the water-supply is derived either from shallow surface wells, sunk in porous material, and in situations where the water is especially liable to be contaminated with sewage matter, or from streams which in the hot weather contain water that is nearly stagnant. Again, the disease prevailed severely in the alluvial plain of the Jubbulpore district, where a large proportion of the villages are dependent for their water-supply on rivers which had been polluted by dead bodies thrown into them, on smaller streams the banks of which are habitually fouled, or on
tanks that receive the surface drainage of the village area.\textsuperscript{26}

Cholera deaths were concentrated in the villages that were situated on ‘the tops of rocky ridges’, ‘high open plateaus’ or ‘hard impermeable rock’ in the trap formation. Water was not easily available in those villages, and what water existed was often contaminated with sewage. Furthermore, the villages in the alluvial part of this region were also severely affected by cholera. Water resources from rivers, small streams or tanks were often polluted. On the other hand, the mortality rate of cholera was low in the metamorphic formation.

Scarcity of water is a key factor in the intensification of cholera epidemics. Usually cholera epidemics reached their climaxes ‘in May and the early part of June’, the hot and dry season just before monsoon rain.\textsuperscript{27} In years when plenty of rain fell in the early months ‘the progress of the epidemic was slow, and it was confined within a comparatively narrow area’.\textsuperscript{28}

Needless to say, cholera broke out in urban environments as seriously as in the rural areas. But the introduction of filtered water reduced the risk of cholera infection. The case of Calcutta shows that cholera mortality drastically decreased after 1870 when waterworks were installed (Table 4).

In the 29 years 1841-69, prior to the introduction of good filtered water, the average death-rate was 4,575 annually. For the 14 years 1870-83 the average is 1,432, demonstrating how enormous the benefit of good water is in diminishing mortality from this disease, and how urgently its complete and sufficient distribution is required throughout every corner of the Town. The great fall in mortality was coincident with the very month on which the water was freely given.\textsuperscript{29}

The slum area (bustee) where the poor classes lived, however, was ‘insufficiently provided with hydrants’ of filtered water.

It has been pointed out elsewhere in this report that two-thirds of the total number of cholera cases in the Town occur in bustees, and it is quite possible that the explanation of this fact may be partly due to the want of pure water, in the absence of which recourse is had to foul tanks and wells for even domestic purposes.\textsuperscript{30}

In India scarcity of water resources became more serious in the second half of 19\textsuperscript{th} century because of the developmental activities. This situation led to the worsening of cholera epidemics.

2. Globalization and Cholera in East Asia (1850s-1910s)

The most important event in 19\textsuperscript{th} century East Asian economic history in the international context was the change from the controlled trade regime to the free trade regime. One of the symbolic cases was the Opium War (1839-42) and its aftermath. The other was the opening of Japan (1858). How did this change affect the history of epidemics in East Asia?
We now look at the period before opening of Japan. A.B. Jannetta examined the epidemic history of early modern Japan. She pointed out that Japan was spared two epidemics, plague and typhus, that engulfed Europe. When China was devastated by plague during the period from the 13th to the 14th centuries, Japan was not affected. The geographical isolation of Japan from the continent cannot explain the whole story. Smallpox, measles and influenza had frequently entered Japan since ancient times. In the early modern period from the 17th century these diseases invaded this country through Nagasaki many times. Nevertheless, plague and typhus did not. It is possible that controlled trade at Nagasaki functioned to quarantine diseases. The infectious diseases which were easily transmitted from human being to human being could enter Japan, but the infectious diseases transmitted by vectors like insects were prevented from entering.  

Six cholera pandemics occurred from the early 19th century to the early 20th century. An endemic disease that originated in Bengal was transformed into an epidemic disease in 1817, spreading all over India. Then it stretched both westward and eastward beyond India. Cholera made its way west to the Middle East, Russia and Europe, and finally to the American continent. In the east it advanced to Southeast Asia, China, the Korean peninsula and Japan. This was the first cholera pandemic. One can say that almost the same pattern of diffusion recurred mostly in the later cases of pandemic. But preceding studies have not been as clear about the eastward route as the westward route.

In the case of the first pandemic, the overland route was also important to some extent. Cholera was disseminated from India through the Middle East to Russia. It also reached China through Yunnan. But, needless to say, the seaborne route was generally more important. It is well understood that seaborne trade grew greatly in the 19th century because of the introduction of the steamship. Asiatic cholera was so lethal that the case mortality was more than 50%. The transmission route was neither person-to-person nor vector-mediated. It was transmitted by the fecal-oral route as a consequence of fecal contamination of water and foodstuffs. This is a kind of indirect transmission that was poorly understood in that era. The survivors of this disease would move to another place, carrying with them *Vibrio cholerae*. The faster speed of seaborne transport raised the probability of pandemics in the 19th century.

If we examine the chronology of cholera epidemics in Japan, we find that they occurred more frequently after the opening of the country. Out of the eleven main cholera epidemics after 1822 ten happened after opening of the ports in 1859. It should also be noted that most cholera epidemics started from Nagasaki or Yokohama, which were treaty ports. Especially Nagasaki often appeared as the starting point (Table 5).

Until the first half of the 19th century the controlled trade regime dominated even in China. Until that time Canton was the only Chinese port open to foreign ships. The frequency of cholera epidemics increased after the Nanking Treaty in 1842. Cholera epidemics often appeared in treaty ports such as Shanghai, Ningpo, Foochow, Amoy and Canton. If we look at the diffusional pattern of cholera epidemics in East Asia, it can be seen that the gateways to East Asia for many cholera epidemics were China’s
Cholera epidemics radiated from there to the Yangtze valley, northern China, Korea and Japan.

If we look at cholera epidemics in East Asia from the Japanese perspective, we find that outbreaks of cholera in Japan were closely related to those in China and Korea. Firstly, prior to outbreaks of cholera in Japan cholera epidemics almost always occurred in the coastal areas of southern and central China. Secondly, Japanese outbreaks of cholera were mostly related to Korean outbreaks. Thirdly, most cholera outbreaks in both Japan and Korea can be causally traced back to those in China (Table 6).

For example, we now take some citations from the 1877 issue of *China Maritime Customs’ Medical Reports*. In 1877 the 4th cholera epidemic occurred in Japan. Before cholera broke out there, it was prevalent in Amoy.

In the absence of any authentic returns of the mortality it is exceedingly difficult to estimate it with any degree of accuracy. The probable mortality at the height of the epidemic was 75 per diem - possibly 100. The total mortality among the Chinese was about 1,600, in a population of 80,000. [34]

The report added that the disease had moved from Amoy to Japan.

Why did the disease first appear in one corner of the comparatively small town of Amoy and thence spread over the whole town and then to the large cities in the neighbourhood, and afterwards make its appearance successively at different ports on the coast, reaching at present as far as Japan? The answer is easy enough. Amoy town itself, though a very small place in comparison with the cities in its immediate neighbourhood, is their port and the center of great Chinese passenger traffic. The disease, as is always the case out of India, was imported, either from Saigon, where it was prevailing, or from Singapore. [35]

The report from Shanghai also informed of cholera diffusion route.

The first case occurred in June and was fatal. The alarm was given on the 2nd July by a telegram to the Commissioner of Customs reporting the presence of cholera in a very fatal from at Amoy, but July passed I believe without a case, at all events without a fatal case. In August there were two deaths, and so far as I know, only these two cases. The first admission to the General Hospital was on the 3rd September. During that month 12 cases were received, four of which were specially noted as “mild” (perhaps severe choleraic diarrhoea). Of the remaining eight, six died and two recovered. Early in September cholera reached Nagasaki, and spread thence to Kobe and Yokohama. The last case in Shanghai for the season was admitted on the 30th October. [36]

One doctor, D.B. Simmons who lived in Yokohama reported as follows. He concurred with the preceding two reports.
...it can in no way be accused of originating the epidemic, which, as the facts enumerated in the Chinese Customs reports already quoted tend to establish, must have come first from China to Nagasaki, whence it afterwards spread to two other open ports, Hiogo and Yokohama.  

From the above-mentioned citations we have confirmed the diffusion route of cholera in East Asia. Although we have not completed studying each case of cholera epidemic in Japan, we can guess that a similar pattern of diffusion recurred in the second half of 19th century. This diffusional pattern of cholera seems to have reflected the spatial pattern of trade during the period.

During the second half of the 19th century trade volume substantially increased under the free trade regime forced on East Asia by the Western powers. Long-distance trade from East Asian countries to European countries and the United States was multiplied. Some countries became specialized in exporting primary products to countries in the Western hemisphere. They imported manufactured goods from these industrialized countries. The growth rate of exports from Asia to Europe and the US during the 1883-1913 period was 3.2%, while the growth rate of imports was 4.3%.

Despite the rapid growth of long-distance trade, intra-Asian trade grew even faster. Its growth rate was 5.5%, greater than that of the trade to Europe and the US. The division of labor progressed not only between Europe-US and Asia, but also among Asian countries. As we have already seen, the usual spatial pattern of cholera epidemics in East Asia was that the disease generally started in China and then spread to Japan or Korea. Japan and Korea influenced each other’s cholera outbreaks. This pattern of diffusion strikingly reflected the spatial trade pattern in the intra-regional trade. During this period Shanghai played a very important role as the main hub in the East Asian trade network. This trade network can be called the ‘Shanghai network of trade’, which was formed by Chinese merchants. Let me give an example. Both British and Indian cotton products were imported to Shanghai, then were re-exported to inland locations within China and treaty ports in Japan or Korea. More concretely, cotton products were imported from Shanghai to Nagasaki, then sent to Korea. These transactions were mediated mainly by Chinese merchants. It is possible that the prevalence of cholera epidemics was closely related to these regional trade patterns.

3. Cholera and Disposal of Human Wastes: Comparison between South Asia and East Asia

Unfortunately we cannot collect data on cholera mortality from China. Vital statistics are not available at all. But even on this feeble basis, we may speculate that the level of cholera mortality in China was much lower than in India in the second half of 19th century.

A witness who appeared in the preceding chapter, D.B. Simmons gave testimony as follows:
When we come to review the literature of the subject, especially that part of it which has reference to Eastern Asia, we are at once struck with the small number of widespread epidemics which are recorded as having penetrated thither from early times, as compared with those which travelled in an opposite direction, and often arrived even in the heart of Europe. Why China and Japan, situated eastward of the Indian source of the scourge, should have escaped its visitations when it ravaged Beloochistan, Persia, Arabia, and other countries to the west, is not at first glance apparent.

He pointed out that widespread epidemics of cholera were fewer in East Asia. The reason why East Asia escaped, relatively speaking, from the scourge of cholera was that there was less traffic between India and East Asia, ‘compared with the enormous migrations, commercial, religious, and military, which for centuries streamed in the contrary direction from the country where Asiatic cholera is born’. But he did not fail to recognize that ‘more frequent and rapid communication’ had led to a greater prevalence of epidemic cholera than before.

Another factor should be taken into account in explaining the difference of cholera mortality between China and India. The degree of railway development was quite different between the two during the early 20th century. India’s railway mileage was 41,221 kilometers in 1903. On the other hand China’s was 3,330 kilometers in 1902. On the other hand, well-developed railways must have aggravated disease environments in India, as far as cholera was concerned. In contrast, the under-development of the Chinese railway possibly restrained the diffusion of cholera epidemics. Cholera epidemics seriously attacked coastal and riverine areas in China. But it is possible that cholera epidemics were not so rampant in inland China as in inland India because railways were less developed.

D.B. Simmons gave a rather interesting speculation about the reason why China escaped from more serious epidemic cholera than India. His analysis focused upon the disposal of human waste in each place. He explained about the factors intensifying damage from epidemic cholera in India.

The Hindu cannot be made to use a latrine. In the cities he digs a hole in his Habitation; in the country he seeks the fields, the hill sides, the banks of streams or rivers, when obliged to obey the calls of nature. Hence it is that the vicinity of towns and the banks of the tanks and watercourses are reeking with filth of the worst description, which is necessity washed into the public water supply with every rainfall. Add to this the misery of pilgrims, their poverty and disease, and their terrible crowding into the numerous towns which contain some temple or shrine the object of their devotion, and we can see how India has become and remains the hot-bed of cholera epidemic.

This description seems to be prejudiced in some sense. In particular, the reference to the Hindu pilgrimages follows the typical stereotype of that time. But we need to appreciate that there is some truth to the point. Simmons stated that most Indian people did not want to use latrines. This is not untrue even now. According to a recent investigation in Bangladesh, 42% of the country’s households do not have
latrines. This rate is low (13%) in rural areas, but high (47%) in urban areas.\(^\text{48}\)

The proper disposal of human wastes is an important factor in controlling the infection of water-borne disease, such as cholera. On the other hand, Simmons raised the Chinese case of human waste disposal.

In spite of the proximity of this vast empire to India, and the fact that it is of much greater extent and twice as populous, we find that cholera, comparatively, is rarely epidemic there. \(^\text{2}\)

Disposed of the Night-soil. - Human manure is valuable, and hoarded for fertilising purposes. \(^\text{3}\) The contents are daily emptied into earthen jars or wooden tubs placed in the courtyard of the house, whence they are in due course removed by the scavenger either direct to the fields, or to boats destined to convey them to a distance. Thus the greatest amount of security attainable is provided against the contamination of the water supply from this source. \(^\text{4}\) A still more potent preventive of infection is to be found in the fact that the Chinese will always, if possible, boil water before drinking it, if even they are unable to make it into some kind of tea. Here it is easy to see in the contrast presented between the customs of the Hindu on the one hand and the Chinese on the other, how in the one case every possible facility is provided for propagation of infection; in the other, how the danger of contamination is reduced to a minimum. \(^\text{49}\)

It seems to us that his description rightly captured the point. For example, the observation by an American agronomist proves this to be true. F.H. King wrote a book after he made a study tour of China and Japan to observe agricultural practices in 1909. He was especially interested in the use of night-soil for agriculture in China and Japan. He pointed out that sewage systems not only wasted resources, but also polluted rivers in Europe and America. On the other hand, he argued that the use of night-soil for agriculture was effective in preventing the pollution of water sources in East Asia. \(^\text{50}\) In the same way recently Alan Macfarlane focused attention to the use of night-soil for agriculture because this practice possibly reduced the level of mortality in early modern Japan. \(^\text{51}\)

In contrast, the use of night-soil for agriculture was not a universal practice in India. J.A. Voelcker, an agronomist in Britain, suggested, ‘Prejudice is the great bar to the proper utilization of night-soil’. \(^\text{52}\) We need to consider cultural reasons why night-soil was not utilized in India. We can speculate that this almost taboo-like prohibition was very much concerned with cultural factors such as purity-pollution concepts.

In India the means of human waste disposal was combined with a situation of water resource scarcity. The conditions of fecal-oral route of cholera infection deteriorated during the period. It is possible that the scale of cholera mortality was much greater in India than in China.

**Concluding Remarks**

Before concluding this paper, we now present some concluding remarks, including a few important points that were not elucidated in this paper.
From the middle of the 19th century most parts of Asia faced globalization in terms of trade growth. Even though we have not dealt with the detrimental aspects of colonialism, we find that globalization itself led to serious health hazards in some parts of Asia. In particular, very severe damage was inflicted by various epidemics in South Asia. From the early 1870s to the late 1910s, South Asia experienced many famines and epidemics, leading to huge death tolls and checking population growth.

Similarly, East Asian countries that opened themselves to the outer world faced epidemic diseases such as cholera. We have examined cholera, and could confirm that trade growth had a close connection with the spread of epidemic disease.

But we infer that there was a great difference in the scale of damage between South Asia and East Asia. Although we cannot obtain good mortality data on China, particularly inland China, for this period, we can estimate that various epidemics brought about lower mortality in China than in British India. To start with, we have confirmed the difference of railway development between the two. There is another factor for explaining the different mortality levels of epidemics. As we have pointed out, ecological conditions disadvantaged South Asia. The semi-arid conditions of India must have raised the level of mortality in epidemic diseases. In the case of cholera, for example, the scarcity of water must have aggravated the problem of water contamination. Finally the way in which human waste was disposed of is an important factor in explaining the different degrees of damage caused by cholera in the two countries. This factor made cholera damage doubly serious under conditions of water scarcity.

We have neglected to look at the Southeast Asian case. According to some studies on the epidemic history of Southeast Asia, during the period in question some areas were ravaged by epidemic diseases such as cholera and malaria. The Philippines experienced the highest crisis mortality in the late 19th century. But in general Southeast Asia recorded high population growth even in this period. Although high fertility must have been a factor, it seems that the level of mortality was not as high as in South Asia. This is a just rough speculation, but this kind of comparison should be attempted more rigorously in the future.

We have also not examined aspects of public health, especially its international aspects. There are many topics to be studied, including quarantine practices, imperial medicine and international organizations. This area of study will be taken up in future.
Figure 1  Two Periods of Population Change in British India

1871 ~ 1920  Population Growth Rate 0.37%

Many Mortality Crises (Famines and Epidemics)

1921 ~ 1941  Population Growth Rate 1.22%

Disappearance of Mortality Crises


Table 1  Growth Rates of Agricultural Output and Population in British India, 1891 ~ 1946 (percent per annum)

<table>
<thead>
<tr>
<th></th>
<th>1891-1916</th>
<th>1921-1946</th>
</tr>
</thead>
<tbody>
<tr>
<td>Population</td>
<td>0.44</td>
<td>1.12</td>
</tr>
<tr>
<td>All crops</td>
<td>0.84</td>
<td>0.34</td>
</tr>
<tr>
<td>Food grains</td>
<td>0.61</td>
<td>0.03</td>
</tr>
<tr>
<td>Non-food grains</td>
<td>1.66</td>
<td>1.08</td>
</tr>
</tbody>
</table>


Figure 2  Deterioration of Disease Environment

Environmental Change → Urbanization → Deterioration of Disease Environment → Epidemics

14
Table 2  Cholera Mortality in India: Decennial Averages, 1865-1960

<table>
<thead>
<tr>
<th>Period</th>
<th>Decennial Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>1865-1870 (6 years)</td>
<td>146,998</td>
</tr>
<tr>
<td>1871-1880</td>
<td>218,033</td>
</tr>
<tr>
<td>1881-1890</td>
<td>301,040</td>
</tr>
<tr>
<td>1891-1900</td>
<td>444,923</td>
</tr>
<tr>
<td>1901-1910</td>
<td>374,298</td>
</tr>
<tr>
<td>1911-1920</td>
<td>350,631</td>
</tr>
<tr>
<td>1921-1930</td>
<td>243,467</td>
</tr>
<tr>
<td>1931-1940</td>
<td>144,147</td>
</tr>
<tr>
<td>1941-1950</td>
<td>214,512</td>
</tr>
<tr>
<td>1951-1960</td>
<td>53,023</td>
</tr>
</tbody>
</table>


Table 3  Cholera Mortality in India, 1874-1968

<table>
<thead>
<tr>
<th>Period</th>
<th>Average Annual Cholera Mortality Rate</th>
<th>Expressed as a % of the 1874-1899 figure</th>
</tr>
</thead>
<tbody>
<tr>
<td>1874-1899</td>
<td>1.68</td>
<td>-</td>
</tr>
<tr>
<td>1900-1924</td>
<td>1.58</td>
<td>94</td>
</tr>
<tr>
<td>1925-1947</td>
<td>0.74</td>
<td>44</td>
</tr>
<tr>
<td>1948-1963</td>
<td>0.17</td>
<td>10</td>
</tr>
<tr>
<td>1963-1968</td>
<td>0.0017</td>
<td>0.1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year</th>
<th>Cholera Deaths</th>
</tr>
</thead>
<tbody>
<tr>
<td>1841</td>
<td>5,177</td>
</tr>
<tr>
<td>1842</td>
<td>6,545</td>
</tr>
<tr>
<td>1843</td>
<td>3,739</td>
</tr>
<tr>
<td>1844</td>
<td>5,811</td>
</tr>
<tr>
<td>1845</td>
<td>6,210</td>
</tr>
<tr>
<td>1846</td>
<td>6,427</td>
</tr>
<tr>
<td>1847</td>
<td>3,041</td>
</tr>
<tr>
<td>1848</td>
<td>2,502</td>
</tr>
<tr>
<td>1849</td>
<td>3,867</td>
</tr>
<tr>
<td>1850</td>
<td>3,348</td>
</tr>
<tr>
<td>1851</td>
<td>4,374</td>
</tr>
</tbody>
</table>

(Sources) *Calcutta Sanitation Report 1885*, p. 10.
Table 5  Starting Points of Cholera Epidemics in Japan

<table>
<thead>
<tr>
<th>Year</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>1822</td>
<td>Nagasaki or Tsushima</td>
</tr>
<tr>
<td>1858</td>
<td>Nagasaki</td>
</tr>
<tr>
<td>1862</td>
<td>Nagasaki</td>
</tr>
<tr>
<td>1877</td>
<td>Yokohama and Nagasaki</td>
</tr>
<tr>
<td>1879</td>
<td>Matsuyama</td>
</tr>
<tr>
<td>1882</td>
<td>Yokohama</td>
</tr>
<tr>
<td>1885</td>
<td>Nagasaki</td>
</tr>
<tr>
<td>1890</td>
<td>Nagasaki</td>
</tr>
<tr>
<td>1895</td>
<td>Several Places</td>
</tr>
<tr>
<td>1902</td>
<td>Karatsu</td>
</tr>
<tr>
<td>1916</td>
<td>Yokohama and Nagasaki</td>
</tr>
</tbody>
</table>

### Table 6: Cholera Epidemics in East Asia

<table>
<thead>
<tr>
<th>Year</th>
<th>China</th>
<th>Korea</th>
<th>Japan</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>The First Cholera Epidemic in Japan</strong></td>
<td>1817</td>
<td>○ (Overland Route)</td>
<td></td>
</tr>
<tr>
<td>1820</td>
<td>○ (Sea Route: Canton, Wenchow, Ningpo, Yangste Valley)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1821</td>
<td>○ (Nangkin, Shantung, Peking)</td>
<td>○ (From China: 平安道、黄海道、京城)</td>
<td></td>
</tr>
<tr>
<td>1822</td>
<td>○ (Peking, Central and Northern China)</td>
<td>○ (Nagasaki or Tsushima?)</td>
<td></td>
</tr>
<tr>
<td>1823-1857</td>
<td>○ [1826, 1827, 1835, 1840, 1842, 1843, 1846, 1848, 1849, 1851, 1856]</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>The Second Cholera Epidemic in Japan</strong></td>
<td>1858</td>
<td>○ (Canton, Amoy)</td>
<td>○ (Nagasaki)</td>
</tr>
<tr>
<td>1859</td>
<td>○ (From Japan)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>The Third Cholera Epidemic in Japan</strong></td>
<td>1862</td>
<td>○ (Peking, Newchwang)</td>
<td>○ (From China) ○ (Nagasaki)</td>
</tr>
<tr>
<td>1863-1876</td>
<td>○ [1863, 1864, 1865, 1867, 1874, 1875]</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>The Forth Cholera Epidemic in Japan</strong></td>
<td>1877</td>
<td>○ (Amoy, Foochow, Wenchow, Ningpo, Shanghai, Tientsin, Newchwang)</td>
<td>○ (Yokohama, Nagasaki)</td>
</tr>
<tr>
<td>1878</td>
<td>○</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>The Fifth Cholera Epidemic in Japan</strong></td>
<td>1879</td>
<td>○ (From Japan: Matsuyama)</td>
<td></td>
</tr>
<tr>
<td>1880</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>The Sixth Cholera Epidemic in Japan</strong></td>
<td>1881</td>
<td>○ (Hainan, Canton, Foochow, Shanghai, Yangchow, Nanking, Wuhu)</td>
<td>○ (From China: Seoul)</td>
</tr>
<tr>
<td>1882</td>
<td>○ Hainan, Amoy, Wenchow, Shanghai, Soochow, Yangchow)</td>
<td>○ (仁川) ○ (Yokohama)</td>
<td></td>
</tr>
<tr>
<td>1883-1884</td>
<td>○ [1883, 1884]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>The Seventh Cholera Epidemic in Japan</td>
<td>1885</td>
<td>○ (Foochow, Shanghai, Wuhu, Yangchow, Newchwang, Ichang)</td>
<td>○</td>
</tr>
<tr>
<td>-------------------------------------</td>
<td>------</td>
<td>----------------------------------------------------------</td>
<td>---</td>
</tr>
<tr>
<td>1886</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1887-1889</td>
<td>○</td>
<td>[ 1887, 1888, 1889 ]</td>
<td>○</td>
</tr>
<tr>
<td>The Eighth Cholera Epidemic in Japan</td>
<td>1890</td>
<td>○ [ Ningpo, Shanghai, Wuhu, Tientsin ]</td>
<td>○</td>
</tr>
<tr>
<td>1891-1894</td>
<td>○</td>
<td>[ 1892, 1893 ]</td>
<td></td>
</tr>
<tr>
<td>The Ninth Cholera Epidemic in Japan</td>
<td>1895</td>
<td>○ ( Several Coastal Cities )</td>
<td></td>
</tr>
<tr>
<td>1896-1901</td>
<td>○</td>
<td>[ 1896, 1898, 1900 ]</td>
<td></td>
</tr>
<tr>
<td>The Tenth Cholera Epidemic in Japan</td>
<td>1902</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Klein, op. cit., p. 506.


26 Ibid., p. 72, para. 257.
27 Ibid., p. 71, para. 253.
28 Ibid., pp. 71-72, para. 255.
30 Ibid., p. 10


34 Dr. David Manson’s Report on the Health of Amoy for the Half-year ended 30th September 1877, China, Imperial Maritime Customs. Medical Reports, 1877, p. 29.
35 Ibid., p. 31.

36 Dr. Alexander Jamieson’s Report on the Health of Shanghai for the Half-year ended 30th September 1877, China, Imperial Maritime Customs. Medical Reports, 1877, p. 38.

38 This calculation of growth rates is based on the trade figures that include not only East Asia but also the other Asian countries. K. Sugihara, Ajiakan-Boueki no Keisei to Kozo (Development and Structure of Intra-Asian Trade), Kyoto, 1996, p. 22.
39 Ibid., p. 22.

40 K. Furuta, Shanghai- Network to Kindai-Higashiajia (Shanghai Network and Modern East Asia), Tokyo, 2000.

41 Cholera epidemics in Japan during this period sometimes originated from the arrival of British or American warships to Japanese treaty ports. Tomoo Ichikawa suggested this point in our personal communications. But in this case also most of these warships came to Japan via Chinese ports.

42 Wataru Iijima compiled the mortality data of treaty ports in China recorded by maritime customs. He pointed out that the frequency and mortality level of various epidemics in modern China were not as high as usually assumed. W. Iijima, Pesuto to Kindai-Chugoku (Plague and Modern China), Tokyo, 2000, p. 333.

43 When D.B. Simmons wrote this monograph, he was titled ‘Physician and Surgeon to the Ken Hospital, one of the Physicians to the cholera Lazaret, and Chairman of the Yokohama Foreign Board of Health’. D.B. Simmons (1834-1889) was born in USA. He came to Yokohama as a missionary and then started a medical practice there. He became a reputed surgeon. J.Z. Bowers, Western Medical pioneers in Feudal Japan, Baltimore, 1970.

46 I.J. Kerr, ‘Introduction’, in I.J. Kerr (ed.), Railways in Modern India, New Delhi, 2001, p.4; T. Kubo,


50 F.H. King, Farmers of Forty Centuries or Permanent Agriculture in China, Korea and Japan, Madison, Wis., 1911, Chapter 9.


