

## INDIAN CHOLERA: A MYTH

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(Received 14 February 2012; revised 11 April 2012)

Cholera, a rapidly lethal dehydrating diarrheal disease had killed millions of people in the nineteenth century. It is said to have started in 1817 in Jessore (now in Bangladesh) near Calcutta and is believed to have spread to Europe by 1823. The epidemic cholera erupted in Sunderland (UK) in 1831 followed by four more epidemics till the end of that century. While European medical officers of the Indian Medical Service like Macpherson, Annesley and others distinguished the disease from the cases of sporadic cholera formerly occurring in India, others marked cholera to be originated from Bengal. India earned the reputation of being the “Homeland of cholera”. Recent research on cholera reveals that *Vibrio cholerae* bacterium is an indigenous inhabitant of aquatic environment, and the pathogenic forms of cholera can arise independently from environmental non-pathogenic forms. The present paper studies the incidences of cholera in India and in Europe before and after 1817 and with the help of the results of the modern scientific researches on cholera, and negates the European interpretation that India/Bengal was responsible for the cholera pandemics of the nineteenth century.

**Key words:** *Viśucikā*, Cholera morbus, Genetic diversity, *Ola-ota*, *Ola-bibi*, Pathogenic and non-pathogenic forms, *Vibrio cholerae*

### INTRODUCTION

There happened five pandemics of cholera in the nineteenth century starting from 1817 in India (Bengal) and killing millions of people throughout the world. The duration of each pandemic was not uniform as the pandemicity was based on the intensity rather than its extent of time. The climate, temperature, soil and air of India, especially the Bengal region, were believed to be the causative agents of the disease.

However, when the disease erupted in Europe during 1830s, the cholera was termed as ‘Indian cholera’ by the Europeans (Fig 1). India

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earned the reputation of being the 'Homeland of cholera' as all the pandemics were believed to have started from Bengal or other parts of the country.

**TO THE INHABITANTS OF THE PARISH OF**  
**CLERKENWELL.**

His Majesty's Privy Council having approved of precautions  
 proposed by the Board of Health in London, on the alarming approach  
 OF THE

**INDIAN CHOLERA**

It is deemed proper to call the attention of the Inhabitants to some of  
 the Symptoms and Remedies mentioned by them as printed, and now  
 in circulation.

**Symptoms of the Disorder;**

Giddiness, sickness, nervous agitation, slow pulse, cramp beginning at  
 the fingers and toes and rapidly approaching the trunk, change of  
 colour to a leaden blue, purple, black or brown; the skin dreadfully  
 cold, and often damp, the tongue moist and loaded but flabby and  
 chilly, the voice much affected, and respiration quick and irregular.

**REMEDIES;**

All means tending to restore circulation and to maintain the warmth of the body should be had  
 recourse to without the least delay.

The patient should be immediately put to bed, wrapped up in hot blankets, and warmth should  
 be sustained by other external applications, such as repeated frictions with flannels and camphor-  
 ated spirits, poultices of mustard and linseed (equal parts) to the stomach, particularly where  
 pain and vomiting exist, and similar poultices to the feet and legs to restore their warmth. The  
 returning heat of the body may be promoted by bags containing hot salt or bran applied to different  
 parts, and for the same purpose of restoring and sustaining the circulation white wine whey with  
 spice, hot brandy and water, or salvolatile in a dose of a tea spoon full in hot water, frequently  
 repeated; or from 5 to 20 drops of some of the essential oils, as peppermint, cloves or cajeput, in a  
 wine glass of water may be administered with the same view. Where the stomach will bear it,  
 warm broth with spice may be employed. In every severe case or where medical aid is difficult  
 to be obtained, from 20 to 40 drops of laudanum may be given in any of the warm drinks previously  
 recommended.

These simple means are proposed as resources in the incipient stages of the Disease, until Medical aid  
 can be had.

**THOS. KEY,**  
**GEO. TINDALL,** } *Churchwardens.*

Sir GEORGE BLAKE, Bart. in a pamphlet written by him on the subject of this Disease, recommends persons to guard against its approach by  
 sobriety and temperate living, and in case of sickness, the prescribed remedies; and in case of attack to smart therein immediately but the great  
 precaution to be taken, is to consult in a due regard to Cleanliness and Focidation.

N.B. It is particularly requested that this Paper may be preserved, and that the Inmate generally, in the House where it is left may be  
 made acquainted with its contents.

T. GOODE, PRINTER, CROSS STREET, WILDERNESS ROW.

Wellcome Images

**Fig. 1.** Broadsheet warning about Indian cholera symptoms and recommending remedies, issued in Clerkenwell, London, by Thos. Key. Geo and Tindall: Churchwardens. London, 1831.

The first five Cholera pandemics occurred during the following periods (Dobson 2007, pp. 44-45):

First (1817-1823), it started in Jessore and Calcutta in 1817 and spread all over India in 1818; Second (1823-1837), it was more widespread as it started in India and spread to Russia in 1823 and then to Poland, Germany, Sweden, Austria and finally to England in 1832; Third (1846-1863), Cholera again invaded Europe and then America. It was thought to spread from Bombay by the sea to Egypt and later invaded Europe; Fourth (1864-1875), the disease again prevailed widely over Asia, Africa, Europe and America; Fifth (1881-1896), the disease spread over Egypt, Asia Minor and Russia in 1883-1887. A severe outbreak in 1892 among the Hardwar pilgrimage was supposed to spread cholera from India to Europe via sea route. There was a severe outbreak of cholera at Hamburg in 1892 and in several places of France, Italy and Spain; Sixth (1899-1923) and seventh (1961-1970).

After going through the historical accounts on cholera by different European as well as Indian physicians and medical historians, and examining the results of modern scientific research on the disease, it has been observed that the five cholera pandemics during the nineteenth century might have resulted from the emergence of a virulent strain of cholera bacteria due to the advent of the Europeans in India. Therefore, the present paper intends to negate the belief that 'India/Bengal was responsible for the cholera pandemics of the nineteenth century'.

#### **HISTORICAL INTRODUCTION**

Epidemics of cholera infection have been reported since time immemorial. It has been recorded in the ancient medical works of the Hindus, the Arabs, the Chinese in Asia as well as in the works of Greeks and Romans in Europe. The word 'cholera' appeared first in the Hippocratic corpus (460–377 BC) and was referred to as a sporadic diarrheal disease. Galen (129–216 AD) too described an illness that is now believed to be cholera. Later classical writers including Celsus, Aretaeus and Caelius Aurelianus described a condition under the same name. It is believed to have been derived from the Greek word 'chole' (bile) and 'rein' (to flow); thus meaning the flow of bile. However, in 1622 Alexander Trallianus said that the word has come from

'cholades' which means intestine, as the evacuations were often serous (producing serum) and not bilious. By late 1669, Thomas Sydenham (1624-1689), an English physician and the English Hippocrates of the 17<sup>th</sup> century, employed the term 'cholera morbus' in describing an epidemic in London. The term was also widely used to describe endemic or sporadic diarrhoea throughout the seventeenth and eighteenth century in Western Europe. The ancient Indian medical texts, *Suśruta Saṃhitā* mentions a diarrheal disease known as *Viśucikā*. In *Caraka Saṃhitā*, another Indian medical text of equal importance, however, we do not find any mention of *Viśucikā* in the chapter on epidemics. The Sanskrit name usually means a disturbance of stomach and intestines generally (Barua & Greenough, 1992, pp. 1-36). However, Dr. H. H. Wilson<sup>1</sup> translated it as spasmodic cholera. Prof. August Hirsch<sup>2</sup>, a German physician reported at the Cholera Conference at Weimar on 28-29 April, 1867 that cholera spread over India, Persia and Constantinople as early as 1031 AD though there has been controversy about the severity of disease at that time (Roy 1925, pp. 50-52). Before discussion on the incidence of cholera epidemics in Bengal (India) from 1817 onwards, it would be interesting if we present the incidence of the disease in India and Europe before and after 1817.

#### CHOLERA IN INDIA BEFORE 1817

In India, a cholera-like diarrheal disease known as *Viśucikā* was prevalent from the time of *Suśruta*. *Caitanya Caritāmṛta*, the celebrated book by the vaiṣṇavas referred to the incidence of this disease in Puri in 1512. Sengupta (1984, pp. 318-319) reported that *Viśucikā* was a violent form of diarrhoea in which the stools became almost watery and in which after a few motions the patients became very weak. Many of the symptoms of cholera did not appear in it such as cramps, fever and even vomiting. Therefore, there is almost no recorded evidence of the presence of 'true cholera' in India (except for the description in *Suśruta Saṃhitā*) before the writings of the Portuguese physicians who settled here in the early 16<sup>th</sup> century. The Portuguese explorer Gaspar Correa described cholera death of 20,000 men in the army of the Sovereign of Calicut as early as 1503 in the "*Lendas da India*" published in 1543. Correa also met cholera in an epidemic form in the spring of 1543 in Goa. Local people called it '*moryxy*'. The mortality was so great that it was with great difficulty that the dead could

be buried: ‘the very worst kind of poison seemed there to take effect, as proved by vomiting’. The disease was marked “by vomiting, with drought of water accompanying it, as if the stomach was parched up, and cramps that fixed the sinews of the joints”(McNamara 1870, pp. 45-98). Cholera was also described in 1563 by Garcia da Orta, a Portuguese physician, in one of the earliest books printed in Goa (Orta 1563). Orta gave a vivid description of cholera as he saw it in Goa. He wrote,

“The Arabs called the disease ‘*hachaiza*’ or ‘*haiza*’, the name it is known by throughout India to this day”.

The Portuguese named it ‘*mordexim*’ from which the French ‘*mort de chien*’ was derived. However, Orta reported the disease as ‘*colericpassio*’ and ‘*morix*’ too. He added that the disease was always most severe in June and July. In 1584, the Netherlander Jan Huygen van Linscoten described what he called ‘*mordexijn*’, in Goa as did the Frenchman Vincent Le Blanc also in Goa in 1585. Succeeding this period the disease had broken out in an epidemic form in south-western parts of the country and in some parts it assumed an endemic form (Roy 1925, pp. 106-108).

In 1736, Poxman reported that as early as 1703, Sieur Luillian visited Bengal and noticed the presence of cholera in Hooghly, a Dutch settlement at that time. This was perhaps one of the earliest incidences of cholera reported by a European (Macpherson 1872, pp.99-167). However, according to McNamara (1870) the earliest account of the occurrence of cholera in India was from the pen of an English physician, Dr. Paisley, dated, February 1774 from Madras. This has also been referred in Curtis’s ‘*Works on Diseases of India*’ published in Edinburgh in 1807. Although nothing further is known about Paisley, his letter forms a cornerstone in the history of cholera in British India. Annesley<sup>3</sup> in an early English classic on cholera quotes the following passages from Paisley:

“Thus there can be no doubt that their (troops) situation contributed to the frequency and violence of this dangerous disease, which is, as you have observed, a true cholera morbus”.

A cholera epidemic in Ganjam in the East Coast among a division of Bengal troops of five thousand who were proceeding down the East Coast towards Madras in the spring of 1781 (March and April were the months when cholera mortality reached the highest point) was reported (Sirkar1917)

by Warren Hastings on 27 April 1781 to Major Scott. The diseased were required admission to the hospital and on 22 March alone no less than 500 men died. The disease spread from the army among the native inhabitants and caused heavy mortality too. Hastings wrote (Sirkar1917) to Major Scott,

“A contagious distemper at Ganjam partly resembled the disease called ‘mordeshi’ or ‘mordeshe’, in Europe cholera morbus, but seems to be a species of plague, and to have been caused by exhalations from the rains, which have fallen almost incessantly and with great violence during two months”.

Jameson in 1820 observed that cholera incidence was perhaps associated with the movement of army contingents from Ganjam to Bengal, as the military personnel were the main victims. Thus the contention of McNamara relating to the original home of cholera in Bengal should no longer be considered as tenable. Prior to the last quarter of the 18<sup>th</sup> century only scattered reports of the occurrence of cholera are available, though there might be some incidence of cholera-like diarrheal diseases in different parts of the country. It was known as an endemic disease amongst the natives of Amboo valley in Arcot district in 1770. In April 1783, Cholera burst out at Hardwar and in less than eight days was supposed to have cut off 20,000 pilgrims (Barua & Greenough 1992, pp. 1-36). Frere Papain in 1709 sailed up to Bengal and he wrote from Chandernagore that cholera was one of the principal distempers for which the native treatment was withholding of fluids and cauterization of feet. Fortunately the disease did not take an epidemic turn and was short lived. Rhyne, a Dutch Professor had spoken in 1769 of a very fatal form of colic by which he might have meant ‘cholera’ that caused death (Sirkar1917).

There were a few occasional notices of cholera in Bengal during the eighteenth century and lower Bengal was the portion of India where there were very little cholera incidence in early times. However, Jaggi (2000, pp. 108-122) opined that since the European or English physicians in India literally had no knowledge about the conditions of the inhabitants of different provinces prior to 1781 we do not get full information about cholera in India. McNamara (1870, pp.45-98) had traced the history of cholera in Calcutta before 1817. He reported the genesis of the term ‘*Ola-ota*’, used by the natives to describe cholera: at an early period of eighteenth century an old woman was wandering in the jungle and found a stone that was

worshipped as the goddess for *ola-ota*, called '*Ola-bibi*'. The necessity of worshipping the goddess '*Ola-bibi*' which used to attract worshippers from distant places revealed that the disease '*ola-ota*' must have caused too much of health problems and mortality for the inhabitants of Calcutta and Bengal as well in the early part of the eighteenth century. Probably around 1720, an English merchant, Mr. Duncan gave Rs 4000/- for a temple to the goddess '*Ola-bibi*'. In 1750, Mr. Duncan again donated Rs 6000/- for the erection of a second temple to the goddess '*Ola-bibi*' in Calcutta. The old rude stone was transferred to the new abode and a somewhat elaborate idol was constructed. This may reveal that the mortality rate among the Europeans might also had been very high so the fund came from a European for the erection of two temples for goddess '*Ola-bibi*'. Just like in Bengal where people worshipped goddess '*Ola-bibi*', men, women and children used to offer prayers at a shrine by the road side during cholera epidemic in Poland in 1873 (Fig 2).



**Fig. 2.** Men, women and children praying at a shrine by the road side during the 1873 cholera epidemic in Poland.

In 1756, Ives gave an account of 27 cases of convulsion of the intestine from a scorbutic state and muddy water. It might have been cholera as commented by Macpherson (1872, pp.61-65). However, Dr. Lind's account of the 30,000 Indian and European deaths in 1762 due to cholera had not been confirmed by Ives or Bogue who had not mentioned any cholera-like disease in Bengal. Dr. Bryden thought that the bad remittent fever of Calcutta in 1768-71 was cholera. Stavorinus who visited Bengal between 1768-71, described a very fatal disorder peculiar to the country, which swept away many in three days, or if there was recovery, left blind or paralysis. This was probably smallpox that often caused blindness and extreme debility. Dr. Clark of Bombay who visited Calcutta in 1772 gave a description of death from a certain disease which might be cholera, as he wrote (Macpherson, 1872, pp.61-65),

“There have been several melancholy instances of persons who have returned home in a state of perfect health from performing the last duties to a deceased friend, and have next day been numbered among the dead”.

In 1779, we find the presence of mild form of the disease in Calcutta as mentioned by Sir Elijah Impey, the famous Judge, who himself used to suffer once or twice a year from mild attacks of cholera (Sirkar1917).

#### **CHOLERA OUTBREAK IN THE WEST FROM AD 1500 TO 1817**

In his book *Annals of Cholera Epidemics*, John Macpherson had given wonderful and detailed account of the incidence of cholera in the West from the earliest period to the year 1817 (Macpherson 1872, pp. 99-176). In 1527, cholera erupted at Bologna (Fig 3). A few years later, in 1538 violent diarrhea ravaged the whole of Europe with such ferocity that scarcely any state escaped unscathed.

Therefore, it seems probable that such epidemics had been somewhat of choleric nature. In 1564, an unknown author Riverius wrote, ‘the disease called cholera was prevalent, killing many within four days but nearly all recovered who sought aid on the first onset of the disease’. For treatment, the European physicians allowed smallest possible quantity of liquid to reduce vomiting and purging which were believed to be the inevitable causes of death. Gardiner reported that in England summer brought ‘tertian ague, yellow cholera and choleric fluxes’. During 1636 the mortality bill in London





**Fig. 3.** The Virgin of Succor venerated in the Sanctuary in the Borgo San Pietro at Bologna, appears above the town and was asked by Sts. Peter, Paul, Roch and Sebastian to liberate the town from the cholera of 1527.

included 'rising of the stomach or vomiting' as new headings of diseases. In 1643, Belgian physician, van der Heyden provided us with a very lively description of 'cholera morbus'. Another great physician of that time, Morton spoke of epidemic diarrhea and dysenteries accompanied with awful twitching cramps, as prevailing annually from 1666 to 1672 with a weekly mortality rate of three to five hundred. Dr. Morton's account is particularly valuable as it gives us the connection between cholera and fevers in those days. In

1689, cholera and dysentery were prevalent in Nuremberg. In 1691, London was hit by intermittent fever accompanied with convulsion or cholera (Macpherson 1872, pp. 61-65). In 1751, epidemic cholera was witnessed by Malouin in Paris in the month of July and was successfully treated by opium. Around this time, an Italian physician mentioned an acute and dangerous disease, similar to cholera as described in ancient times. In 1762, Dr. Bisset remarked, 'the true malignant cholera morbus seldom appears in Great Britain, at least in the northern parts of the island' and had not met with more than four cases of cholera in his seven years practice. He had, however, recognized several cases of non-malignant cholera particularly in 1759 and confirmed the existence of a virulent form of the disease. A great variety of forms of cholera had been described by Sauvages in 1763. In 1765, there was a choleric form of intermittent at Montpellier. From the beginning of the nineteenth century we find the presence of cholera or cholera-like disease in London and in other parts of Great Britain. A notice by Dr. William stated that in 1800, the cholera was a frequent disease in London in August and September. Mr. White of Bath published a book on cholera in 1808. Mr. Curtis, in his book also published in 1808 reported that he had observed many cases of cholera near Edinburgh, nearly identical to cholera he had seen in the East Indies though only one of these cases was fatal. In the 1809 edition of his 'Treatise on Liver' Saunders remarked that cholera morbus was extremely frequent in England in the months of August and September and was known as 'autumn epidemic'. It is important to note that in 1802 and 1803 and again in 1811, 1814 and 1815 diarrhea, summer cholera and other diseases of the nature of flux were unusually fatal as observed in the bills of mortality. Mr. Hennen at Cephalonia in the years 1816 and 1817 recorded prevalence of a most fatal cholera. Though it did not spread widely but it destroyed three out of four attacked by it. 'It was, therefore, proportionately more fatal than the ordinary Indian severe epidemic', reported Hennen. Macpherson opined that the 'fièvre perniciouse' appeared to him to resemble cholera much more closely than any other phase of fever did (Macpherson 1872, pp.61-65).

#### **CHOLERA OUTBREAK IN THE WEST AFTER AD 1817**

At the beginning of the nineteenth century Cholera Morbus or 'true Cholera' was first noticed among the British troops in India and was first

described near Jessore (now in Bangladesh) in 1817. It took five years for cholera to reach Europe when in 1822 the disease erupted within 150 miles of the Georgian frontiers of Russia. Finally during 1828-29 it appeared 400 miles north of the Caspian Sea. In 1831, cholera followed the Russian army employed in the subjugation of Poland and the disease proved to be very destructive in Warsaw (Poland) and many other places during the months of April and May. After cholera erupted in St. Petersburg, vivid accounts of the effects of the disease appeared in the press. The first hand knowledge of the disease, and the reports that the mortality might happen in large cities, led the Privy Council to put all ships from Russia arriving in England under quarantine. In June 1831 cholera erupted in Cracow and other adjoining places, extending its course to Hungary and Constantinople. At Cairo cholera raged with such intensity that 10,400 Mohamedans besides Jews and Christians were carried off. During that year when cholera was progressing over the continent of Europe, it appeared at Mecca and proved very destructive to the 'Hadji' or pilgrims (Bascomb 1851, pp.158-160). By 1831 cholera reached Hamburg and the first incidence of the disease was reported in England when a girl died of the disease in Sunderland (Douglas 1991). As in most British towns of that time, standard of sanitation in Sunderland were low as there was no regulation of housing, water supply or sewage. The disease was thought to be carried in by the sailors of a ship who were suffering from cholera. The ship was allowed to dock because the port authorities had objected to the quarantine issue and therefore, the government instructions to quarantine all ships from Baltic States were ignored. The quarantine enforced by the government resulted in the decline in trade. As a result, there had been a great deal of resentment among the businessmen and that led the citizens to discredit the cholera talk. Influenced by the business community, the town's doctors withdrew their former opinion that Indian cholera was affecting Sunderland. From Sunderland cholera made its way northwards to Scotland and southward towards London. After Sunderland cholera visited Newcastle-upon-Tyne, Houghton-le-Spring, North Shields, Tynemouth, South Shields and other places. There had been 215 reported deaths. On 9 January 1832, the Board of Health declared Sunderland free of cholera. Unknown to the Board, a young doctor named John Snow was working single handed with epidemic in Killingworth Colliery, a Tyneside coal mining village. His experience led him to make an important discovery

which he used in London during the cholera epidemic of 1848. However, the first appearance of cholera in London was reported in February 1832 in the immediate vicinity of the shipping; but solitary cases were met with in the close filthy quarters of the very poor, early in December 1831. The arrival of this new and terrifying lethal malady in Europe at the beginning of the 1830s presented a serious challenge to the societies affected by it. They reacted in widely different ways. Subsequent visitations of cholera in 1848-49, 1854, 1865-66, 1871-73, 1884 and 1892 attracted the attention of the European scientists and physicians to work on the possible cause of the disease and its treatment.

Modern research on cholera started slowly from 1817 using microscopy, statistics and germ theory of diseases. By the time cholera erupted in Russia in 1823, a Frenchman, de Jonnes, in a series of memoirs published in 1821-23 declared that cholera was a contagious disease. However, the manufacture of many theories on the spread of cholera clearly indicated the interest in and confusion of scientists at that time over the origin and nature of cholera (De 1961, pp.6-7). During the evolution of germ theory of cholera in 1840s, Dr. John Snow (1813-1858), an English physician and anesthetist of Queen Victoria at the University College Hospital at London, made his appearance with his skepticism on the then dominant 'miasma theory' that stated that diseases such as cholera or Black Death were caused by pollution or a noxious of 'bad air'. He was the first to use statistics of the number of deaths from different localities of London. He found that the victims of cholera were more 'within a short distance of the Broad Street pump'. He concluded that water of that particular pump must have been contaminated from the sewage line and consumption of contaminated water was the likely cause of the disease and deaths. He convinced the municipal authorities to dismantle the handle of the pump so as to make it non-functional and the result was imminent. He publicized his theory in an essay (Snow 1936, pp.1-136), 'On the Mode of Communication of Cholera' in 1849. Through his shrewd observations and rational philosophy he saved the germ theory of cholera and catalyzed its further evolution by directing the attention of the microbe hunters to the intestines and their discharges. In 1884, the fifth European epidemic cholera broke out on 13 June in Toulon after the arrival of the ship *Gartha* with troops from Saigon in Cochin China, a French possession in the East. From Toulon it extended to Marsailles and

then to the south of France. About 8000 death had been reported from Naples due to the soldiers who landed there (Evans1990).

However, scientific research on cholera began when Filippo Pacini (1812-1883), an Italian anatomist became very interested in the disease when cholera erupted in Florence in 1854 during the cholera pandemic of 1846-63. Immediately after the death of a cholera patient he performed an autopsy and with his microscope conducted histological examination of the intestinal mucosa. During such studies Pacini first discovered a comma-shaped bacillus which he described as '*vibrio*'. He published a paper in 1854 entitled 'Microscopical observations and pathological deduction on cholera' in which he described the organism and its relation to the disease<sup>4</sup>. However, because of the prevailing belief of the Italian scientists in the 'miasma theory of disease', his discovery was ignored by the Italian medical community until Robert Koch (1843-1910) rediscovered<sup>5</sup> the organism in the rice-water dejects of cholera patients while working at the Medical College Hospital in Calcutta. Koch and his team isolated *V. cholerae* as a pure culture in 1884.

#### CHOLERA IN THE NINETEENTH CENTURY INDIA

There was no authentic reference to corroborate that cholera became endemic in Lower Bengal after the epidemic of 1781-83 by which Calcutta was also seriously affected. There is, however, no denying of the fact that cholera-like disease known as *Viśucikā* was present in Calcutta and Jessore prior to 1817. It had been reported that from 1808 to 1813 there was presence of cholera among European troops at Chunar, Dinapur, Benaras and Nagpur. In 1814, there were cases of cholera in crowded barracks in the Fort William in Calcutta among the newly arrived European troops. If cholera was present every year during that period among the European troops outside Bengal, it would not be an unreasonable presumption that cholera was also present among the troops at Calcutta. The reports of death due to cholera sent to the Magistrate of Calcutta from the burial grounds and ghats for 1815 and 1816 were respectively 182 and 142 only among Hindus and 200 only in each year among the Muslims. These figures indicate that cholera was not of that serious type as was found during 1817s and later. It is interesting to note that the fatal case of cholera that occurred in the Fort William in the 59<sup>th</sup> Regiment on 30 March 1817 attracted no attention. When after March it gradually

assumed a very serious form and during the two worst months of its prevalence there were 727 deaths among the inhabitants of the Fort William, the authorities became aware. However, the total deaths reported from the burial ground and ghats including Hindus and Muslims were only 1323. In the first week of August, cholera broke out as a severe epidemic in Calcutta and suburbs indicating great alarm. It assumed a much more serious form than at any former period within the recollection of the oldest inhabitants of the city, running its course in a few hours and sometimes in a few minutes. In addition to the old temple of '*Ola-bibi*', a new temple to her was established at Kidderpur, while at Salkea in Howrah, a young woman sat for some days in a temple as an incarnation of goddess '*Ola-bibi*' till removed by the order of the Magistrate and the road to the old temple of *Ola-bibi* at Kalighat was crowded with pilgrims – such was the description of the great epidemic of 1817 at Calcutta which visited many parts of Bengal and at Jessore assumed a very serious form. On 5 September 1817, several cases of cholera occurred amongst the Europeans and from that day onwards the disease became more frequent daily (Sirkar 1917). John Macpherson (1853) reports that the class of Europeans that produced most cases of cholera in Calcutta was that of the sailors; next to them was the detachment of soldiers arriving from England or from the Upper Provinces. The sailors and the new arrivals furnish mostly young men while the latter furnish men over the age of 30. Cholera attached itself to particular ships; one case on board ship was sure to be followed by another. A solitary case in a detachment of troops was rare. Since the 'germ theory of disease' was established only during the second half of the nineteenth century, in 1817s the medical men were skeptical about the bacterial origin of cholera and considered the disease to be non-contagious, and that possibly helped the disease to spread among the population more easily.

When the report of a very serious diarrheal epidemic at Jessore reached the Medical Board in 1817, that body opined (16 Sept 1817) that 'it was the usual disease of that season which assumed that serious form due to the local peculiarities of the season and not improbably by certain local causes affecting the health of the inhabitants of that place'<sup>6</sup>. The members of the Medical Board who were probably serving the country 20 years prior to the year 1817 opined that there was no town in the low lying areas of Bengal and certain quarters of Calcutta where humid climate prevailed, were then entirely free from cholera epidemic. When cholera occurred in Jessore and

Calcutta and caused an alarm, the medical authorities reported in the first instance that it was the usual epidemic of the season in an aggravated form. It was some little time before the term cholera was applied to it. However, there were further notices of its existence from English witnesses. Dr. Young of Allipur for a long time used to have a few cases of cholera, but not of much virulence, among the prisoners in his jails every season. Dr. Barnes of Jessore said that he had been accustomed to cases of the identical disease, although he had not called them by the name of cholera; he thought the disease was a new one, superseding the periodical remittent of the season, and it had repeatedly been the subject of correspondence between him and the Medical Board. Dr. Tytler, who was the Assistant Surgeon present at Jessore at the time of the outbreak of 1817, considered the disease to be the usual epidemic. He relied on ‘calomel’ and ‘opium’ which were regarded as ‘wondrous drugs’ in the European pharmacopeia during that time<sup>7</sup>. When cholera erupted in Travancore in 1818 the *vaidyas* unscrupulously fled as they had no knowledge of the disease and of its remedial measures. This incidence was reported by the Staff Surgeon Hay from Madras. The havoc created by cholera in the first half of the 19<sup>th</sup> century in India led many European medical men to scan Ayurvedic sources with the help of *vaidyas* or indigenous medical practitioners. Texts like *Cintāmaṇi* which was regarded as an important indigenous medical source had reference to terms like *Śitāṅga* and *Vidhumārviśucī* as diseases resembling spasmodic and epidemic cholera, characterized mainly by ‘chillness like coldness’. One finds compatibility of symptoms of *Śitāṅga* and *Viśucī* in the term *Viśucikā* that was made synonymous with cholera by the Europeans<sup>8</sup>. Hay recruited and reinstated the native medical men by arming them with ample instructions and medicines from western medical system to fight cholera. Therefore, cholera was very much a disease in the West and their medical system had remedies and medicines for combating the disease even in India. Hay was convinced that since the disease in its acute form never occurred in India, no Ayurvedic medicine or remedies were available and the native physicians were not capable enough to save a single person. However, after almost a century later in 1902, a *vaidya* established his reputation and redeemed Ayurvedic tradition by facing ‘*veshoo-u-geka*’ of cholera calamity in and around Kotakkal in Kerala by administering them a self made tablet called ‘*vishoochikari*’ (Krishnankutty 2001). Pandit D. Gopalacharlu<sup>9</sup> started the

Madras Ayurvedic Laboratory in 1898 and the first Ayurvedic pharmacy in Madras and thus facilitated large-scale trade in Ayurvedic medicines at an affordable price (Fig 4). His Ayurvedic Hospital in Madras was the first in India to have in-patients wards.



Fig. 4. Advertisement for Pandit D. Gopalacharlu's Ayurvedic cholera cure, 1909.

### CONCLUSIONS

*Vibrio cholerae* is the causative bacteria of cholera, a rapidly lethal dehydrating diarrheal disease and is known to be an autochthonous inhabitant of our aquatic environment. Therefore, it is pretty certain that cholera was known to ancients at an early period. Though it would be futile to attempt



to state the exact date when and the place where the disease propagated first, current research reveals that cholera is a relatively recent disease which was unknown to Nomadic Paleolithic humans but which developed when villages and village water supplies were established. The disease, however, is confined to humans only though the virulence properties of the pathogenic *Vibrio cholerae* remained unknown for many years. The disease however, had taken the lives of millions of people throughout the world along with many distinguished personalities of the world in the past. The discoverer of the second law of thermodynamics, Sadi Carnot, the French novelist Alexander Dumas, the great German idealist philosopher Hegel, a President of the United States of America, James K Polk, the Irish philanthropist and a leading light of the Bengal Renaissance, David Hare were victims of cholera.

The description of the disease in *Suśruta* agrees closely with that of cholera as known today; it has however, been described as a sporadic condition. As cholera is a contagious disease, the density of population is an important factor in the causation of cholera epidemics. It is therefore, possible that cholera did not cause epidemics in India at the time of *Suśruta* until later when population density became favourable with the coming of the people from other countries for trade and for loot as well. Barua (1992) pointed out that McNamara of the Indian Medical Service, a leading British authority on cholera, who had studied under Koch himself, wrote,

“While we have numerous treatises on the works of *Suśruta* and *Avecena*, we have literally no clue in the oriental languages as to the history of epidemic cholera in India”.

In India, however, the disease was first reported by the Portuguese physicians as epidemic cholera in Goa in 1503 and later. As reported by the Portuguese physicians Hindu *vaidyas* had remedies for fevers, dysentery and especially cholera-like diarrhea. According to Cristavo da Costa, a Portuguese physician, the Hindus were particular in taking bath every morning and followed personal hygiene whereas the Portuguese did not care for personal hygiene<sup>10</sup>. In my opinion, this habit of personal and environmental cleanliness as well helped the natives to keep the disease at bay. Modern scientific research (Ramamurthy & Nair 2010) has confirmed emergence of more virulent strain of cholera from less pathogenic one under favourable conditions, therefore it can be presumed that the unhygienic and unhealthy habits of the Portuguese particularly sailors and armies caused epidemic

cholera in the 16<sup>th</sup> century Goa and in other neighbouring Indian cities and towns. Later when the Portuguese traders commenced trading in Bengal, the two great centers of maritime trade, Chattagram or Chittagong and Saptagram or Satgaon became overcrowded with Portuguese sailors and traders from Goa who might have carried cholera germs and polluted the sea and river waters of that region<sup>11</sup>. We get information of a fatal diarrheal disease or *Ola-ota* from the pen of Dutch explorers from Hooghly where the Portuguese shifted the markets when the Saptagram port was abandoned due to caprices of the rivers. Since the natives considered the disease different from '*Viśucikā*', the term '*Ola-ota*' became popular as a newly emerged diarrheal disease in Bengal. Macpherson (1872) noted the local tradition in which the term *Ola*, a Bengali slang in rural areas was used in the sense of the downward flow of flux. Cholera carrier's role in the spread of the disease has attracted the attention of recent researchers and it has been concluded that the spread of cholera continues largely by means of healthy carriers. The *vibrios* may be found when no clinically manifest cases are observed. All these healthy carriers are for the most part short-term carriers and short-term shedders of the organisms, they are rarely found to be chronic carriers. All these findings point to the important role played by the healthy carriers of *V. cholerae* in endemic areas (Bencic & Sinha 1972).

Apart from citing the incidence of '*Ola-bibi-temple*' building in the city of Calcutta sometimes in 1720 and two cases of cholera among the European troops in 1808 and 1814, McNamara could not cite any evidence of the prevalence of cholera in Bengal. McNamara (1870) also noted that of the 19 persons accidentally drank infected water on shipboard in 1861, only 5 contracted the infection. This resistance might well be nonspecific; the natural acidity of the stomach could act as a barrier to infection (a possibility well appreciated by McNamara). On the other hand, one infection does not produce solid immunity against repeated infections in survivors as in other infections such as smallpox and measles. Macpherson mentioned the incidence of cholera among 200 Muslims in Calcutta between 1815 and 1816. These incidences cannot establish on a satisfactory basis the ancestry of cholera epidemic in Calcutta or Bengal. Prior to 1817 cholera is hardly accountable in the medical history of Bengal. But subsequent annual incidence led many observers to believe that the disease had struck its root in Bengal *de novo*. In my opinion, the epidemics of cholera or *Ola-ota* in Bengal after 1817 were the results of regular trading activities in this region with European

countries where according to Macpherson (1872, pp.99-167) “cholera was present before 1817”.

Of the accounts of the disease contained in ‘*The Epidemic Cholera of the East*’ ones attention would be attracted to the works of Drs. Annesley, Scott and Ainslie. In the capacity of Principal Medical Officer to the General Hospital, and to the garrison of Madras, at the time when the disease was prevalent in the city and its vicinity, Annesley appears to have had most extensive opportunity of observing its course, of investigating its effects upon the organization of its victim, and of testing, by experience, the different means recommended for its cure. Scott on the other hand, had compiled from the reports which were furnished to the Medical Board of Madras, chiefly by assistant surgeons of the Company’s regiments. Ainslie’s report “*Observations on the cholera morbus in India*” rests only upon what had previously been written on the subject, for he had left India some time before the breaking out of this most destructive epidemic. In his Report Scott said that the epidemic cholera in 1824 was the same as that known in India by the name of *mort de chien*, as described by Dr. James Johnson in his excellent work on tropical disease, and that the same disease was prevalent in some parts of India in 1774 until 1782 and again appeared in 1787 according to the accounts furnished by Paisley, Sonnerat, Curtis and Girdleston. Annesley disputed Scott’s observation and opined firstly, that there was no proof of the prevalence of cholera in India as a wide-spreading epidemic in former times and secondly, that the accounts which had been given of the more than usual prevalence of cholera, in a particular district or country, or at particular seasons, evidently showed that such prevalence of disease was owing to the nature of the locality, of the seasons. Moreover, Annesley studied the blood of the cholera patients and reported,

“this condition of blood .....viewed in connection with the other symptoms is sufficient to distinguish the disease from the cases of sporadic cholera formerly occurring in India and from the cholera usually observed in warm climates, or in temperate ones during the autumnal season.....The low, weak, small and undeveloped state of the pulse from the commencement of the attack; the extension of the spasms so early in the disease to the muscles; the cold tongue and mouth; the coldness of the respired air, the great derangement of the respiratory function; the shriveled state of the extremities; the cerebral congestion; the colic nature of the spasms; the suppression of the urine and other secretions; the wide diffusion

of the disease throughout Southern Asia; its violence and fatal effect – are circumstances which authorize the inference that the epidemic cholera is different from the common cholera of India, as observed previous to 1817, not in degree alone, but it is also different in kind”.

I find the account furnished by Annesley is more full and circumstantial than those contained in Scott’s and Ainslie’s reports. Dr. Mackinnon of the Bengal Medical Service in his article on pestilential epidemics (cholera) remarked (Mackinnon 1856),

“It is surely a hidden thing or mystery of nature that in 1817 an epidemic disease which if known before, had certainly not been seen lately appeared in Jessore, a district of Bengal”.

The ‘mystery of nature’ can be solved today with the help of modern scientific research. In India, incidence of ‘true cholera’ had been reported among the European troops during 1802-1813 at Chunar, Dinapur, Benaras and Nagpur. On 30 March 1817, when the fatal case of cholera occurred among the newly arrived British troops in the crowded barrack at the Fort William in Calcutta, the incidence did not attract the attention of the medical authorities of the colonial government. Moreover, after receiving the report of a very serious diarrheal epidemic among the Jail inhabitants at Jessore, the Medical Board in 1817 blamed the ‘local peculiarities of the season’ and certain local causes as the reasons for the onset of the disease. It is interesting to note that the Third Anglo-Maratha War coincided with the 1817-1821 cholera epidemics in India when there was much more movement of European troops than before. It has been observed that from 1 April 1842 to 31 March 1853 the prevalence of cholera among Europeans in Calcutta did occur more especially among seamen and troops arriving at the presidency, who furnished the great amount of cases. Since modern research on cholera has established that the genome of *vibrio cholerae* carries several determinants that aid for its survival both in aquatic environment and in the human intestine and there are potential causes for ‘mixing and matching’ of genes in the environment or in human intestines leading to new more virulent strains, in my opinion, cholera bacteria strain that was present before 1817 epidemic underwent change in the intestine of European troops who followed diets<sup>12</sup> and habits different from the natives of India. And that change brought a new strain of *Vibrio cholera* that was the causative agent of cholera morbus or true cholera in India. As the medical authorities were not aware of the contagious nature of cholera at that time, the excreta of the affected person polluted the water

bodies of the area and more people were affected. With the movement of the troops throughout India and to Europe the disease spread easily with more virulent character.

It is to be noted that cholera erupted throughout the nineteenth century all over the world when the cities became overcrowded because of economic and political activities. The first incidence of cholera occurred in England in Sunderland in 1831 when a ship carrying sailors who had the disease, docked at the port. The ship was coming from the Baltic States. As in most British towns, standard of sanitation in Sunderland were low as there was no regulation of housing, water supply or sewage disposal. From Sunderland, the disease made its way northwards into Scotland and southwards toward London. London was the largest city in the world in 1800s, a city overwhelmed by waste products of its ever-growing population. Overcrowded into decaying, stinking slums, the poorest citizens were literally surrounded by their own filth. Piled up in courtyards or overflowing from basement cesspits, into which toilets were drained, raw sewage was everywhere and so was its stench (Brown 2008). In such condition disease was inevitable. Spread via the bacteria-laced diarrhea of its victims, cholera's violent and rapid assault on the human body was terrifying. Although, it killed fewer than other contemporary diseases – such as influenza or tuberculosis – it was cholera that provided deadly backdrop to this era of social and economic upheaval. There was no known cure. In this connection Michael Faraday's letter (Fig. 5) to 'The Times' clearly indicates the filthy condition of the river Thames which might have provided the suitable ground for emergence of a more virulent strain of *V. cholerae* that caused cholera in London and other parts of Britain. He wrote,

“I traversed this day by steam-boat the space between London and Hungerford Bridges between half past one and two o'clock; it was low water, and I think the tide must have been near the turn. The appearance and the smell of the water forced themselves at once on my attention. The whole of the river was an opaque pale brown fluid.....I have no doubt that this would have occurred further up and down the river.

The smell was very bad, and common to the whole of the water; it was the same as that which now comes up from the gully-hole in the streets; the whole river was for the time a real sewer.....The river which flows for so many miles through London ought not to be allowed to become a fermenting sewer”.

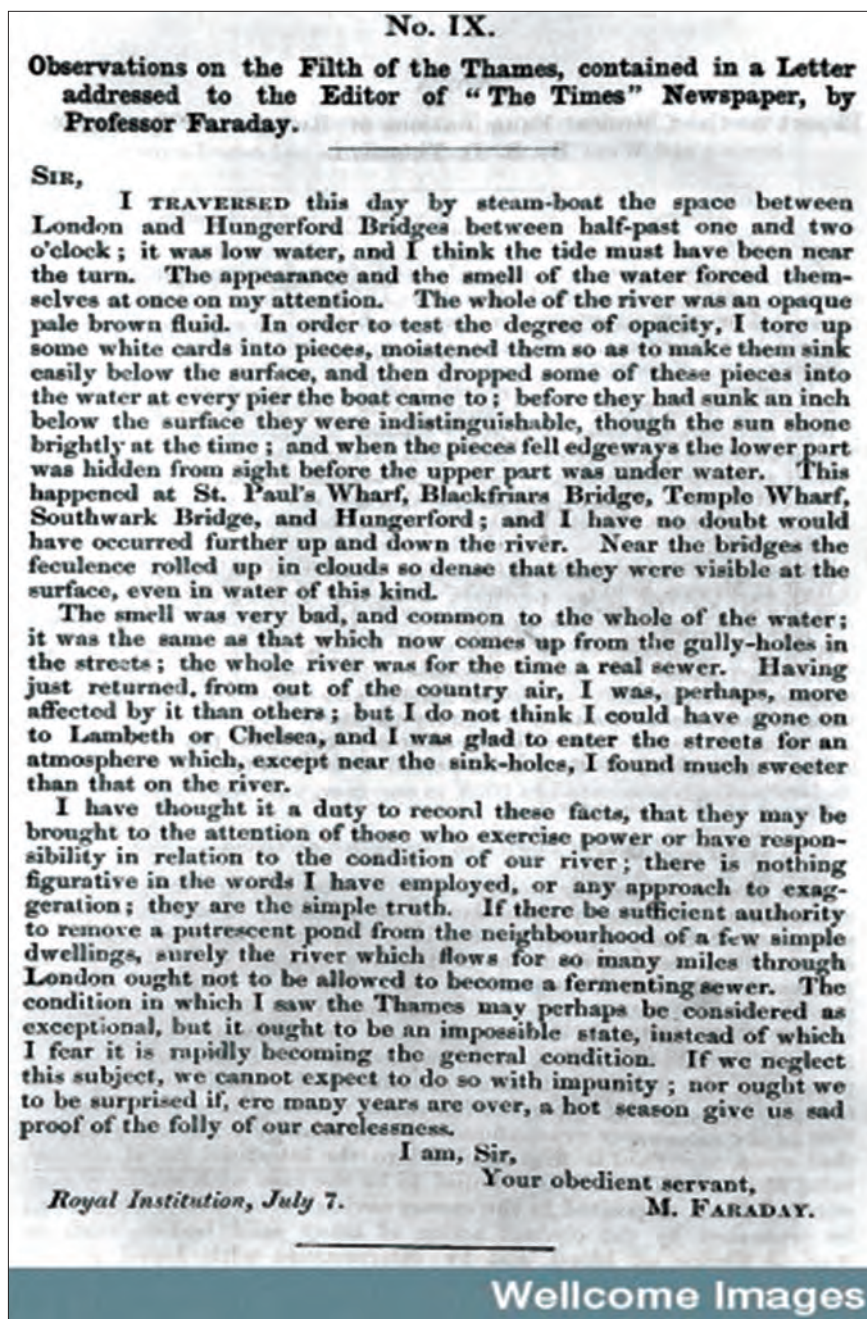


Fig. 5. Observations on the filth of the Thames, from a letter to 'The Times' by Michael Faraday, 1855.

However, when E. H. Hankin did simple microscopic examination of the water of the Ganga and Jamuna rivers he observed a noticeable difference compared to the equally cloudy water of European rivers. He found that water from the Ganga and Jamuna did not contain any trace of organic matter and he proved the bactericidal action of the water of these two rivers. He noticed in his laboratory at Agra that the unboiled water of the Ganga killed the cholera germ in less than three hours<sup>13</sup>. In Liverpool cholera erupted in the spring of 1832 and sparked extensive riots in the city. There were at least eight reported riots occurring in a ten-day period (Gill, Burrell & Brown 2001). However, the mobs were not fearful of contagion or disease, but rather suspected the doctors of exploiting the epidemic in order to acquire bodies for dissection. Riots did not occur during any of the later cholera epidemics in the city. In Britain, the word cholera had been in common use for nonspecific gastroenteritis at least four decades prior to the emergence of this virulent form of cholera. Physicians frequently diagnosed “summer cholera” or “autumnal cholera” when confronting diarrheal illness, as well as “cholera morbus” when symptoms were of more severe forms. At the time of the arrival of cholera, Liverpool was arguably the worst of Britain’s overcrowded and unsanitary cities. Huge number of poor lived in cellar. The sustained influx of the Irish immigrant exacerbated population pressure. Over a half a million of Irish entered Liverpool during the first half of the nineteenth century. Such population pressure, without an adequate supply of clean water and disposal of sewage, led inevitably to the emergence of toxigenic strains of cholera that was not present in Liverpool before. With regard to cholera Liverpool was the hardest hit of English cities - there were 4977 recorded cholera cases, of which 1523 died (a mortality rate of 31 percent) (Burrell & Gill 2005). On 5 May 1832 Liverpool Journal reported that the Liverpool cholera was not a case of ‘*Asiatic cholera*’ and had been confirmed by Dr. Parker who had military experience in India with exposure to cholera and its effects. This report clearly indicates that *V. cholerae* that had caused havoc in Bengal in 1826-1830 was not the same *V. cholerae* strain that erupted in Liverpool. It was McNamara who coined the term ‘*Asiatic cholera*’ as he believed that cholera originated from India and its neighbouring countries. S. N. De objected (De 1961) to the implications of the term ‘*Asiatic cholera*’. Sircar, Mahendra Lal (1904, pp.67-68) did not agree that cholera originated from Asia and objected to the term ‘*Asiatic*

*cholera*'. He made symptoms the yardstick both, as presented in the European medical literature before 1817 and in the Indian Ayurvedic literature, in order to compare with the cholera of the nineteenth century. His survey of cholera in Europe and in India convinced him that "the two diseases though allied, were distinct". The factors of fatality and epidemicity vs. sporadicity were employed by him to distinguish between the disease as it occurred in Europe and India in the nineteenth century. The sanitary and municipal conditions in Calcutta from early times has been given by Sirkar in an article (1917) published in *The Calcutta Medical Journal*. Just as early Victorian Britain was filthy, the unhealthiness of Calcutta was going from bad to worse during the 18<sup>th</sup> and early 19<sup>th</sup> centuries. The congestion and filth were gathering and there was no proper well-organized conservancy system, drainage or water supply in Calcutta. Therefore, it was no wonder that cholera gradually came to assume a serious form — especially as the communication of Bengal and Calcutta with other parts of India and other countries affected by cholera became more frequent. However, from the time of Warren Hastings though some efforts mostly by the Lottery Committee were taken towards sanitary improvements of the town, it was not sufficient or comprehensive. In Calcutta, wrote Sirkar in 1917, 'the city remained crowded and filthy, most of the streets were merely *katcha* lane and the so-called drains filthy ditches'. The Lottery Committee discontinued from 1836 and the town suffered again in consequence. The great scheme of underground drainage was prepared from 1856, received the final sanction of the Lieutenant Governor in 1857 and was experimented upon on a small scale in 1858. The filtered water works were opened to the public in 1869 though up to 1870 river, tank and well water was generally used. The filtered water supply system was experimented on a smaller scale that was finally introduced in 1870 at cost of 65 lakhs of rupees. 11164 premises were connected with water works (Sirkar 1917). The introduction of filtered water supply, the cessation of the practice of throwing night soil into the river, the stoppage of throwing carcasses into it – all these had a beneficial effect against cholera and dysentery. The health of the town was gradually improving under the administration of the Justices and there was yearly decrease in the mortality due to cholera.

It took five years for cholera to reach Europe and we do not know which *V. cholerae* strains had caused the first of the five pandemics. Therefore,



it can be presumed that cholera erupted in Russia either due to the new *V. cholerae* strain that emerged in India during the 1817 epidemic because of the advent of Europeans and carried on by the soldiers returned home and sailors of the ships or some other strain that emerged from the existing *Vibrio cholerae* under the local conditions of the water bodies and population pressure at St. Petersburg. The *vibrios* may not be very resistant to heat but the cholera *vibrios* show a remarkable tolerance for low temperatures, even for those well below the freezing point (Politzer 1959, pp. 116-117). Therefore, the bacteria not only occur in tropical countries but also evolve and survive in temperate and cold regions of the world as well to cause 'true cholera'. It is difficult to prove whether the *V. cholerae* strain that erupted in India during 1817s was responsible for cholera deaths in Europe and America during the pandemics of the 19<sup>th</sup> century. The scientific research on cholera points to the fact that while O1 classical biotype and O1 El Tor biotype were involved in the sixth and seventh pandemics respectively, epidemic of cholera that started in Bangladesh in 1992 replaced *V. cholerae* O1 El Tor by *V. cholerae* O139 "Bengal" biotype<sup>14</sup>. Therefore, it can be presumed that neither O1 nor O139 but some other strain of *V. cholerae* was involved in the cholera pandemics of the 19<sup>th</sup> century that evolved independently from the environmental reserve of non-pathogenic strains under the influence of filth, dirt and waste-products of the over-growing population. Even different serotypes might be involved in the spread of the disease that had now been replaced by other strains. Recent advances in science and technology have established that new strains could arise from genetic recombination and DNA transfer that can elude our present understanding of cholera. Recent study reveals that warm water along the coast, coupled with plankton blooms fostered by El Nino rains help to multiply cholera bacteria in the ocean. It has been found that the zooplankton, *Tigriopus californicus* attract cholera microbes as *Vibrio cholerae* feeds on chitins present in its exoskeleton (Meibom 2004). The feeding breaks down the chitin to its elemental building blocks (Meibom 2005). These elements are absorbed by *Vibrio cholerae* as nutrients and these nutrients cause fundamental changes to DNA of *Vibrio cholerae*. This genetic change converts El Tor O1 strain into the 'Bengal' O139 strain. The change happens with the alteration of less than 100 genes. *Vibrio cholerae* gains genetic diversity by digesting the chitin and it specially primed to infect a human host where it will achieve another round of biomass

amplification. It is to be noted that the algal bloom biomass amplification is not limited to the Ganges Delta; it can occur in any body of water experiencing an algal bloom. Moreover, the algal bloom evolutionary course is not limited to the Ganges Delta either. The biomass amplification that occurs in humans happens anytime the bacteria pass through the human body.

There is little doubt that *Viśucikā* or a cholera-like contagious disease was present in India before the advent of the Europeans. Similarly, the 'common' or 'English' cholera was frequent in Europe during summer. During the reign of Gallienus in AD 262, we find that 5000 citizens of Rome perished daily. Dr. Bascomb had reported (1851) that Cyprian, a bishop of Carthage, a man of erudition in detailing the symptoms of this horrific condition of people affected wrote,

“The symptoms were, a dejection of spirits, exhaustion of strength, incessant involuntary evacuations, violent fever of the bowels, with destruction of sight, hearing and feeling”.

We may here recognize all the terrible symptoms of that devastating disease cholera, which ravaged the four quarters of the globe and continued for a series of years. In 1830s the terms *Asiatic*, *spasmodic*, *malignant*, *contagious* and *blue* were used to describe cholera morbus which was generally thought to be a more serious form of the contagious cholera already well known. Of late, a few persons in the United States of America contracted cholera after eating raw or undercooked shellfish from the Gulf of Mexico. Shellfish eaten raw have been found to be a source of cholera. In Japan during cholera epidemics that occurred in 1822, 1858, 1877 the medical authorities advised people to avoid (Suzuki & Suzuki 2009, pp.184-203) “raw fish, salted fish, tempura, sushi, shellfish (which suffered the heaviest slump), *natto* and *tofu*”. In one of the recent reports published by WHO we found that of the total 1,31,943 cholera cases in the world in the year 2005, about 95% occurred in Africa, about 5% in the Asia excluding Bangladesh and Pakistan, only 10 cases were reported in Europe, 24 cases in Americas and 3 cases in Oceania. Interestingly, per cent death in Africa and Asia were 1.78 and 0.6 respectively, while deaths in Europe and Oceania were 100% and 62.5% in Americas. This explains that the *V. cholerae* strains present in Europe, Oceania and Americas were more virulent than that present in Africa and Asia. With the availability of filtered water, improved sewerage and

sanitation systems, and with the general awareness of good hygiene and oral rehydration process, the cholera outbreaks and cholera deaths in the advanced countries have been overcome. In India all the above measures have been taken to reduce the cholera incidence. The outbreak of cholera in India in recent years has been accidental, arising out of the breakdown of sanitation system due to natural disasters like cyclones, floods, earthquakes, etc, or on rare occasions, the contamination of filtered water in the pipeline with that from the sewerage. However, a great job has been done by the bottled mineral water that has reached the Indian villages too and has almost stopped the incidence of cholera in India. In my opinion, India/Bengal was not responsible for the five pandemics of the 19<sup>th</sup> century and not only India but the whole world is the “Homeland” of cholera. This is an instance of subtle British operational characteristic of denigrating colonial subjects.

#### ACKNOWLEDGEMENT

The author acknowledges the Indian National Science Academy, New Delhi for financial support and the Asiatic Society, Kolkata for academic support to carry out the research work. Thanks are also due to Wellcome Trust for allowing researchers to use photographs from their collection for academic purposes. The author has taken five photographs from Wellcome Images.

#### NOTES AND REFERENCES

1. Horace Hayman Wilson (1786 – 1860), English orientalist. He studied medicine at St. Thomas Hospital. He came to India in 1808 as assistant surgeon of Bengal establishment of the British East India Company. In 1811 he was appointed Secretary to the Asiatic Society of Bengal. He prepared the first Sanskrit-English Dictionary in 1819. He was interested in Ayurveda and traditional Indian medical and surgical practice. His paper “On the native practice in cholera, with remarks” was published in the Transactions of the Medical and Physical Society of Calcutta in 1826, Vol 2, pp 282-292.
2. Notes on Cholera Conference at Weimar, *British Medical Journal*, 1 (1867) 625.
3. Sir James H Annesley (1774-1847), an Irish surgeon. In 1812, he joined the Madras European Regiment and was appointed as Superintendent Surgeon to the advanced division of Army. In 1825, he published “Sketches of the most prevalent diseases of India, comprising a treatise of epidemic cholera of the East”.
4. Longmate, 1966, p.269
5. Robert Koch (1843-1910), German physician. He came to India in 1883 and discovered cholera vibrio at Calcutta with simplest means.

6. Smith, 1869, p.172.
7. Smith, 1869, p.174
8. W.Scott, *Report on the Epidemic cholera as it has appeared in the territories subject to the Presidency of Fort St.George. Drawn up by the order of the Government under the Superintendence of Medical Board*, Madras. Asylum Press, 1824, pp iii.
9. Pandit D. Gopalacharlu (1872-1920). Born at Machilipatnam (now in Andhra Pradesh), she studied at the Maharaja's Ayurveda Oriental School at Mysore. He was instrumental in restoring the lost glory of Ayurveda at a time when western medicine was beginning to gain acceptance.
10. Cristavo da Costa pointed out that Hindus, Brahmins, vanias, all of them never started the day without bathing the whole body. Muslims did this at least every three days while Europeans notoriously would have been much more parsimonious in their ablutions. In 1569, the King of Cochin was ill, but he told Costa that even if it cost him his life he still had to take his bath every morning.(*Tratado das drogas e medicinas dad India Orientaispor Cristavo da Costa*. Edited by Jaime Walter).
11. Chatterjee, 1999, p. 5
12. It has been reported that the average Englishman in India does certainly consume far too much nitrogenous food, that is flesh-forming food and it is in the writer's experience rarest thing to treat any ailment at all without at the same time having to check the excess consumption of this class of food.....To some extent in nearly all our people in India this sort of auto-intoxication is going on.
13. Hankin, 1896, p. 551
14. So far 193 serogroups (groups of microorganisms only differ by their composition in terms of antigens) of *V. cholerae* have been identified among which only two major serogroups O1 and O139 are currently associated with epidemic and endemic cholera. The serogroup O1 has two biotypes, classical and El Tor and two serotypes (a group of closely related microorganisms distinguished by a characteristic set of antigens) Ogawa and Inaba. The causative agent of cholera in the first five pandemics is not known. However, the sixth pandemic (1899-1923) was caused by O1 classical biotype and was responsible for cholera epidemics until 1961, when El Tor biotype displaced it and started the seventh pandemic (1961-1970). It is interesting to note that as early as 1910 the cholera-producing strain O1 El Tor caused sporadic infections and epidemics. The O1 El Tor biotype was found to be different from the O1 classical biotype involved in the sixth and during the initial period of seventh pandemics. However, the characteristic differences between El Tor biotype and the classical biotype are not sufficient to justify their separation as two species.

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