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# Cholera: from uncontrolled pandemics to a controlled but the longest pandemic

## Abstract

In 144 years, cholera was declared a pandemic seven times, the first declaration in 1817 and the seventh in 1961. However the term pandemic became familiar only after corona was declared a pandemic in 2020. It is China for zoonotic pandemics and India for cholera pandemics. Out of the recent four zoonotic pandemics three started in China and out of seven cholera pandemics six originated in India, particularly the Ganges Delta Regions of West Bengal and so India is considered as the 'ground-zero of cholera'. Cholera killed millions of people and ravaged the whole world. During the first pandemic, the death toll was estimated at 0.1 million in Korea and another 0.1 million in Java, 0.21 million in Vietnam and 1-2 million in the British India. The list goes on. This is the condition with all other pandemics. Vibrio cholera, an agent that thrives in polluted water, is the main cause for the spread of cholera. Lack of sanitation, particularly open defecation is the reason for its quick spread. The main symptom of cholera is severe diarrhoea, with expulsion of a large quantity of fluid and watery stool, apart from vomiting and sweating. However, it is an easily curable disease; the fluid outpoured should be immediately replaced by the same quantity of dehydration fluid, a chemical solution. Medical attention is required only if it goes beyond this stage. It is beyond doubt that if every household is provided with 100% safe drinking water and proper sanitation facility, cholera outbreaks can easily be stopped and people of every country can be free from the severity of the most feared disease of the 19th and 20th centuries. It is also necessary to maintain adequate supply of anti-cholera vaccines in every country.

**Keywords:** pandemics, diarrhoeal disease, notorious disease, bilious cholera, pestilential cholera, malignant cholera, Asiatic cholera, water-borne diseases, spasmodic cholera

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## Introduction

Cholera has been declared a pandemic seven times in the 19th and 20th centuries. However the term pandemic became familiar only after COVID-19. Between 1200 BC and 2020, the world has experienced 249 pandemics.[1] It means that declaration of a disease as a pandemic is not new to the globe. A disease is declared a pandemic only if and when its health threat at the global level is very high. As cholera was considered as the worst and the most feared disease and millions of people became victims for it, it was declared a pandemic seven times, the first one in 1817 and the last in 1961. The seventh outbreak of cholera is the longest as it has been threatening the whole universe since 1961 till. As it was in vogue for a long time, the longest among the seven cholera pandemics, it entered the Guinness Book of World Records.[2] Only after declaring a disease as a Public Health Emergency of International Concern (PHEIC), for its containment the medical world requires the cooperation of all countries, international health organizations, and NGOs, a disease is declared a pandemic by the World Health Organization (WHO). On the 30th January 2020, corona or COVID-19 was declared a PHEIC by the WHO and on the 28th of February 2020 COVID-19's global threat level was upgraded to 'very high'. Finally, it was declared a pandemic on the 11th of March 2020. In phase II (2021), COVID-19 infected 700 million and killed seven million people.[3] Though COVID-19 was declared a pandemic in 2020 its infection was almost stopped by the invention of vaccines and other efforts taken by world bodies and international institutions and even the PHEIC declaration was withdrawn in May 2023. However the declaration of cholera as the seventh pandemic still continues.

Cholera is an acute diarrhoeal disease. It is caused by a pathogen called Vibrio cholera, 'V. cholera', a comma shaped bacterium first identified by an Italian scientist Filippo Pacini in 1854.[4] In reality it is an easily curable disease. It is reported that nearly 90% of infections are very mild. However cholera is considered as an acute disease as the incubation period of cholera virus is only 2-3 days. Further, it is noteworthy to indicate that it is difficult to distinguish cholera from other diarrhoeal diseases caused by E. coli.[5] At present cholera is one of the major public health problems at the global level as the number of countries affected by cholera is continuously increasing and the number of cases affected by cholera and deaths related to it are very many. However at present in comparison with cases of the past deaths are less as treatment is easily available and accessible.

## Statement of the problem

Cholera has been in vogue for a very long period. Within 144 years it was declared a pandemic seven times. The last pandemic declared was not yet withdrawn though a long period of 65 is over after the declaration. There are reports of cholera infections and deaths every day in Newspapers and news channels. The WHO is unable to take appropriate steps to control cholera. However everyone knows the adverse impact of diseases and pandemics. Pandemic diseases like corona kill millions of people within a short period. Killing of millions of people including children and youngsters by a disease is a great loss to the world. Cholera has also already killed millions of people, is killing a few thousands every day and will kill a few hundred in the coming days if its spread is not stopped altogether. Cholera is active though a lot of measures have been implemented and medicines have been invented and administered. In this context it is the duty of every elite to find out a solution for the cholera pandemic by explaining to the whole world what a pandemic is, what its health impact is, what its present position at the global level is and how the world

overcome from cholera can. As a researcher it is utmost importance to the author to conduct a research study on cholera pandemics. Hence a review study on cholera 'Cholera: From Uncontrolled Pandemics to a Controlled but the Longest Pandemic' is undertaken to awaken both governments and health authorities.

## Theoretical background

The theoretical framework of a research article relates to the theoretical basis on which the research takes place. It also forms a link between the theoretical aspects and practical components of the study undertaken. Water pollution, which is the major reason for cholera is an environmental problem, Environmental Economics. Environment pollution is considered as market failure, externality or social cost in Environmental Economics. Water pollution is a negative externality. It is a great cost to the society in the form of external costs, requires heavy expenditure to both governments and households. Any improvement in health is a positive movement towards prosperity or a better economic condition. Many diseases such as smallpox and guinea worm diseases have been eradicated not only from India but also many other countries. Eradication of any disease is an upward movement in the ladder of economic development. Healthcare intervention is one of the reasons for the improvement in health conditions of people of any country. However the impact of a disease that lasts for a long period is not good for any country from any point of view. Hence cholera as a long period disease has to be eradicated from the modern society to achieve a great economic growth.

## Cholera: a historical background

There are a few records to find the early history of cholera. Once, even medical professionals did not know how to distinguish cholera from other diarrheal and vomiting diseases.[6] There was utter confusion even in defining cholera. The term cholera itself was a matter of severe contentment. The term cholera is found in the writings of Hippocrates and it was understood that the term has been derived from two Greek words, 'chole' means 'bile' and 'rein' means to flow, the two terms together mean 'flow of bile'.[7-9] In the 17th century, Thomas Sydenham, an English Hippocrates, used the term 'cholera morbus' to indicate the disease and distinguish it from the term cholera, meaning 'the state of anger'. However, in 1622, Alexander Trallianus indicated in his writings that the term is derived from 'cholades', meaning intestine. Again in 1872, Emile Littre, a philologist by profession, 250 years after Alexander Trallianus' findings, categorically explained that the term cholera was derived from the Greek word 'cholera'. The exact meaning of cholera is gutter, gutter of roof, as the cholera fluid flows like water from a spout. It was reaffirmed by him once again in 1878.[10] But Haeser used two words 'cholera nousos', nousos meaning sickness to differentiate the cholera sickness from cholera, the roof.[9]

The term cholera might be derived from the Sanskrit word 'visuchika', which has a literal meaning of "an abnormal bowel movement or merely a disturbance of the stomach and intestine". The term 'visuchika' is used in 'Sushruta Samhita',[11] it may have been written in 500-400 BC. In India, words meaning cholera had also been used in different Indian languages. For example in Bengal terms 'ola utha', 'ola' means descending and 'utha' means vomiting, are used to refer cholera. The Marathi word 'mordeshim' or 'mordezin' and the Urdu word 'heidja' are in usage to indicate cholera-like diseases. An Arabic word used to indicate cholera is 'haida'. To refer to an epidemic, both the Indian word, 'mahamari' and the Arabic word 'wuba' or 'el wuba' are used similarly, both mean epidemic or 'a great killer'. The term 'fok lun', meaning something wrong inside the human body, expressed by vomiting and purging is used in China even 2000 years ago. At present, the term 'huo luon' is used in China to indicate cholera.[12] There are so many sources to collect details about cholera after the first cholera pandemic, i.e., after 1817. But there are very rare sources about cholera before 1817; though there are reports of cholera-like diseases, expelling of fluid and vomiting, in Asia, including India and China. Before the settlement of the Portuguese and their writings in the early 16th century, the only evidence for the presence of cholera in India is Sushruta Samhita'.[11] Hence it is easy to conclude that there were diseases or sicknesses like cholera even before 1817.

## Cholera before the 1817 Pandemic

Cholera pandemics are only a matter of recent origin, a matter of the 19th century. Identifying the origin of cholera is not feasible. However there are a few records that indicate that there were cholera-like diseases in different parts of the world even 2500 years ago and in the first and in the 7th centuries in China. In the 5th century CE, Sanskrit scriptures report that there was a spread of cholera-like disease and the disease was also carried out to other areas in other countries beyond their boundaries by ship travellers. Hippocrates and Galen have also reported in their writings about the cholera-like disease or disease that has similarities with cholera and European authors considered the disease as one of the gravest epidemic diseases.[4] Once it was known as a mild disease like other diseases that prevailed at that time. But after dangerous outbreaks it was treated as a notorious disease. Due to the aggravated form of its spread and the lengthened duration of the disease and its frequency both governments and health authorities have given attention to it. The disease is known in Greece and Rome as an ordinary disease of 'bilious cholera'. After the occurrence of severe kinds it was called 'spasmodic cholera'. After few years the disease became epidemic and devastated some areas in some countries.[13]

In India, the delta of the Ganges River was an epidemic spot at the global level and cholera's place of origin is India. Very often the Hindu pilgrimages and festivities were exposed to cholera as there were large crowds and there is significant correlation between holydays and occurrence of cholera. In Bengal, the Goddess of cholera called 'Oola Beebee' was worshipped by Bengal people and there was a temple dedicated to her in Calcutta up to the end of the 19th century.[4] Proper recording of details about the occurrence of cholera took place in India only after the arrival of the Portuguese in 1498. The disease was properly documented only by Europeans. For example Gasper Correa wrote about the disease in his book 'Legendry India' 1543, that a type of disease that causing cramps and vomiting killed a large number of people in a single day. In 1503, 20,000 men in the army of the Sovereign Calcutta were affected suddenly with very strong pain in their belly and hundreds of them died just in eight hours. In 1563, another report written by a Portuguese doctor who served in Goa, named Garcia da Orta, pointed out that there was a cholera-like disease in India.[4]

Further in 1586, a French observer indicated that once again there was a firing up of the disease in Goa, India. After that in 1629, a physician of the Dutch East India Company reported that the General Governor died due to cholera in Indonesia. Once again there was a severe attack in Goa in 1683. During the English and French colonial presence India saw a number of cholera epidemics. There were reports of cholera-like conditions in India around 1760 and from 1768 to 1771. It spread to Burma in 1770. In total about 60,000 people lost their lives because of cholera. In 1781-82 cholera appeared in Calcutta and in 1782-83 it spread to Hardwar, a holy city in Uttar Pradesh and killed 20,000 people within eight days. There are also reports of cholera in 1787 and 1796. In addition to these reports there

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are 64 references of the occurrence of major cholera outbreaks in India between 1503 and 1817.[4] Disappearance and resurgence were very common; the violent epidemics of 1669 and 1680 in England and of 1695 in India are typical examples of the serious outbreaks of the disease. The type of cholera that spread in India was 'spasmodic', and it affected various parts of the country, but local and temporary, cholera outbreaks of 1762, 1780, 1781 and 1783 are confined to India only.[13]

## Cholera pandemics, cholera after 1817

There is wide difference among authors and other sources like Wikipedia in indicating the periods of different pandemics. Even in the first pandemic, there is a controversy in stating both the starting year and the end year. The starting year was 1816 according to Diaz and 1817 to all others. The end year is 1825 to Diaz and 1826 to Hibberts and Hilary and 1824 to others. As there is wide difference in indicating the period of different pandemics, a table is given having the different periods of different authors. However there is no controversy in indicating the starting year of the seventh pandemic, 1961.

## Uncontrolled Pandemic (1817-1961)

From Table 1 it is easy to infer that the world has been affected by seven cholera pandemics in the last 208 years, between 1817 and 2025. Before India got its independence in 1947 the riverine villages in the Sundarbans covering the vast delta of both India and Bangladesh were the 'ground-zero of cholera'. In India, cholera has been known for a long period. The first declaration of cholera as a pandemic was due to the outbreak of it in Jessore, a part of the present day Bangladesh; Jessore is just 250 km away from the Sundarbans of West Bengal, India[2]. Before the declaration of cholera as a pandemic, it was a local problem though it was endemic in parts of Asia and the Indian Ocean. It was not endemic in Greece and Rome where people suffered a lot from cholera.[4] For the first time only in 1816, cholera spread in an unprecedented speed and it spread across the whole of India and then from India to various other countries including Japan and the Philippines in the East and Russia and Iran in the West.[5] And so it was declared as a pandemic in 1817. The latter pandemics, except the seventh, reached Europe and the greater part of the Americas and the remaining world only from India. Millions of people died in various parts of the world because of cholera.

**Table 1** Periods of different cholera pandemics given by different authors

| Pandemic | Diaz | Hibberts & Hilary | Krishnamuthy et al | Wikipedia |
|---|---|---|---|---|
| 1st | 1816- 1825 | 1817-1826 | 1817-1824 | 1817-1824 |
| 2nd | 1826-1838 | 1829-1837 | 1826-1849 | 1826-1837 |
| 3rd | 1845-1859 | 1846-1862 | 1852-1860 | 1852-1860 |
| 4th | 1862-1879 | 1864-1875 | 1863-1875 | 1863-1875 |
| 5th | 1881-1896 | 1883-1896 | 1881-1896 | 1881-1896 |
| 6th | 1899-1947 | 1899-1960 | 1899-1925 | 1899-1923 |
| 7th | 1961-till date | 1961- till date | 1961-till date | 1961-till date |

The entire history of cholera and the periods of different cholera pandemics, similarities of years among different authors are taken as maximum as possible, and drug development are portrayed in the following chart.

500-400BC:- First known documented cases of cholera-like disesaes.

-1000 BC:- Prescription of the first known oral dehydration therapy.

1817:- Starting of the first cholera pandemic.

1826:- Starting of the second cholera pandemic

1852:- Starting of the third cholera pandemic.

1854:- Snow linked polluted water and cholera and Pacini's isolation of V. cholera.

1863:- Starting of the fourth cholera pandemic.

1881:- Starting of the fifth cholera pandemic.

1884:- Koch's inference that 01 strain is the causative agent of cholera

1899:- Starting of the sixth cholera pandemic.

1905:- Gotschlich's isolaltion of EL Tor strain of V. cholera from others.

1961:-Starting of the seventh cholera pandemic caused the EL Tor strain of 01 serogroup.

1992:-Identification of 0139 serogroup of V. cholera.

2000-2010:- 130% jump of cholera cases.

2011:- WHO recognized cholera as a global public health problem.

2015:- Cease in infections caused by 0139 serogroup

2023:- WHO's declaration of cholera as grade 3 emergency.

**Source:** Cholera. The Prokaryotes 2013 in Krishnamurthy et al., Down to Earth, 2024. Hibberts and Hilary, Cholera Case Study, 2003 & WHO 2023.

## The first pandemic (1817 – 1824)

Before the pandemic that started in 1961, the world had seen six cholera pandemics. It means that in about 144 years, the world was affected by V. cholera-causing six pandemics. The first pandemic started in 1816 in India and reached epidemic proportion in Bengal and petered out in 1824 after attacking various countries of the world. In this pandemic, people mainly in parts of Asia and the Indian Ocean were affected very seriously. Colonialism brought both England and France in close contact with South Asia where cholera was wide spread and so the people of these countries were also affected by cholera.[4] Actually this cholera was the 'pestilential' or 'malignant' cholera. It spread with high speed from place to place and with high fatal effect, the death rate was very high, particularly in areas with thick population and areas which were filthy and low-lying. It spread in all directions, east, west, north and south and at a speed of about 60 miles a month.[2] It very quickly spread to other parts of Asia including China and Indonesia and the region of the Caspian Sea.[14] The consequence of cholera in India is the death of 10,000 people within a few months. After that, it spread among English soldiers stationed at Fort William in Calcutta. The consequence of this is the death of 5,000 soldiers within a few weeks, and in a few months another 4,000 died of cholera. Both navigation and commercial activities favour the spread of cholera. Between 1822 and 1824, it spread to different countries. The countries affected by the first pandemic are: the Philippines, China, Chinese Tartary, Mongolia, Tibet and Iran. The number of people who lost their lives due the first cholera pandemic was 0.1 million in Korea and 0.1 million in Java.[4] In Iraq 18,000 people died within a month and in Vietnam 0.21 million people died because of cholera in 1821. Between 1821 and 1823, Iran lost 0.1 million people to this deadly disease. The total loss of people was estimated at 1-2 million in British India, and in Bangkok 30,000 people died of cholera,[15] the list of countries affected by cholera continues.

## The second pandemic (1826-1837)

The second pandemic also originated from India, particularly in Bengal and then spread to other countries in Asia and so it is called the 'Asiatic cholera pandemic'. There were diverse outbreaks in the Ganges delta in 1826. Cholera spread to Lahore, Kabul and Balkh in Afghanistan and from there it entered into Russia in 1827. Then

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it spread to various countries, entered into Europe, the Great Britain and the Americas after reaching the Western Asia; in 1829, cholera reached North Africa. In North America and Europe, it infected thousands of people in major cities where people thronged for getting jobs due to the job boom created by Industrialization. In the newly developed cities, there was a huge crowd of population but with poor sanitation and lack of potable drinking water. It also spread to Riga, St. Petersburg and the central parts of Russia and followed the Russian army, which was camped in Poland and attacked the army people. After spreading through Austria and Germany in September 1831, it entered into Hamburg, Smyrna and Istanbul. It was transported by a caravan from Mecca, where 10,400 persons (all were Muslims) died within a short period, to Cairo. It also spread to England in the same period and in the following months it spread to some other areas and appeared in London in February 1832, it was followed by Scotland and Ireland.[13]

The death toll due to the second cholera pandemic is not available at the global level. However, it is estimated that the total number of deaths in Russia alone is 0.1 million during 1826 - 1837 and in Egypt it was estimated at 30,000 and in Paris 20,000 in 1831 alone.[14] The death toll is 0.1 million in Hungary, where cholera entered in 1831. Then it spread to Germany, Finland, Sweden, England, Wales and Scotland. In Ireland the disease caused 25,000 deaths. It entered into France, Spain and Italy and ravaged in 1832 and in subsequent years. In England it reappeared in 1834 and the ravage continued up to 1837.[13] In Spain the death toll was 0.1 million. Between 1834 and 1837 it killed 0.24 million in France and the surrounding areas of Italy. It also spread across China, Malaysia, Singapore and the island of Malta. In the United States of America, it killed 0.15 million people and there, the pandemic lasted for 17 years, from 1832 to 1849. People become victims of cholera in many countries including Havana, Portugal, Spain, Cuba, Iraq, Syria, Palestine and Cairo were affected by cholera during this period.[4,13] Though pandemic declaration was annulled in 1837, cholera disappeared in Europe in 1838, but it reappeared in Burma in 1842 and spread to India and affected the various Indian provinces up to 1846. Then, in 1847, it entered into Iran and Russia and some other countries. In England the death toll due to cholera between 1838 and 1842 was very huge.[15]

## The third pandemic (1852-1860)

The period between 1852 and 1860 is the period of the third pandemic. This pandemic also originated in India. In 1845, cholera appeared again in Bengal. It spread to Arabia in the next year. At the end of 1846, it entered into Iraq and Mecca, then to the coast of the Black Sea and from there to Turkey, then to Norway, Finland, Germany and some countries in Central Europe. Between 1846 and 1860 the reported number of deaths was more than one million, a significant portion of it was from Russia. In England and in Wales, the death was more than 52,000 and in London alone more than 10,000 people lost their lives and 23,000 people died because of cholera in the entire area of Great Britain and in Mecca alone 15,000 people died in 1846. After hitting England it spread to Holland, Belgium and Ireland. A ship from Hamburg, where there were 5,400 victims, brought the disease to England, where 62,000 people died between 1848 and 1849. Further, in 1849, it attacked Austria, Switzerland and France and there were 0.11 million victims. Then in 1852 it invaded the southern side of Germany. In 1852, it was declared a pandemic. In between 1854 and 1855 it seriously hit France and Italy. In Italy the death toll was 0.25 million and in France it was 0.15 million. Due to the Crimean war it spread to Naples and other places. The movement of English, France and Italy troops to the Black Sea became the reason for the spread of cholera to Bulgaria, Greece and Turkey. In 1855 it entered into Spain and killed 0.24 million. From there it entered into Morocco and Algeria. In 1848, it spread to the port cities of the United States and slowly spread to other areas like Mexico. In Mexico alone the total number of people who died was 0.2 million. Then it spread to Venezuela and Brazil. From Bengal it also entered into Singapore and then it reached China, Japan, the Philippines, Korea, Egypt, Sudan, Eritrea, Zanzibar, Mozambique and Madagascar. The most affected was Egypt, where cholera ravaged the whole nation in between 1853 and 1858.[4,14] After the Indian mutiny of 1857, a huge number of British troops in India were killed by cholera[5]. The list of countries included is only the iceberg of the problem.

## The fourth pandemic (1863-1875)

This time also cholera started from the Ganges delta of Bengal, India. Then it travelled to Mecca with Muslim pilgrims and killed 30,000 to 90,000 Mecca pilgrims. As Mecca pilgrims were from throughout the world they took the disease throughout the world. After entering into the Middle East it spread to Russia, Europe, Africa and North America. Then in 1865 it reached Northern Africa and from there it entered into sub-Saharan Africa. In Russia it killed 90,000 in 1866. In the same year in the Austrian empire 0.17 million people lost their lives. In Italy the loss of life was 0.11 million, in Algeria it was 80,000 and in North America it was 50,000.[14] In 1867, more than 0.1 million persons died due the spread of cholera in a religious fair held in Hardwar, Uttar Pradesh,[5] with 20,000 pilgrims in just eight days. In Zanzibar alone it killed 70,000 people in 1869-70. Apart from these there are many more countries where cholera ravaged the people without any pity. In the fourth pandemic period, the attack of the disease was very terrible in West Africa. But there is lack of documentary evidence to prove it. But there are documents reporting the attack of the disease in East Africa, Zanzibar and the Indian Ocean, eye-witness account was given in 1876 by James Christie, the physician in Zanzibar.[4]

## The fifth pandemic (1881-1896)

The period of the fifth pandemic is from 1881 to 1896. The origin of this pandemic is also India, specifically the Ganges Delta Regions of West Bengal. From there it entered into different parts of Asia, Europe and South America. In this cholera infection, the most affected was Europe, where cholera spread from Russia. The total number of deaths was nearing 0.3 million in Russia, 0.12 million in Spain, 90,000 in Japan, a little bit more than 60,000 in Iran and 58,000 in Egypt. The death toll in Europe alone was 0.25 million between 1883 and 1887 and in the Americas nearly 50,000. There were 0.12 million deaths in Germany and 30,000 in Belgium in 1887, 0.12 million in Spain, 90,000 in Japan, more than 60,000 in Iran and more than 58,000 in Egypt in between 1883-1887,[14] the list not ended here.

## The sixth pandemic (1899-1923)

The sixth outbreak of cholera started in 1899 and continued up to 1923. This time also cholera started from India, at the Hardwar Kumbh Mela. Then it entered into the Middle East, Eastern Europe and North Africa. In India alone, it killed 0.80 million. This spread was due to the classical strain 01. Due to the publication of a report by Chadwick in 1942, regarding poverty as the cause of cholera but not vice versa, concentration was given to improve the living conditions of the poor;[5] due to the improvement in sanitation in Europe, there was a slowdown in the spread of cholera in Europe. But there were ravages in other countries. There were more than 0.5 million victims in Russian cities in between 1900 and 1923. During this period there was

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a strong socio-economic disturbance due to the Russian Revolution and warfare. It is also reported that cholera outbreaks took place 27 times during the Hajj at Mecca between the 19th century and 1930. It killed 0.8 million in India and 0.2 million in the Philippines between 1902 and 1904. In 1947, Egypt was very seriously affected by cholera. The last cholera outbreak took place in the US between 1910 and 1911.[14] Cholera took place in many other countries and made havocs. It is very clear that for classic cholera there was no effective treatment. Hence the case fatality rate (CFR) was about 50%, varying from 50% to 60% at the beginning and then it decreased to 25% to 30%, with mortality of more than 100 per 1,000 people, 10% was a very common rate during these periods of the six cholera pandemics. In 1876, it was between 36% and 40%, and affected 3% to 5% of the population. Hence cholera was considered as the most feared disease of the 19th century. Then it slowly decreased[4] and reached just 2.9% in Africa and the global average CFR was 1.9% in 2023. However the acceptable rate is only 1%.[16] It means that before 1961 cholera was uncontrolled with no medical intervention and so the death toll was very high.

## The seventh pandemic (Controlled pandemic) (1961-till date)

All the six cholera pandemics affected the people of this universe within a short time span, between 1817 and 1899, and resulted in the declaration of six pandemics within 72 years. Though there were some disturbances here and there between 1923 and 1961, the present pandemic re-emerged after a long period and was declared a pandemic only in 1961, after 62 years. Since 1961 it has been threatening the whole world. This time cholera originated not from India but from Indonesia and the agent causing cholera is also not the same V. cholera but another strain called EL Tor. It was named after it was found among patients who were taking treatment in a secluded area, a place for quarantine, named EL Tor. The strain is from the same group, O1 but had a different serotype either from Inaba or from Ogawa. It made a relentless spread throughout the world within a short period. In 1963 the people of Bangladesh experienced its infection. In 1964 it entered into India. In the following years it spread to Russia, Iran and Iraq. In 1970 it reached Africa and slowly to other countries. In 1991, it spread to Lima's port city through the contaminated bilge water released from a Chinese ship. From there it spread rapidly to other countries, affected 16 South American countries and by 2000 V. cholera O139 infection was reported from 11 countries in Southeast Asia alone.[5] Simply saying during the seventh cholera pandemic it spread across Asia, Africa, Europe and the Americas.[14] A large increase in cholera cases was reported in the 1990s not only from Asia and Africa but also from the Americas. Due to a large jump in the sanitation facility the infection of cholera decreased much in developed countries. However it seriously hit Africa. In 1995, there were 0.21 million cholera cases globally and out of this, 72,000 cases were from Africa, amounting to 34% of the total. In April 1997 alone 90,000 Rwanda refugees in the Democratic Republic of Congo, were affected by cholera. In 1998, out of a global total of 0.29 million cases a total of 0.21 million cases were from Africa, amounting more than 72% of the total and in the Americas the number was only 57,000. In Zimbabwe, in April 2009 there were 96,000 cases and 4,200 deaths.[16]

The 7th pandemic became the cause for 0.4 million deaths in South American countries and nearly 5,000 deaths in Bangladesh and India between 1992 and 1993.[5] By April 2009, there were 96,000 cases and 4,200 deaths in Zimbabwe alone and in 2010-11, Haiti experienced the infection of cholera, causing 0.47 million cases and 6,631 deaths.[17] According to the WHO, there was less number of cases in the 1990s. There was a lull in the spread of cholera in the 1990s, but it was followed by a sharp rise after 2017. In Nigeria, which has a strong positive history regarding cholera infection, by the end of 2021 there were 90,000 cases and there were 3,000 deaths and among the deaths, children ageing 5-14 were the majority.[18,19] Further, the WHO report 2022 indicates that Yemen accounted for 84% of all cholera cases at the global level in 2017; it increased to 93% in 2019.[20] In Nigeria as of May 2024, the reported cholera cases were 44,044 and cholera-related deaths were 571 since August 2022 (CFR is only 1.3%).[21] There was a sharp rise in deaths in 2023 in comparison with 2022. The total number of cholera cases was 535,321 and the number of deaths was 4,007 from 45 countries. It means that there was 13% increase in the number of infected cases and 71% increase in the number of deaths in 2023. The number of countries infected increased from 13 in 2021 to 45 in 2023. It is further indicated that out of the total infected persons 38% were children of less than five years old. There is also a shift in the area of infection. Once, the global burden of the disease was very heavy in the Middle East. It was very high in Africa, where the rise was 125% in 2023.[22] Areas that are the most suitable for the spread of cholera are: 'coastal Peru and Ecuador in south America, Canberra in Australia, the Bay of Biscay and the North Sea in Europe, the Gulf of California, the Yellow sea, the Gulf of Oman, coastal Mauritania, Sengal, Western Sahara, large areas in South western Africa and along the coast of Kenya, Maldives, Bangladesh, Thailand, Vietnam and Cambodia.[2]

At the global level, the estimated number of cases is 2.9 million and death is 95,000 per annum. The estimated annual number of deaths is the maximum in India with 20,256 and it is followed by Ethiopia with 10,458 deaths and by Nigeria with 8,375 and in the Democratic Republic of the Congo it is 7,184. In all other countries, the number of deaths is less than 5,000, most of the countries around 1,000. The CFR in India is only 3% and in other 41 countries it is higher than that, 3.80%, particularly among the African countries.[23] As per an earlier report by a group of researchers, it was only 2.8 million cases and 91,000 deaths per annum.[24] But WHO in its fact sheets indicated that the number of cases ranges between 1.3 and 4.0 million and deaths between 21,000 and 140,000 every year across the globe.[21] It is reported by a daily newspaper on the 1st of June 2025 that in a week time 172 persons died due to cholera infection in Sudan, an African country. It is also warned by the WHO that it would affect one million people if no stringent measure is taken to control it.[24] In the second week of August 2025, in Sudan at least 40 persons died because of cholera infection and there were 0.1 million suspected cases. The main reasons are lack of safe drinking water, war and war-related displacement.[25] Among the different world regions the most affected region is the African region. It is followed by the Mediterranean region and South-East Asian regions. In May 2025 alone there were 52,589 new cases across 17 countries, showing a 35% increase. As far as death is concerned there are only 552 deaths; a 4% decrease from the previous month. In total, in the first five months of 2025, the accumulated number of cases was 0.21 million and of deaths 2,754 (CFR is only 1.35%) across 26 countries,[26] CFR is only 1.8% in African countries in 2024.[27] It all means that the pandemic has been in existence for a very long period since 1961, and millions have been affected by cholera except in a very few nations. However the number of deaths is very low and the CFR is also low in comparison with the uncontrolled six cholera pandemics.

## Causes, symptoms and treatments of cholera

Causes: Many reasons are reported as the causes of cholera. However polluted water is the main reason for cholera. This water-borne disease is caused by an agent that thrives in polluted water. It

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was reported by Snow in 1849,[28] 177 years ago; that a water-borne agent that entered the gut might be the cause of cholera. The agent that entered by the mouth multiplied in the gut. After multiplication it expelled from the stomach via the highly watery faeces. In 1854, he confirmed it and stated that the cholera that spread in nearby areas in Broad Street, London is due to contaminated water taken from a pump. There was controversy regarding this finding. Only after the work of Koch and the development of microbiology it was confirmed that a comma-shaped bacterium, called 'Vibrio' was the cause of cholera and it was isolated again in 1884 and proved that dirty water is the cause of cholera.[4,5] Due to lack of safe drinking water and sanitation facilities cholera appeared and re-appeared many times in Nigeria. In Ethiopia, cholera outbreak is considered as a health crisis. Ethiopia is the worst nation in terms of the provision of drinking water, only 69% of total households in the country have access to safe drinking water, 31% depends on unsafe sources for drinking water.[12]

Polluted water becomes the reason for not only cholera but also for many water-related diseases. Water for household purposes, especially for drinking and cooking purposes should be free from pollutants. When there are pathogens in water, they may cause cholera and other diseases. Water becomes the cause for diseases when it is polluted or has unhygienic organisms like worms and bacteria and excess chemicals such as fluoride, arsenic, phosphates and nitrates. Non-availability of enough quantity of safe water and the presence of vectors and insects that thrive in polluted water also cause diseases. Thus water-related diseases can be broadly classified into four. They are: water-borne diseases (diseases caused by contaminated or polluted water), water-based or parasitic diseases (diseases caused by aquatic organisms which thrive in water), water-related vector diseases (diseases caused by insects that live in or near water sources) and water-scarce or filth-borne diseases (diseases caused by water scarcity).[29,30] Safe drinking water is an important indicator of development. But out of the world population of eight billion nearly two billion is deprived of it. A portion of those who lack potable drinking water collect water from streams and lakes and become victims of water-related diseases such cholera or dysentery, polio, hepatitis. It is also a reason for malnutrition, which becomes the cause for nearly 50% of childhood deaths. In total, lack of safe drinking water is the cause for nearly 0.8 million deaths at the global level. In some water stress countries more than 5% of all deaths are caused by unsafe water.[31] Simply speaking, water gives 'jeevan' (life) to humans. But the same water takes away humans' 'jeevan' when the water supplied is not safe or when water supplied is not adequate, by causing water-related diseases including cholera.

Rise in temperature is also another important reason for the outbreak of cholera in many countries. For every rise in temperature by one degree Celsius there is a huge rise in cholera cases.[2] Cholera spreads when safe water is not available in adequate quantity. When safe water is not available, people go for unprotected water sources to fulfill their water requirements. The bacterium may also be present in contaminated food, which may be contaminated by faecal matter from an infected person or from free-standing bacteria existing in plankton or seafood living in infected brackish water.[4]

It is also believed that the most important reason for cholera is high density of population and its related lack of sanitation and drinking water facilities. Due to high density of population, sanitation becomes very poor and there is lack potable drinking water. Congested population makes the disease's spread easy and so it very quickly affects the whole area and sometimes it travels to nearby areas very quickly.[6] For example in a densely populated neighborhood in Mozambique, cholera has been a part of life for the last 12 years, almost after every rainy season because of waterlogging and open-pit latrines resulting in mixing of excreta and drinking water.[22] Open defecation leads to the speedy spread of cholera in congested areas. V. cholera from the stools of an infected person can easily mix with drinking water in many areas, particularly in rural areas of emerging economies like India, where open defecation is a major cause for the spread of cholera.[32] The worst sufferers are the poor as they live in congested areas.

It is also indicated that the main reasons for cholera outbreaks are 'conflict, climate change, socio-economic disturbance including population displacement due to conflicts and disasters, inadequate supply of safe drinking water and lack of sanitation facility, poverty and underdevelopment. There were millions of cholera victims in Russian cities between 1900 and 1923 due to the Russian Revolution and warfare related socio-economic disturbance.[14] In Sudan also the main reasons for cholera outbreaks are war and war-related displacement.[26]

Symptoms: Cholera begins with diarrhoea; watery diarrhoea is the main symptom of cholera. The result of the infection of cholera is massive outpouring of fluid from the stomach of the affected person.[33] If this condition continues without any medical interference, it results in collapse, "extreme depression, painful cramps, coldness of the breath, tongue, and skin, and blueness or lividity of the surfaces; violent discharge of watery matter from the stomach and bowels; a thick viscid condition of the blood, from this copious separation of its serum; impeded circulation, the blood remaining black; intense congestion of the alimentary viscera, and rapid sinking of the powers of life. If the patient survive, Reaction supervenes, which when moderate, tends to recovery, when excessive, to fever, with suppressed secretions and inflammatory complications".[15] As the stool is like "the cloudy water left behind after rice has been cooked, the stool is called rice-water stool". It is flecked with mucus and has a fleshy smell. In an infection, 10-15 litres of rice-water stool may be produced and expelled apart from vomiting and sweating. The ultimate result is dehydration and a huge quantity of important electrolytes is lost and so the final result in many cases is death. The important electrolytes lost are: $K^+$ and $HCO_3$ ions. $K^+$ ions are necessary for proper functioning of abdominal muscles and so the loss of them due to cholera results in cramps in the abdominal muscles and the loss of $HCO_3$ ions results in the imbalance of the pH value of the body. Finally, the person affected by cholera may be experience a stop in urine production, wrinkled skin and sometimes sunken eyes. It may cause a drop in blood pressure and circulatory shock. If treatment is not given immediately, the patient becomes weaker and weaker and finally death occurs usually within a day from the appearance of cholera symptom. If the patient survives, then the patient will recover within five days.[5]

Treatment: Once cholera was considered as the act God and so people thought that there was no medicine or treatment for the disease. Cholera devastated the entire area/habitat where it spread; more than 50% of cholera affected persons died as there was no medicine to control it. During the early years of 1900s an intravenous hydration therapy was used by Rogers and this hypertonic intravenous solution reduced the death rate. Even then cholera was an uncontrolled disease, causing a number of deaths as the therapy was not available in all places in all countries. During the early 1960s, a few successful drugs and modes of treatments were developed. The Watten cot' treatment, which is used in cholera treatment centres functioning throughout the world was developed by Watten to measure the quantity of fluid outpoured from the victim's stomach and the same volume of dehydration fluids (a chemical composition) is given to the patient. The important matter found out by Watten is the way to measure the

exact volume of fluid expelled from the cholera victim's stomach. For that, he used a cot with a hole at the middle onto which the cholera victim is placed. A plastic sheet funnelled the fluid into a bucket under the cot through the hole and the exact quantity of watery stool is measured and replacement is taken immediately after every pouring by dehydration chemicals. This method is the standard care and is used throughout the world to treat the victims of cholera.[28]

Oral dehydration therapy was first used officially for treating cholera patients in the early 1970s. During the 1980s, this therapy was widely available and in 80-90% of cases simple dehydration is enough and intravenous fluids are required if patients become serious. Antibiotics are used to stop/limit the flow of the virus along the faeces and to reduce the duration and volume of diarrhoea.[5] At present, cholera vaccines are also available to control the spread of cholera.[2] Hence at present, cholera is not an uncontrolled but a controlled pandemic. Though the fatality rate is very low, the rates of fatality differ from country to country and continent to continent; it is on an average of 1% in Asia, Europe and the Americas, even in the African region it is only 1.8% in 2024[21] and as on 17th June 2025, the CFR is just 1.3% at the global level.[26]

## India and cholera

It is China for Zoonotic pandemics and India for cholera pandemics. Recently five pandemics apart from cholera pandemics occurred and of these, the first four were zoonotic pandemics, diseases caused by infections spread from animals/birds to humans, and the fifth one is the Corona pandemic. The four zoonotic pandemics are: Spanish flu (1918), Asian flu (1957-58), Hong Kong flu (1968-70) and Swine flu (2009-10). Of these, the first three originated in China.[34] The Corona pandemic also started in China. However of the seven cholera pandemics six had started from India. Hence it is very easy to conclude that India is the origin for cholera and cholera is a notifiable disease in India. In India, water is plenty but, safe water is very scarce; lack of safe drinking water and rise in temperature are the two main reasons for the occurrence of cholera in many Indian provinces. Some areas are affected by cholera immediately after rainy seasons due to polluted drinking water, some others during summer due to the paucity of safe drinking water and in some areas it occurs in both the seasons. In India, most of the places are single peak areas including Delhi, Hyderabad, Odisha and Chandigarh having cholera cases only during the rainy season. But in West Bengal, areas like Kolkata there are two peaks, the first one in summer (summer peak) and the second one during rainfall (monsoon peak or flood water peak). Cyclones also create favourable conditions for the spread cholera. For example in West Bengal after the cyclonic storm Aila on the 25th May 2009, diarrhea cases increased manifold. The main reasons for the rise are damages caused to piped water supply system and water logging. In West Bengal, most of the tube wells available in Basanti block are highly polluted and water contains the cholera-causing virus. It is also reported that even bottled water in these areas has this virus. In the state, the entire Sundarbans delta region is considered as the 'homeland' of cholera.[2]

The above discussed causes of water-related diseases are upheld by the study conducted by the author in Kanniyakumari district, the most advanced district in terms of both education (literacy rate is 91.75%, the highest literacy rate in the state of Tamil Nadu) and per capita income ($940, the highest per capita income in the state).[35] Even then in the district the water supplied by local governments has a strong chlorination smell or turbid or bitter taste and the groundwater available is unpalatable and brackish. According to the test reports, samples collected by the author, there were 50 coli cells in every 100 ml of drinking water supplied by the local governments in the rural areas of the district. Coli cells' presence in surface sources ranges between 200 and 2,425. In the test report, it is also found that in the district, the groundwater available is also not safe, with high pH value, electrical conductivity and ionic concentration. Hence water-related diseases affect the people of the district here and there though there is a decreasing tendency in their occurrence according to the data collected from the Office of the Deputy Director of Health Services, Kanniyakumari District, diarrhoea by -0.175 and dysentery by -0.03, both values are significant at 1% level of significance[36]. However there is no cholera case in the district. The primary data related to water-related diseases collected from 240 households by the author also support the above discussed facts.

The factors mentioned above are responsible for the spread of cholera in India. However at present the spread is not very severe as it was in the 19th century or in the first three quarters of the 20th century. In the sixth cholera pandemic, the total number of deaths in India was 0.80 million. There is no data for the total number of persons infected by cholera and in 1961 the total number of cases was only 47,637 but deaths were 26,946, with a CFR of 56.57%, an extraordinary high death rate. But in 1995, the prevalence rate decreased to just 10% and in 2015, the CFR was only 3% and in 2024 it is just 0.50%, with 10,615 cases and with only 52 deaths.[37,38]

## A brief discussion

It is absolutely clear that the world has seen seven cholera pandemics; the seventh one is the longest one, in vogue for the past 65 years. Every time, cholera kills millions of people. Losing millions of people particularly productive people within a short span of time is a great loss to the concerned country. Its economic loss is very much for individual households and individual countries. In the past every pandemic ravaged the whole nation as its CFR was almost 50%. The most affected are the least developed and emerging economies like India, Bangladesh and African countries like Sudan. Though India is the hot spot of cholera at present the CFR is very low in India. Cholera infects people when they make use of polluted water. In India also polluted water is the main reason for water-related diseases, particularly cholera. Another reason is lack of sanitation facilities, open defecation. Other reasons for wide spread of cholera are poverty, underdevelopment and population displacement. The main symptom of cholera is expelling of a large quantity of fluid from the stomach of cholera patient apart from vomiting and sweating. The result is dehydration and death if treatment is not given immediately, death occurs within 12-24 hours.

Diseases become a cause for heavy expenditure in the form of medical expenses and wage loss to individual families. Individual households spend a lot for medicines apart from wage loss of patients and care givers and other losses. As cholera death occurs within a short period its cost is not much. However diseases like cancer it is very much. It is estimated at $3,588 per cancer patient.[39] Further a project report of the author on 'Healthcare in Rural Areas of Kanniyakumari and Tirunelveli Districts' indicates that out of 400 surveyed households there were 131 persons affected by water-related diseases and per month per household expenditure on healthcare was $100 in Kanniyakumari district and $82 in Tirunelveli district.[40] Whatever may be the disease and its related illness it is a great loss to not only individuals but also to the whole country. For example corona pandemic became a cause a great loss to almost all countries of the world including India.[41] Every year the government spends a huge amount on healthcare. In India, though the share of public health expenditure is around 1% of its GDP it is a huge amount.[40] This view was upheld by some other authors.[42,43]

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## Policy implications

As it is indicated earlier cholera is an easily curable disease. Due to lack of knowledge and treatment facilities in many developing and emerging economies, people are much affected by cholera and its related ill-health. As safe water is not accessible, people are forced to use unprotected water sources for their household purposes. Using of unsafe drinking water becomes the cause for cholera. It is reported that in one way or the other way 80% of diseases[44] and 5% of total deaths are caused by unsafe water or polluted water.[31] In India, to provide safe drinking water to every household the Union Government has introduced 'Amrut' drinking water scheme, under the 'Jal Jeevan' programme, though at present still a significant portion of the rural poor households are not accessible to safe drinking water. The scheme aims at enhancing both the quantity and quality of drinking water supplied to various households and reducing the diseases that occur due to poor quality of drinking water. However this scheme is not functioning in all areas. The economic loss related to water-related diseases, particularly cholera is heavy on many poor households. Here the simple solution is supplying of 100% safe drinking water to all people of a country. However in developing and emerging economies like India it is a challenging task.[45] It is reported that if safe drinking water is provided in adequate quantity, the incidence of diarrhoea and dysentery can be reduced by more than 50%, conjunctivitis by about 95%, typhoid by 100% and scabies by 70%.[44] Further people who are not accessible to safe drinking water should be made aware of various water-purifying techniques. If the drinking water is purified then there will be less chance for the occurrence of water-related diseases, particularly cholera. In countries like India every surface source of water is polluted by wastes flown from agricultural lands, industrial sites, households and hospitals.[36] This situation should be stopped at any cost.

Other reasons for the easy spread of cholera are: poverty, poor living conditions, and lack of sanitation. It can be avoided only if and when living conditions are improved. Living conditions can be improved in various ways; the simple solution is the establishment of good habitations with proper drinking water and sanitation facilities. These facilities are very poor in developing countries including India. In India, health centres such as sub centres, primary health centres and community health centres and government schools lack both drinking water and sanitation facilities.[32,46] The economic condition can be improved only by providing good employment opportunity and jobs with good salary. It is only utopia in countries like India and many of the Asian and African countries.

Generally, oral cholera vaccines can be administered in endemic areas; it is just a preventive tool and a reactive measure during an outbreak though no one knows how long the vaccines offer protection from cholera. However in general the supply of vaccines is not enough to meet the high demand. For example, the total stock of vaccines at the global level is just 3.2 million doses as on 6$^{th}$ May 2024 against the targeted demand of about five million, a short of two million doses. However in June 2024, the stockpile was increased to 6.2 million doses.[2] It is utmost necessary to have enough number of vaccine doses in stock in every country. It is the duty of each government to protect its people from all types of morbidities and mortalities. Hence it is high time that every nation to increase the supply of cholera vaccines to protect its people from the burning problem of cholera.

## Conclusion

It is very clear from the above discussion that cholera has been in vogue for a very long period, appears, reappears then appears and disappears, but without any end. However the present cholera pandemic has been in existence in the world for the last 65 years though there are drugs and vaccines to treat and control cholera. There is no sign of complete disappearance or stoppage of cholera outbreaks. It is due to various reasons and some of them like cyclones and rainfalls are not under human control. Cholera outbreaks occur when there are environmental stresses that affect human population such as poverty, climate change, and lack of infrastructure such as sanitation and safe drinking water facilities. The adverse health impact of every disease on households is very serious. The economic loss to the world is great due to the occurrence of pandemics including corona and cholera. Corona was declared a pandemic only once. However cholera was declared seven times. It is beyond our imagination to estimate the economic loss of cholera pandemics to individual households and individual nations. Hence every serious disease like cholera has to be stopped altogether. The easiest way to stop the outbreak of cholera is the supply of 100% safe drinking water to all people and establishment proper sanitation facilities at all households. It is not a Himalayan task to the governments, which are ready to spend a major portion of its exchequer in distributing freebies. The treatment of cholera is also very cheap and can be made available very easily. The most feared disease of the last two centuries can be easily removed from the society if both the government and people work together. If people are made aware of the ill-effects of cholera and the causes for its spread and if treatment methods are made available, people may be relieved from the brunt of cholera outbreaks and can stop the occurrence cholera outbreaks and its related deaths.

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## Conflicts of interest

The author declares that there is no conflicts of interest.

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