

# Don't We Have Anything to Learn From the Past? Perspective of Epidemics

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## Abstract

History gives us the chance to learn from the past. In this article, a few of history's biggest outbreaks, epidemics, and pandemics have been chronicled. The difference between these three are: an outbreak is when an illness occurs in an unexpectedly high number of individuals. It may stay in one area or extend more widely. An outbreak lasts up to several days to years. Sometimes, a single case of a contagious disease is considered as an outbreak by experts. An epidemic is labeled when an infectious disease spreads quickly and affects many people at a time. It affects a larger area than an outbreak but lesser area than pandemic, usually limited to a city or country. Whereas a pandemic is a disease outbreak that spreads across the whole world engulfing various countries or continents. It may last up to years with several waves. These include Plague of Athens, Antonine Plague, Plague of Cyprian, Plague of Justinian, Cocoliztli Epidemic, Great Plague of Marseille, etc. from ancient times as well as Russian Flu, Spanish Flu, Influenza Pandemic, Severe Acute Respiratory Syndrome, Swine Flu Pandemic, Middle East Respiratory Syndrome, Ebola, and the very recent COVID-19 Pandemic, etc. in modern times. In the past few years, COVID-19 has engulfed the whole world. Humanities' reliance on one another has increased the chances of diseases spreading. Urbanization has helped in forming denser neighborhoods. These have a profound effect on the spread of COVID-19. But due to public lethargy to understand the gravity of the situation, multiple waves became inevitable. Indeed, we, humans never learn from our past.

**Keywords:** Epidemics, pandemics, MERS, Ebola, SARS, swine flu

## INTRODUCTION

Epidemics have affected human history in many ways, like demographically, politically, financially, culturally, biologically, etc. The earliest plague epidemics have even raised questions about presence of God. The global influenza epidemic led to selfless concern of others. When an outbreak expands beyond a country, the illness officially becomes a pandemic. Communicable diseases are as old as from the time of hunter-gatherers, but with the start of agriculture, creation of communities led to more epidemics like malaria, tuberculosis, leprosy, smallpox, etc. With civilization, came different trade routes as well as wars and likewise pandemics became common. Here is a short history of epidemics that changed human lives and of course history [1].

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## PLAGUE OF ATHENS

This was an epidemic that devastated Athens in ancient Greece during the Peloponnesian War (430 BC), when Athens was on the verge of victory. The epidemic killed between 75,000 and 100,000 people and is said to have entered Athens through Piraeus, the city's sole port and source of food and supplies. The epidemic reappeared twice as much in 429 BC and 427/426 BC [2].

Thucydides, a historian who contracted and survived the sickness, discusses the outbreak in his book, "History of the Peloponnesian War." According to him, the disease came from Ethiopia and through Egypt and Libya into Greece and spread throughout the Mediterranean. Corroboration of the plague first came in 1994–1995, when excavation of mass grave was done. According to Thucydides, individuals stopped fearing the law because they thought they were already sentenced to death. No one was ready to take care of the sick because of contagiousness of the disease. The dead bodies were dumped into mass graves or funeral pyre. Those who survived the plague developed immunity. The disease also created religious ambiguity and doubt, as people felt abandoned by the Gods [3].

The epidemic devastated Athens two years into the conflict, causing it to never recover. Common symptoms were fever, sneezing, coughing, insomnia, redness and inflammation of the eyes, sore throat resulting in bleeding and poor breath, pustules and ulcers on the body, severe thirst, loss of voice, vomiting, and diarrhea. Historians have long attempted to determine the cause of the outbreak. Previously, it has been considered due to bubonic plague but reconsidering the symptoms has led to alternative diseases like typhus, smallpox, measles, toxic shock syndrome, Ebola or viral hemorrhagic fever. Pathogens are unable to leave an imprint that can be recovered after several millennia, limiting DNA sequence-based identification [4].

### **THE ANTONINE PLAGUE**

From 165 to 180 AD, soldiers returning from the Near East to the ancient Roman Empire carried the Antonine Plague, often known as the "plague of Galen" after Galen, the physician who diagnosed it. Galen recorded various observations and descriptions of the epidemic in his treatise "Methods MedNLI". He mentioned fever, diarrhea, pharyngitis, and skin eruptions (dry or pustular) appearing on the ninth day of infection. Scholars have suspected the epidemic to be due to smallpox or measles. It was called Antonine plague after an emperor Antoninus Pius [5].

### **CYPRIAN PLAGUE**

Cyprian Plague afflicted the Roman Empire between 249 and 262 AD. The plague agent is not clearly known due to a lack of sources. Various diseases like smallpox, pandemic influenza, and viral hemorrhagic fever have been suspected for the epidemic. According to historian Kyle Harper, the symptoms cited by ancient sources matched with Ebola [6].

### **PLAGUE OF JUSTINIAN**

It was the first reported plague epidemic (541–549 AD) caused by *Yersinia pestis*. Mediterranean Basin, Europe, and the Near East were afflicted by it. This is the first plague pandemic which recurred until 8th century. It was one of deadliest pandemics in human history which killed between 15 and 100 million people over two centuries. The impact of the epidemic has been compared to the Black Death (1347–1351) and the second plague pandemic that devastated Eurasia [7].

Genetic studies reveal that the origin of this plague was in Central Asia. Other scholars say that the specific strain came from Sub-Saharan Africa. The epidemic killed up to one-fourth Eastern Mediterranean's human population. Subsequent waves of the pandemic strike throughout 6th, 7th, and 8th century, with the disease becoming less virulent [8].

### **COCOLIZTLI EPIDEMIC**

This epidemic occurred in New Spain territory in present day Mexico in the 16th century. The disease characterized by high fever and bleeding became known as cocoliztli by the native Aztec people. It originated from the native Nahuatl word for pest/disease/illness/plague. There have been twelve epidemics, the greatest of which occurred in 1520, 1545, 1576, 1736, and 1813. The Aztecs and other local populations were vulnerable due to their lack of exposure to zoonotic illnesses [9].

The symptoms were high fever, severe headache, neurological difficulties, black tongue, abdominal/chest pain, dark urine, dysentery, head and neck nodules, vertigo, jaundice, bleeding from nose, eyes, mouth, and gastrointestinal system. The disease has very high virulence, death occurred within a week of onset of symptoms. Later, it was considered that cocoliztli was not caused by any recognized pathogen, but by a virus of either European or New World origin. Subsequent studies have accepted viral hemorrhagic fever diagnosis, more specifically arenavirus. Estimated loss of human life ranged from 5–15 million, making it one of the deadliest disease outbreaks of all time [10].

### **GREAT PLAGUE OF MARSEILLE**

This was one of the last significant outbreaks of bubonic plague in Western Europe. It started in Marseille, France in 1720 and killed 1,00,000 people in the next two years. The commercial ship Grand-Saint-Antoine brought *Y. pestis* from the Levant to the harbor in 1720. When it reached Marseille, the port authorities quarantined it. Powerful city merchants sought the ship's silk and cotton and pressed officials to lift the quarantine. A few days later, the sickness spread in the city.

In 1998, a mass burial was excavated, and 200 skeletons were examined. This revealed numerous previously undisclosed data and insights into the 1722 outbreak. The reconstruction of a body's skull showed an autopsy performed in the spring of 1722 [11].

### **ASIATIC/RUSSIAN FLU**

In 1889–1895, a pandemic killed 1 million people worldwide. It occurred from October 1889 to December 1890, and March to June 1891, November 1891 to June 1892, winter of 1893–1894, and early 1895. The causal agent was unknown. Since the 1950s, it has been hypothesized to be Influenza A virus H2N27. However, in 1999, sero-archaeological studies found the stain to be Influenza A virus H3N8. In 2005, genetic virilocal study says that the virus could have been human coronavirus OC43.

Modern transportation networks helped to spread the disease. Within four months, it had spread over the Northern Hemisphere. The virus's rapid spread in all climates demonstrated that it was highly contagious [12].

### **SPANISH FLU (1918 INFLUENZA PANDEMIC)**

H1N1 Influenza A virus was the cause of Spanish flu. Between February 1918 and April 1920, it infected 500 million individuals all over the world in four successive waves. Death toll was somewhere between 20 million and 50 million. The first illness and mortality were observed in USA (Kansas) in March 1918, then in April in France, Germany, and the UK. Only in neutral Spain during World War I, newspapers were free to report the epidemic. Thus, it produced a misleading impression that Spain was heavily hit, giving origin to the name 'Spanish flu'.

Analysis has indicated that the virus was lethal because it caused a cytokine storm, which ravaged the stronger immune system of young people. But some believed that malnourishment, poor hygiene, overcrowded medical camps and hospitals were promoted by bacterial infections [13].

- *First wave:* It lasted until the first quarter of 1918 and was relatively moderate. Mortality rates were not above average.
- *Second wave:* It began in the second half of August. It spread over the span of the next two months, aided by army movements to different countries. Then it spread across Africa and Europe. The second wave from Europe surged across the Soviet Union, China, and Japan in October. October 1918 was the month with the greatest fatality rate during the pandemic. It was deadly in India, with 12.5 million deaths in the fourth quarter of 1918 alone.
- *Third wave:* In January 1919, a third wave of influenza struck Australia, killing 12,000. Then it rapidly spread to Europe and the United States. It was less severe than the second wave, but more than the first wave.

- *Fourth wave:* In the spring of 1920, fourth wave occurred in isolated areas of New York City, Switzerland, South American islands, Spain, Denmark, Finland, Germany, etc. It recorded a peak between January and April 1920.

The virus has a basic reproduction rate of 2–3. The proximity of soldiers among themselves and extensive troop movements of World War I intensified the pandemic. Factors contributing to the global spread of the flu included increasing travel as well as official lies and denials, leaving the people unprepared to deal with epidemics. After the deadly second wave, the number of new affected cases decreased dramatically. This could be due to the virus rapidly mutating to a less harmful strain when the more dangerous strain's hosts died. This type of evolution is very prevalent.

In September 1918, the Red Cross advocated two-layer gauze masks to combat the spread of the flu. Mitigation tactics included improved ventilation, arrests for not wearing masks, crowd size limits, selective business closures, curfews, and lockdowns. A later study discovered that prohibiting mass gatherings and the wearing of masks might reduce the fatality rate by 50%. However, this relied on being imposed early and not being lifted prematurely.

The Spanish flu was forgotten quickly. There are various theories regarding this. The rapid pace of the pandemic and the outbreak coincided with the deaths due to World War I. The war-related deaths among young adults were very high in number and it may have eclipsed the effect of flu and mortality due to it.

### **1957–58 INFLUENZA PANDEMIC**

This was a worldwide pandemic of influenza. H2N2 virus subtype that originated in Guizhou, China. The pandemic killed 1–4 million people globally. In 1968, the Hong Kong flu pandemic was prompted by the re-emergence of the viral stain H3N2.

On May 12, 1957, the Public Health Services gave virus cultures to vaccine manufacturers, and a vaccine went into testing on July 29. Rapid vaccination helped restrict the pandemic, and the vaccine is thought to have saved hundreds to thousands of lives. Influenza, the subtype of H2N2 virus, was a recombination of avian influenza and human influenza viruses. The pandemic may have infected more people than Spanish Flu, but vaccines, improve healthcare and invention of antibiotics resulted in low mortality rate. The virus was found to be fatal in children and most lethal in pregnant women, the elderly, and adults with comorbidities [14].

### **SEVERE ACUTE RESPIRATORY SYNDROME (SARS)**

Coronavirus causes a zoonotic viral disease known as SARS. The syndrome was responsible for the 2002–2004 outbreaks. When the pandemic ended in June 2003, there were 8422 reported cases and an alarming 11% death rate. The symptoms of SARS include fever, muscular ache, tiredness, cough, sore throat, and other flu-like symptoms. Shortness of breath and pneumonia are possible side effects of SARS. The incubation period might be 4–6 days or even up to 14 days. Contact between mucosal membranes and respiratory droplets or fomites is the primary mode of transmission of SARS-CoV.  $R_0$  ranges from 2 to 4. Control measures reduced the  $R_0$  to 0.4. Treatment is mainly supportive. Administration of corticosteroids is recommended in patients with oxygen saturation of 90%. Serious damage caused by SARS is due to the body's own immune system reaction, known as the cytokine storm.

The epidemic of SARS began in China's Guangdong province in November 2002. The virus outbreak was eventually genetically linked to cave-dwelling horseshoe bats in Yunnan. While SARS-CoV is likely to remain a zoonotic concern in its initial animal reservoir, human-to-human transmission of the virus has been abolished.

### **SWINE FLU PANDEMIC**

This was an influenza pandemic that lasted about 19 months from January 2009 to August 2010 involving the H1N1 influenza virus. The virus was a new strain of H1N1 which emerged from re-assortment of genes from bird, swine, and human flu viruses and again mixed with a Eurasian swine flu virus, leading to the term “swine flu”. The term “novel flu virus” was accepted by the European Commission. Israel and South Korea expressed alarm about the use of the word “swine”. They pondered calling it the “Mexican flu”. The “Science” journal published an article with the funny title “Swine Flu Names Evolving Faster than Swine Flu Itself”.

Genetic divergence analysis revealed that it reached human levels in 2008. The virus was latent in pigs for several months before the epidemic started which indicates the necessity of increase of agricultural surveillance. Subsequent findings revealed that the 2009 H1N1 virus most likely originated in pigs in Central Mexico.

The disease is spread through respiratory droplets from person to person. Symptoms persist for 4–6 days and are like those of other influenza strains. Most problems occurred in unhealthy people who had comorbidities such as obesity and respiratory disease. There were many pulmonary problems.

Confirmation of the diagnosis of H1N1 flu is done by nasopharyngeal, nasal, or oropharyngeal tissue swab from the patient. Real time-PCR is the recommended test. The basic reproductive number for this pandemic is estimated to be 1.75. It is estimated that the sickness could have killed 5,79,000 people. Most of the deaths occurred in Africa and Southeast Asia. In February 2010, the CDC’s Advisory Committee in USA advised to implement universal flu vaccination in the United States. Face masks and quarantine protocols were also implemented.

### **MIDDLE EAST RESPIRATORY SYNDROME (MERS)**

Camel flu or MERS was first observed and identified in Saudi Arabia in the year 2012 and has since spread to other nations. At the end of December 2020, a total of 2566 cases were reported including 882 deaths, globally. MERS-COV causes this specific respiratory infection with symptoms of fever, cough, diarrhea, and shortness of breath.

Bats are believed to be the original source of the virus. Humans are infected by camels, either by direct contact or indirectly. Spread between humans requires close contact with an infected person. The first identified case occurred in Jeddah, Saudi Arabia, and most cases have occurred in the Arabian Peninsula. The mortality rate is 35 percent.

The MERS-COV is a ssRNA virus belonging to genus Betacoronavirus, which is distinct to SARS coronavirus and the common cold coronavirus. WHO has recommended certain measures like, to avoid contact with camels, to eat only thoroughly cooked camel meat, to drink pasteurized camel milk, and to avoid drinking camel pee. Most of the transmissions happened in close contact with critically ill people in hospitals or residences, and there is no evidence of transmission from asymptomatic cases.

Antivirals, interferons, corticosteroids, and other treatments did not enhance results. As of March 2020, one MERS vaccine had completed phase 1 trials in people. Three additional are under progress: two adenoviral vectored and one Modified Vaccinia Ankara (MVA) vectored [15].

### **THE WESTERN AFRICAN EBOLA VIRUS EPIDEMIC**

In 2013–16, there was a widespread outbreak of Ebola virus mainly in Guinea, Liberia, and Sierra Leone. World Health Organization has reported 28,646 suspected cases and 11,323 deaths till May 8, 2016. The pandemic was ultimately declared over on June 9, 2016. The outbreak left approximately 17,000 survivors, many of whom suffered from post-Ebola syndrome. It has a high fatality rate of

70%. Another cause of concern is the ability of the virus to hide in the recovered body for months to years. In December 2016, rVSV-ZEBOV vaccine was launched which appeared to offer protection from Ebola virus. It received regulatory approval in 2019.

Ebola was originally identified in 1976, after two simultaneous epidemics in the Democratic Republic of the Congo and South Sudan. It is caused by four to six viruses from the genus *Ebolavirus*. Among these, Zaire *Ebolavirus* is deadly. According to studies, the outbreak in Sierra Leone was caused by at least two different lineages brought from Guinea at roughly the same time. As the epidemic proceeded, one of the lineages vanished, and a third appeared.

The continent of Africa has seen enormous deforestation. The early cases have occurred near deforested areas where fruit-eating bats' natural habitat is threatened, while definitive evidence is absent. Human-to-human transmission happened through direct contact with the infected individual's blood or other bodily fluids, contact with a person who died from Ebola, or contact with things contaminated by an infected person or sexually. There was concern that the disease may spread farther in West Africa or around the world, thus travel restrictions and quarantine procedures were implemented.

No proven Ebola treatment has been identified till now. According to one study, a person's genetic composition may have a role in predicting how an affected person's body reacts to the disease.

## CONCLUSION

In the present situation, the pandemic of COVID-19 has caused huge devastation not only for human life, physically and mentally, but also it has caused economic instability all over world. It will take years to recover from these losses. Perhaps this is where the importance of recapturing historical viewpoints lies. Do we truly have anything to learn from the past? According to the latest risk modeling from London-based illness forecasting business Airfinity, there is a 27.5% possibility that a pandemic as lethal as COVID-19 would strike by 2033. To avoid pandemics, we must invest in three areas: surveillance, manufacturing, and coordinated research and development.

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