A comparison of the coronavirus (COVID-19) with the 1918 flu

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ABSTRACT

The COVID-19 pandemic has changed the lives of people around the world and has had significant social, political, and economic impacts, as well as a significant toll. Many people are wondering how it compares to seasonal influenza and previous pandemics and how to predict when the pandemic will end. In order to better understand and manage the current pandemic, it is useful to compare it with historical pandemics such as the 1918 Spanish flu, which has been shown to improve the performance and quality of life of patients who have already suffered from some symptoms (COVID-19) for a long time. Therefore, this study aimed to investigate the comparison of the coronavirus (COVID-19) with the 1918 influenza. The design of the present study was a review. This study searched and reviewed articles related to the coronavirus and the 1918 influenza from international databases including PubMed, Web of Science, Scopus, and the Cochrane Library and Embase using relevant keywords. The 1918 flu affected less than half of the countries, and the most vulnerable groups were healthy adults between the ages of 25 and 40, while COVID-19 has affected almost all countries, and the most vulnerable group are adults over 65. Victims of the 1918 flu died mainly from secondary bacterial pneumonia, while victims of COVID-19 died mainly from an overactive immune response that led to organ failure. These comparisons are important for understanding and predicting the long-term effects of the new COVID-19 pandemic. The lower number of deaths may be the result of our advances in medicine over the century, as we better understand the functional phenotypic expression of COVID-19, we can predict viral mRNA expression, and start treatment earlier. It was a race between using the most advanced synthetic biology of the 21st century against a 21st century virus.

Keywords: Coronavirus (COVID-19), 1918 Spanish influenza, pandemic, PCR test, Antibody test, Antigen test

1.Introduction

As of July 2022, more than 500 million confirmed cases of coronavirus disease 2019 (COVID-19) have been recorded worldwide, resulting in over 6.3 million deaths[1]. The COVID-19 pandemic has major health and economic consequences[2]. Although most patients recover, evidence suggests that 15% may experience long-term effects of COVID-19, including fatigue, muscle pain, and cognitive dysfunction, which are referred to as post-COVID [3-5], or pre-COVID [6-8], or long-term COVID-19. COVID is difficult to diagnose because most symptoms are non-specific and many studies lack sufficiently rigorous designs to attribute symptoms to COVID-19 infection [9]. Up to 93% of infected individuals develop a long-term illness, which includes often severe symptoms affecting multiple organ systems, known as long-term COVID [10]. These estimates vary widely based on factors such as the definition of long-term COVID, conditions such as hospitalization versus

outpatient care, reporting methods such as medical records versus self-report, and vaccination status [11]. The cost of long-term COVID in the United States is estimated at $2.6 trillion per year [12]. Patients living with long-term COVID experience varying degrees of disability. Many current strategies involve self-management and rehabilitation. There are no validated biomarkers or treatments for long-term COVID, making management difficult for healthcare providers and frustrating for patients already living with long-term COVID. Patients with long-term COVID are increasingly using their primary care providers to seek further care for their new chronic condition [13]. On the other hand, in 1918, a wave of influenza called the Spanish flu caused a worldwide pandemic that spread rapidly and killed everyone. The old, the young, the sick, and the healthy all contracted the disease, and at least 10% of patients died. The death toll from the disease varies, but it is believed that one-third of the world's population was infected and at least fifty million people died, making the Spanish flu the deadliest infectious disease of modern times. Although it was nicknamed the Spanish flu at the time, it is unlikely that the virus originated in Spain [14]. The outbreak began in 1918, during the final months of World War I, and historians today believe that the war may have played a role in the spread of the virus. Soldiers on the Western Front, who lived in cramped conditions, dirt, and dampness, fell ill. The main and direct cause of this was the soldiers' weakened immune systems due to malnutrition. Their illness, called "la grippe" (the flu), was contagious and spread through the army. Within three days of falling ill, many soldiers would recover, but not all would survive. In the summer of 1918, as the battalion returned home for leave, they brought the unknown virus that had made them sick back home and into the city. The virus spread through the cities and villages of the country where the soldiers were stationed. The recovery of many infected people, both soldiers and civilians, was slow. The virus affected young people in their 20s and 30s, who were previously healthy, the most. The COVID-19 pandemic has changed the lives of people around the world and has had significant social, political, and economic impacts [15]. Many people wonder how it compares to seasonal flu and previous pandemics and how to predict when this pandemic will end. In order to better understand and manage the current pandemic, it is useful to compare it to historical pandemics such as the 1918 Spanish flu. Therefore, the aim of this study was to investigate how the coronavirus (COVID-19) compares to the 1918 flu, which may be useful in improving the functioning and quality of life of patients who have already suffered from some symptoms (COVID-19) for a long time.

2. Research Methodology

The research design was a review. This study searched and reviewed articles related to coronavirus and 1918 influenza from international databases including PubMed, Web of Science, Scopus, and the Cochrane Library and Embase using relevant keywords. This study was conducted in June 2025. Google Scholar and the reference lists of available articles were also searched to find more relevant articles.

3. Research Overview

3-1. Coronavirus Disease (COVID-19)

Coronaviruses are a large and diverse family of viruses. A large number of organisms can be infected with these viruses, which naturally include mammals and birds. Bats are the best host for these viruses and they contain a greater variety of these viruses. The identification of the novel coronavirus (Covid-19), which is the

newest known virus from the coronavirus family, was carried out in Wuhan, China, in late December 2019. This virus causes an infectious disease that usually affects the respiratory system, especially the lungs, which is a contagious disease. According to Corona statistics, this virus has so far affected more than 219 countries and is still spreading. Coronavirus disease 2019 (COVID-19) is an infectious disease caused by the severe acute respiratory syndrome coronavirus 2. In January 2020, the disease spread worldwide and led to the COVID-19 pandemic. Symptoms of COVID-19 vary but often include fever, fatigue, cough, difficulty breathing, loss of sense of smell and taste[16].

3-1-2. Ways of transmission of the coronavirus

The coronavirus is large and heavy, so it cannot remain suspended in the air for long and therefore is not transmitted through the air. The main way this virus spreads is through tiny respiratory droplets that are spread to surrounding surfaces and objects when an infected person coughs or exhales. One way this virus is transmitted is through surface transmission. These viruses are most likely to accumulate on surfaces that are frequently touched by hands. If surfaces are contaminated with this virus, healthy people can become infected by touching these surfaces and then touching their mouth, nose, and eyes or eating food before washing their hands. Another way this virus is transmitted is through person-to-person transmission. The virus can also be spread by people who have no symptoms. If an infected person coughs or sneezes directly at a healthy person, the infected respiratory droplets can enter the eyes or respiratory tract of the healthy person and infect them. Most cases of person-to-person transmission occur in closed spaces and during prolonged contact with a sick person. According to scientists, the coronavirus cannot be transmitted from pets to other animals or humans[17].

3.1.3. Symptoms of Coronavirus

The symptoms of coronavirus can vary from person to person. Also, different age groups may not experience the same symptoms. Some of the most common symptoms of coronavirus are a new or worsening cough, shortness of breath or difficulty breathing, a temperature of 38 degrees Celsius or higher, feeling feverish, chills, feeling tired or weak, body or muscle aches, loss of taste or smell, stomach and intestinal symptoms (heartburn, diarrhea, vomiting), and feeling sick [18]. Symptoms of coronavirus may appear in children as a rash or changes in the appearance of the skin. Symptoms of this disease may take 14 days to appear after a person is infected with this virus. It is important to note that you can have the virus but not show symptoms. The virus can be transmitted from someone who does not show symptoms to another person. This type of spread is common among people who are in close contact with others or who work in public and enclosed spaces[19].

3.1.4. Diagnosis of coronavirus

COVID-19 infection is diagnosed by finding evidence of the virus in respiratory samples, such as swabs from the back of the nose and throat or fluid from the lungs. Testing for COVID-19 is done in public health laboratories[20].

3.1.4.1. PCR test

PCR is a type of coronavirus test used to diagnose people who have been infected with the virus. This test uses a sample of mucus from the nose or throat of an infected person, and research is investigating the possibility of performing this test on a person's saliva. The purpose of the PCR test is to find the genetic material of the coronavirus and uses a technology called PCR (polymerase chain reaction). This genetic material is detected in people who have an active infection[21].

3.1.4.2. Antibody test

Unlike the previous test, this test is designed to detect people who have previously had the coronavirus. This test cannot show whether you have the disease or not, and in fact, the Health Organization uses it to track the spread of the coronavirus in a population. This test is performed by taking a blood sample and analyzing the antibodies to check for the presence of the coronavirus. When the body is exposed to pathogens, including the coronavirus, it produces antibodies, the number of which increases after 4 days or more than a week after infection [22].

3-1-4-3. Antigen test

Like PCR, this coronavirus test detects people infected with the virus. The main advantage of the antigen test is its high speed of results and is used for immediate diagnosis. This test can detect the presence of the virus by examining the virus proteins and analyzing them in nasal and throat secretions. Given that this test has only recently been approved, it is not yet as accurate and precise as the PCR test, but it is used to screen people with the infection [23].

3-2. History of the 1918 Spanish Flu

The 1918 Spanish Flu was caused by the influenza virus (H1N1 A), which is believed to have originated in birds. The 1918 Spanish Flu lasted from 1918 to 1920 and consisted of four waves. The first wave lasted from approximately February 15, 1918 to June 1, 1918. The second lasted from approximately August 1, 1918 to December 2, 1918. The third period lasted from approximately December 3, 1918 to April 30, 1919. And the fourth wave lasted from approximately December 1, 1919 to April 30, 1920. It infected an estimated 500 million people, about one-third of the world's population at the time, and killed 50 million people, including 675,000 Americans. The first public news of the pandemic was published in Madrid on 22 May 1918 in the ABC newspaper of Madrid. It became known as the Spanish flu. However, there is no definitive evidence of its origin, and most epidemiologists and virologists believe that the virus originated in the United States or France. A week later, on 28 May 1918, King Alfonso XIII, the Prime Minister and some members of the cabinet fell ill. As the flu spread, essential services such as the postal service, the telegraph service and some banks were forced to temporarily close their offices[24]

3.2.1. Cause of the Spanish flu

The outbreak began in 1918, during the final months of World War I, and historians today believe that the war may have played a role in the spread of the virus. Soldiers on the Western Front, who lived in cramped conditions, dirt, dust and humidity, fell ill. The main and direct cause of this was the soldiers' weakened immune systems due to malnutrition. Their illness, called "la grippe" (the flu), was contagious and spread through the army. Within three days of the illness, many soldiers recovered, but not all survived. In the summer of 1918,

as the battalion returned home for leave, they brought the unknown virus that had made them sick back home and into the city. The virus spread through the cities and villages of the country where the soldiers were stationed. The recovery of many infected people, both soldiers and civilians, was not rapid. The virus affected young people between the ages of 20 and 30, who were previously healthy[25].

3-2-2. Reason for choosing the name Spanish flu of 1918

Spain was one of the first countries in which the virus was identified, but historians believe this is probably the result of wartime censorship. Spain was neutral during the war and did not impose strict censorship on the press, so it was free to report the first signs of the disease. As a result, people mistakenly thought that the disease was unique to Spain, hence the name “Spanish flu.” In fact, according to Henry Davis’s book “The Spanish Flu,” in late spring 1918, the Spanish news service reported to Reuters in London that “a strange form of the disease, with the characteristics of a contagious virus, had been observed in Madrid. The epidemic was mild and no deaths were reported.” Within two weeks of this report, more than 100,000 people had contracted the flu. Between 30 and 40% of people who worked or lived in enclosed spaces such as schools, barracks, and government buildings contracted the virus. Medical resources and services were overwhelmed. The term “Spanish flu” quickly became a household name in London. According to Niall Johnson's book Britain and the Influenza Pandemic of 1918-19, the British press blamed the Spanish weather for the outbreak of influenza: "The dry and windy weather of Spain in the spring has made for an unpleasant and unhealthy season" (quoting an article in The Times). It was said that the dust laden with germs was dispersed by the strong winds of Spain, meaning that the humid climate of Britain prevented the spread of influenza in the country[26]

3.2.3. Symptoms of the Spanish Flu of 1918

The early symptoms of the disease included headache and fatigue, along with a short dry cough, loss of appetite, digestive problems, and then, on the second day, profuse sweating. The disease then affected the respiratory system and could develop into pneumonia. Humphreys explains that pneumonia or other respiratory complications of influenza were often the main cause of death. For this reason, it is difficult to determine the exact mortality rate from influenza, because the cause of death was often something other than influenza. By the summer of 1918, the virus was spreading rapidly to other countries in continental Europe. The disease had already gripped Vienna, Budapest, and Hungary, and parts of Germany and France were similarly affected. Sickness and absenteeism were reported from many German schools, and the illness of munitions factory workers caused a decline in production. On June 25, 1918, the Spanish flu reached Britain. The epidemic had such an impact on the London textile trade in July that, according to the book The Spanish Influenza Pandemic of 1918–1919: A New Perspective, 80 of the 400 workers in one factory fell ill in a single day. Reported absenteeism from civil servants in London due to influenza was 25 to 50 percent of the workforce [27].

3-2-4. The 1918 Spanish Flu Compared to Seasonal Flu

The Spanish flu is by far the deadliest influenza pandemic in history, killing an estimated 1 to 3% of the world's population. The most recent flu pandemic that can be compared to the Spanish flu occurred in 2009-2010, following the emergence of a new strain of H1N1 influenza. It was called "swine flu" because the virus that causes it is similar to a virus found in pigs (not because pigs are the cause of the disease). Swine flu caused a

respiratory illness that killed between 151,700 and 575,400 people worldwide in one year, according to the Centers for Disease Control and Prevention. This number represents approximately 0.001 to 0.007% of the world's population, so the impact of the disease was much smaller than that of the Spanish flu of 1918. Approximately 80% of deaths from swine flu occurred in young people under 65 years of age, which was unusual. Typically, 70 to 90% of deaths from seasonal flu occur in people over 65 years of age. Today, the swine flu vaccine is part of the annual flu vaccine. Of course, a number of people still die from influenza each year, but the average death toll is much lower than the death toll from swine flu or Spanish flu. According to the World Health Organization, an annual seasonal flu epidemic causes an estimated three to five million people to become seriously ill and 290,000 to 650,000 to die [28].

3-2-5. Similarities between the Spanish Flu and the Coronavirus

First, both diseases appear to have originated in animals. Research into the genome of the H1N1 virus in the Spanish flu suggests that the deadliest outbreak originated in a bird, but no one knows for sure what type or origin it came from. Similarly, health experts suspect that the COVID-19 virus may have had an animal host before it jumped to humans, but the type of animal is still unknown. This brings us to another comparison. The Spanish flu became more dangerous after an apparent mutation. Coronavirus strains are also known to mutate relatively easily and quickly. In fact, according to an article edited by MedicineNet editor-in-chief Dr. Charles Patrick Davis; this has happened twice before: “Previous mutations led to the emergence of SARS in 2002-2003, when a virus related to civet cats mutated and jumped to humans. In 2012, a coronavirus strain that originated in camels in Saudi Arabia caused disease in humans, leading to the outbreak of MERS [29].

3.2.6. Comparison between 1918 influenza and COVID-19

The first difference is the patient population; while 1918 influenza killed a disproportionate number of people aged 25 to 40, COVID-19 affects mostly people over 65, especially those with underlying medical conditions. People aged 25 to 40 accounted for 40% of deaths from 1918 influenza, while people aged 18 to 44 accounted for only 3.9% of deaths from COVID-19 [30]. Most countries were spared the 1918 pandemic, while only the smaller Pacific islands (Solomon Islands and Vanuatu) remain free of COVID-19. The mortality rate for pregnant women with Spanish flu was 23% to 37%, and 26% of those who survived lost their babies, while the mortality rate for pregnant women with COVID-19 is unknown. Spanish flu caused severe illness in 25% to 30% of the world's population, with over 50 million deaths[31], while COVID-19 has infected nearly 55 million people to date, with 1.3 million deaths from that virus. A second difference is that the two diseases are transmitted through different mechanisms. While influenza patients died from secondary bacterial pneumonia, COVID-19 patients died from an overactive immune response leading to multi-organ failure. Acute respiratory distress syndrome (ARDS) can occur in both cases. Acute respiratory distress syndrome (ARDS) as a complication of influenza had a mortality rate of 100% compared to a mortality rate of 53.4% for COVID-19[32, 33].

3-2-7. Spanish Flu Mortality Rate vs. COVID-19

According to Dr. Taubenberger, the mortality rate from the Spanish flu was significantly higher than that of the seasonal flu. It is estimated that the fatality rate was more than 2.5%. This means that for every 100 people

who contracted the disease, on average, more than 2.5 people died. Dr. Taubenberger says that the fatality rate from other infectious flus was less than 0.1%. Comparing statistics is difficult, as new information about COVID-19 is collected by different organizations and governments and in different ways, so it takes a lot of effort to determine the exact death rate for this disease. But according to a study published in JAMA in February, the fatality rate is 2.3%, which is almost the same as the figures for the Spanish flu [34].

3-2-8. Treatment of 1918 Flu and COVID-19

Using synthetic biology, diagnosis can be made using complete sequencing of COVID-19 strains, which also reveals the number of strains. In addition, obtaining data on the patient's genotypes will determine its effect on the expression of the virus. In addition, vaccines created with synthetic biology and then manufactured with nanotechnology can be made in unlimited quantities compared to current vaccine production methods, which use fertilized eggs. Synthetic vaccines can be made for each strain with a unique sensor on each monoclonal antibody that indicates the presence of a specific strain, allowing for efficient and timely vaccination in each population. We should also be able to begin to unravel the mystery of this virus. By studying each base of the positive-sense messenger RNA and determining its individual function, we can predict the patient's prognosis and be prepared to treat patients when they become ill. The prognosis for patients in intensive care units is currently poor, with high mortality and risk of lung damage [35, 36].

3-2-9. Economic Impact of 1918 Flu and COVID-19 on the World

COVID-19 had a significant impact on the economies of many countries, with the United States facing a decline in GDP according to the World Bank. The projected economic impact of COVID-19 on the economies of many countries has caused even most countries, such as the United States, to face a decline in GDP according to the World Bank. Data on the economic impact during the 1918 flu pandemic is scarce, but it has been noted that Mexico lost $9 billion. Diagnosis, treatment, and vaccines were delayed in both cases. States developed different diagnostic tests for COVID-19 because the initial test was not approved by the Centers for Disease Control and Prevention (CDC). In the early trials, there were no FDA-approved COVID-19 treatments, but antiviral drugs such as remdesivir, antibodies, and interleukin-33 blockers were used [37, 38]. Many treatments for the virus are now approved and available to the public. Vaccines have also been developed and are available worldwide. There is disagreement about the duration and origin of both viruses, and both have been composed of multiple waves. The 1918 flu lasted 25 months, and may have originated in Spain, France, or the United States, although there is no definitive evidence. The first wave lasted from approximately 15 February 1918 to 1 June 1918, and the fourth and final wave lasted from approximately 1 December 1919 to 30 April 1920. COVID-19 originated in Wuhan, China on 31 December 2019, with much debate as to whether it originated in a wet market or at the Wuhan Institute of Virology. Unlike the 1918 influenza, DNA sequencing of COVID-19 can predict whether infected individuals are symptomatic or asymptomatic based on a single base change[39, 40].

4. Conclusions

Both the COVID-19 pandemic and the 1918 influenza pandemic have similarly had significant negative impacts on the global economy, disrupted international relations, and caused significant delays in diagnosis,

treatment, and vaccines. The severity of the pandemics differed greatly in the at-risk population and the mechanism of death. The 1918 influenza pandemic affected less than half of all countries, and the most vulnerable groups were healthy adults between the ages of 25 and 40, while COVID-19 has affected almost all countries, and the most vulnerable group is adults over 65. Victims of the 1918 flu died primarily from secondary bacterial pneumonia, while COVID-19 victims died primarily from an overactive immune response that led to organ failure. These comparisons are important for understanding and predicting the long-term effects of the new COVID-19 pandemic. The lower number of deaths may be a result of our advances in medicine over the century, as we better understand the functional phenotypic expression of COVID-19, can predict viral mRNA expression, and initiate treatment earlier. This is a race between using the most advanced synthetic biology of the 21st century against a 21st century virus. We are 100 years away from 1918 and the tools that scientists and doctors had in the last century. Hopefully, we can win this fight against this virus. It is difficult to predict how long this fight will continue, but with the advancement of new technologies in science and technology and the use of rapid diagnostic methods such as (RT-PCR), and ultimately with social distancing and adherence to hygiene tips, important therapeutic points should be reached.

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