

Impacts And Preventions of COVID-19

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Abstract. The goals of public health are to protect and advance the well-being of both individuals and the communities in which they reside. However, the coronavirus disease 19 (COVID-19), a recent emerging plague, has had a catastrophic effect on sanitation. COVID-19 has infected more than 650,000,000 individuals and caused over 6,000,000 fatalities worldwide. In this study, how COVID-19 affects human beings, societies, and countries is discussed. Additionally, COVID-19 is investigated in several aspects such as mechanisms, contagiousness, persistency, mortality, and sequelae. Furthermore, the paper provides suggestions for preventing COVID-19. Considering the disease's analysis, its impairment of it is unmeasurable. Despite the fact that researchers have created a viable COVID-19 vaccine, there is no guarantee that people will not be infected due to the properties of the disease. However, the probability of being too sick or dying is reduced because of the vaccine. In this paper, people can gain a comprehensive view of the influence, infection mechanism, and nature of COVID-19. In addition, another purpose is to help people protect themselves from this disease.

Keywords: COVID-19; impacts; mechanism.

1. Introduction

The three main factors that reflect health, according to the WHO, are social health, psychological condition, and physical fitness [1]. To protect and enhance the health of people and communities, the science of public health was established. The public can range in size from a neighborhood to a city, nation, or even a whole continent. The field "public health" is broad and encompasses a wide range of topics. It includes epidemiology, biostatistics, social science and other sub-fields, such as environmental health, behavioral health, mental health, health education etc. [2]. Due to the complexity of public health, it has to face lots of challenges. One of intractable threats to public health is a virus. This microbe is an infectious creature that can multiply exclusively within living cells [3]. A virus is composed of a protein-coated capsid and a deoxyribonucleic acid (DNA) or ribonucleic acid (RNA) genome. Some viruses have a membrane envelope on the outside. Viruses can have a wide variety of forms, structures, and genomes. Infection by viruses can occur in all living things, including plants, animals, and microorganisms like bacteria and archaea [4]. A virus travels along the cell surfaces after entering a host's body until its proteins begin to interact with receptors on the cells [5]. The virus' DNA or RNA is able to get into the cells and start replicating after the virus and cells have bonded [5]. The infection starts in earnest when sufficient viral material is able to enter host cells without being neutralized by the immune system or another antiviral mechanism [5]. Recently, the emerging coronavirus, coronavirus disease 2019 (COVID-19), is causing tremendous damage, killing millions of people. The first documented incident occurred near the end of 2019 in Wuhan, China [6]. Although COVID-19 indicators might vary, they typically include the increase in body temperature, irritation in the throat, pain in the head, physical or mental tiredness, breathing difficulties, and loss of sensation of flavor or odors [7]. COVID-19 is distributed to other humans when they inhale air contaminated with other persons' exhale germ-carrying particles [8]. Additionally, contamination can be transmitted when infected liquids that splash or spray into the mouth, nose, or eyes or, less commonly, those that come into touch with contaminated surfaces [8]. Infected individuals can transmit the disease for up to 20 days even though they don't have any

symptoms [7]. This paper will discuss how COVID-19 affects in different aspects around the world, how it infects human beings, and possible preventions from it.

2. Impacts of COVID-19

The WHO has received reports of over 650,000,000 verified cases of COVID-19 worldwide, with over 6,000,000 fatalities [9]. Compare with influenza (flu), COVID-19 spreads more quickly and results in more serious disease. Additionally, individuals infected with the flu usually take shorter time to show symptoms, and they are contagious for shorter periods than COVID-19 [10]. At the early time of COVID-19 pandemic, most countries took actions such as announcing new policies, making restrictions, etc. to protect their citizens. For instance, some countries halt a significant amount of transportation, some no longer provide Visas to travelers, some enforce people to be quarantined if they are infected with COVID-19, etc. However, these won't happen if people get the flu. By postponing events in different fields and halting some manufacturing of goods and services, the prevailing pandemic is causing imbalances in community and economy. From an economic standpoint, there have been approximately 100 million job losses worldwide, more than 5,000,000 individuals in China lost their jobs, and over 10,000,000 persons in America are under unemployed circumstance, with the unemployment rate in 2020 anticipated to increase even more [11-12]. Similarly, a partial lockdown has caused significant job losses in France and Britain, over 900,000 job losses in Spain, over 20 million job losses in India, over 44% unemployment in Canada, over 20 million job losses in Canada, and severe job losses in manufacturing and production in Germany [13]. Additionally, there is a chance that over 20 million jobs will be lost in Africa [14]. The educational systems were impacted by the pandemic in many countries. Presently, education is impacted by COVID-19 in over 193 nations [15]. Many schools temporarily closed, replaced by virtual education which reduces the efficiency of education since the disconnection can happen due to fluctuations of the network. In additional, misleading information about the virus is disseminated online, which further increases community dread. That leads to panic buying: people empty groceries of essentials. For the cultural aspect, in 2020, events and performances had been postponed or cancelled, and museums, libraries, and other cultural institutions had been closed. Furthermore, the pandemic even affected politics: legislative activities were suspended, politicians were dead, and elections were rescheduled. The pandemic of COVID-19 also caused the rise of hunger and undernourishment. Since COVID-19 has caused huge hardships in the society, potential drugs or vaccines that can cure COVID-19 are in urgent to develop. And knowing the infection mechanism and the nature of COVID-19 is the foundation to develop possible treatments.

3. Infection Mechanism and Characteristics of COVID-19

The SARS-CoV-2 is the viral pathogen accountable for the COVID-19 [16]. There are four primary constitutional glycoproteins including spike, membrane, envelope, and nucleocapsid in COVID-19 [16]. The virus spreads through the air in droplets. When the virus infects human cells, it usually enters through angiotensin-converting enzyme-2 (ACE2), a plasma membrane receptor [17]. Additionally, if the spike to reach the host cell membrane, it must fuse with itself [18]. The process involves serine proteases and furin that will make cleavage of the spike [18]. The host cell will then receive the genetic material (RNA). Since the cell recognizes the viral RNA as its own, it will produce more viruses' RNA and viral proteins. The viruses' parts get assembled. The infected cell dies, and viruses are ready for another infection of other cells. As lots of functional cells die due to the infection of viruses that may eventually lead to human death. Another fact is that compared with SARS-CoV, SARS-CoV-2 spreads effortlessly, though they share 86% of the same genomic sequence [19]. Between 2002 and 2004, the SARS outbreak caused around 8000 cases and approximately 750 deaths with a fatality rate of 9.5% in 8 months [20]. However, SARS-CoV-2 spreads much faster than SARS: it infects more than 82,000 people, causing more than 2,800 deaths within 2 months [8]. One of the

reasons that make SARS-CoV-2 more contagious could be due to its spike. As mentioned above, the coronavirus uses its spikes to bind to the membrane of the human cells that they infect. The homologous spike of SARS-CoV is able to attach to the host cell surface receptor, but the spike from SARS-CoV-2 is so distinctive that it is able to do so at least ten times more firmly [21]. The fact that the spike in SARS-CoV-2 involves an area where it can identify and activate the enzyme furin may be one reason for its potential specificity [22]. The enzyme furin can be discovered in all kinds of human tissues such as the liver, lungs, small intestines, etc. [22]. The virus might have the ability to attack numerous organs at once since this enzyme is detected in majority of human organs [22]. However, the same family of coronaviruses, including SARS-CoV, do not share the same furin activation site, according to numerous studies [23]. According to Gary Whittaker, furin activation site possibly alters virus stability and consequently transmission since it sets the virus up very differently from SARS in terms of its entry into cells [22]. Furthermore, the surface receptor ACE2 makes humans vulnerable to the new coronavirus because it binds to ACE2 with higher affinity than other coronaviruses [21]. Additionally, SARS-CoV-2 has high adaptability. For instance, the virus was examined in an experiment at three different temperature degrees which are 20, 30, and 40 with a moderate humidity [24]. A variety of surfaces made up with different textures were used in the study [24]. The surfaces were left exposed for up to 28 days after the researchers dried a droplet of fluid containing the virus at quantities similar to those reported in infected patients [24]. When kept at a temperature level of 20, or roughly room temperature, and without light, the virus could persist on flat surfaces for about 4 weeks [24]. The authors in this study indicate that the results demonstrate SARS-CoV-2 can continue to be contagious for much longer lengths of time than typically thought to be possible [24]. Furthermore, COVID-19 has high mortality. A study was conducted in Fortaleza in 2020 by using IntegraSUS data. The researchers analyzed over two thousand confirmed cases of COVID-19 [25]. While hospitalization rate was about 11%, and around 5% of subjects were moved to the ICU, the cumulative incidence of disease-related deaths was about 6% [25]. The median time from the beginning of signs of the illness to death or the survey's conclusion was 19 days; the mid-position value of time from symptom outset to ICU admission was about one week; and the median time from ICU admission to death or the survey's conclusion was around 12 days [25]. In addition, the sequelae of COVID-19 are another aspect that makes it perilous. A study demonstrates that in a sizable majority of COVID-19 patients exhibit ongoing symptoms that go beyond the initial infection. A portion of these people may experience symptoms that last longer than 12 weeks after the condition first manifests, consequently, these people will be diagnosed as post-COVID-19 syndrome [26]. Post-COVID-19 syndrome may affect several organs, but the pulmonary, neuropsychiatric, cardiovascular, and gastrointestinal systems are where it most commonly manifests [26]. Also, another study that investigates post-COVID symptoms indicates that COVID-19 survivors commonly had the following symptoms at one year after the infection: weakness/fatigue, unable to breathe fluently, a feeling of muscular soreness, sadness, the sensation of discomfort, mental fogging, having trouble focusing, and sleeplessness based on its meta-analyses of prevalence data [27]. Indeed, a major reason that makes COVID-19 dangerous is that it is new to humans. When people face something that they've never been through, it causes panic in the society which may cause the government hard to maintain the stability that would help the society to overcome it. Although the virus may be not more powerful than other viruses, we do not have pre-existing defenses, so the human body cannot identify it and eliminate it. Also, no pharmaceutical business and/or venture capital seemed to have a focus on creating anticoronavirus medications prior to the global COVID-19 pandemic [15]. Furthermore, new coronavirus genetic variations can emerge quite quickly. By now, there are alpha, beta, delta, gamma, omicron... And authoritative institutions are not sure about whether there will be more new variations emerging. However, though COVID-19 is highly contagious, has high mortality, and has serious sequelae, and its mechanisms of infection seem hard to break, there are some preventions that can be used.

4. Preventions from COVID-19

The WHO states that individuals can protect themselves by maintaining a physical separation of at least one meter from others, staying away from crowded areas, and avoiding close contact [28]. Additionally, If physical separation is not possible and there is limited ventilation, you should also wear a properly fitted mask [28]. Regular hand washing should be done with hand soap [28]. Make sure the mouth and the nose are not exposed in the environment when someone coughs or sneezes [28]. Immediately throw away used tissues and disinfect hands with sprays or wipes [28]. However, people cannot keep distance from other people and wear masks forever, thus, getting an effective vaccine is essential. The CDC claims that though the COVID-19 vaccine may not protect you from infecting COVID-19, the chance of developing severe COVID-19 illness, requiring hospitalization, or passing away is considerably reduced by maintaining current COVID-19 vaccinations [28]. Injecting messenger RNA (mRNA) vaccine can be a good strategy. Traditional vaccinations are produced using viruses that have been generated in chicken eggs or mammalian cells. Instead of using the real virus, the mRNA vaccines train the immune system using a messenger RNA molecule, as opposed to conventional vaccines that use a weakened or inactive component of a specific pathogen [29]. The messenger RNA contains instructions for making proteins. By injecting a piece of messenger RNA that responds to the viral protein, the mRNA vaccines operate. [30]. The human body is protected once the immune system detects the foreign protein complex by producing more antibodies and getting the body ready to identify viruses in the future. When compared to traditional vaccinations, mRNA vaccines help establish a stronger sort of immunity that is also more efficient against the pathogen by activating the immune system to generate antibodies as well as immune cells themselves that attack the virus. [30]. Despite the fact that mRNA vaccines are much more effective against variants of coronavirus and produce a tolerable immune response, clinical trials and evaluations have shown that they also have a number of advantages over conventional vaccines [30]. Many experts believe that the application of mRNA technology also enables engineers to effectively simulate numerous variants, alter strategies as necessary, and start battles against challenging variants [30]. According to researchers, numerous mRNAs can be encoded in a single vaccination, allowing them to target different antigens simultaneously, something that is not possible with conventional vaccines [30]. In addition, a CDC study supports the preventive effects of the mRNA COVID-19 vaccination. This study shows that in real-world situations, mRNA vaccines of COVID-19 are highly successful at decreasing the infection of the virus in healthcare personnel, first responders, and other critical employees [31]. The experiment, which lasted for one year, looked at the effectiveness of mRNA vaccines from major biopharmaceutical companies in preventing SARS-CoV-2 infections in about 4,000 study participants in six states [31]. The risk of infection was 90% lower two or more weeks after getting another dose of the vaccination. Only injecting one dose of mRNA vaccine reduced the subjects' probability of getting SARS-CoV-2 by 4/5 after two or more weeks later [31].

5. Conclusion

This paper analyzes the damage caused by the COVID-19 pandemic from health, economic, cultural, political, food, and educational areas. It also examines COVID-19 in several aspects such as infection mechanism, infectiousness, persistency, mortality, and sequelae. Additionally, proper suggestions are proposed to protect people from getting COVID-19 and getting it too sick. The purpose of this paper is to give a broad view of this disease and let people not fear it and protect themselves from it scientifically. However, there are some limitations about this paper. Most studies' results are from the beginning of the outbreak of COVID-19, but this disease mutates itself quite rapidly through these three years. In other words, COVID-19 already has several variants that are classified by genetic lineages. However, the differences among these variants are not explained. Furthermore, some people get reinfected with the virus, but the examination of reinfection is not discussed in this paper. Also, the comparison between conventional vaccine and mRNA vaccine lacks specific data that people can understand directly. For the further direction, more recent studies about

the COVID-19 will be deliberated. Different variants of SARS-CoV-2 can be investigated include how they are different from each other, what makes them less prominent than others etc. Also, there are other possible treatments of the disease include autophagy regulation. Although it is the first time that human applies mRNA vaccine, the study of it has been decades. The success of mRNA vaccine on COVID-19 increases the possibilities that other diseases that cannot be cured before. Thus, other diseases that are possibly healed by mRNA vaccine can be examined.

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