Learning from COVID-19, Will this Pandemic Reappear: A Reflection for Indonesian Children Future

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ABSTRACT
Infectious diseases have a massive impact on human life, especially when it has become a pandemic such as Covid-19. Infectious diseases that have become epidemics have often occurred and have claimed many lives and damaged the economic order in various regions of the world. For this reason, this study aims to find out: (1) what epidemics have occurred in the world; and (2) what we can learn from these epidemics. This research was conducted by following the method of systematic literature review. There are four stages carried out in this study, namely designing the review, doing the review, analysis, and writing the review. The researchers collected the data from books and academic journals relating to infectious diseases that cause epidemics. The collected information is then analyzed qualitatively with an interactive analysis model consisting of three stages: data reduction, data display, conclusion drawing/verification. The results of this study show that: (1) from the general literature there were 12 infectious diseases recorded as epidemics before covid-19, whereas from Islamic religious literature there were registered 12 contagious diseases that became epidemics; and (2) what we can learn from the outbreak is that infectious diseases that become epidemics are pathogenic microorganisms that can adapt (evolve) and have more ability to be able to transmit viruses from a human to another human quickly. Changes in the environment and ecosystems affect the occurrence of epidemics. Climate change contributes to the changes in the background and ecosystems. Climate change is an unsolved problem, so outbreaks will likely continue in the future, and we must prepare for them.

Keywords: covid-19, pandemic, infectious disease, climate change

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INTRODUCTION
Infectious diseases have caused threats to health, both to local communities and regional and global communities. If an infectious disease is at a specific community-level or area, then this contagious disease is called an epidemic. The examples of epidemics are cholera, diarrheal diseases, measles, malaria, and dengue fever. Epidemics caused death in huge numbers, such as smallpox epidemics and other pathogenic agents that killed around 50 million from 60 to 65 million Amerindians between 1492 and 1650 (Cook, 1998). In the middle Ages, Europe suffered successive epidemics that caused the deaths of more than 30 million people (Brossollet & Mollaret, 1994). Although it is horrifying to be classified as an epidemic, there needs to be preparation and field investigation concerning local health and other relevant authorities (Tulchins & Varavikova, 2015). In 1948, the World Health Organization (WHO) was formed and given the task of advancing ways against the epidemic (Martin, 2008).

Pandemic brings a broader impact than the epidemic. It has a larger area and a bigger size of the population being affected in the global scope. Various waves of activity characterize many pandemics during the pandemic period (Treanor, 2015). After the pandemic developed, it was too late to implement new steps that might be needed to minimize their impact (Fiore, Bridges, Katz, & Cox, 2013). Diseases that cause epidemics are highly contagious. In influenza pandemics, for example, during a pandemic, the virus spreads rapidly, resulting in significant morbidity and mortality (Fry, 2016). In the past, pandemics still included cholera, smallpox, leprosy, measles, polio, and yellow fever. (IFRC, 2018). Examples include the plague in Athens (430 - 429 BC), which caused the decreased of 25 percent of the population, which is thought to be caused by measles, a smallpox outbreak in Rome (165 - 180 BC), and many others. (Dobson & Carper, 1996). In the 20th century, there is a pandemic that emerged in 1918-19 (known as the Spanish flu), 1957 (Asian flu), and 1968 (Hong Kong Flu) (Targonski & Poland, 2017). Spanish flu is one of the most devastating epidemics in human history (Phillips & Killingray, 2003). Nearly a third of the world’s population or 1.8 billion people are infected, and an estimated 50-100 million die from this disease in less than one year (Mamelund, 2017). This flu spread throughout the world from the Arctic Circle in the north to the remote Pacific islands (James & Whitley, 2017).

Now, we can control the infectious diseases that caused epidemics in the past instantly. As an example of cholera and diarrhea, which is very easy to make an outbreak in the past, now it is not easy to spread, especially in areas with proper sanitation and good hand hygiene behavior. Likewise, with smallpox, which in the past made a frightening specter, so now it is infrequent that we encounter smallpox sufferers around us because of a successful vaccination program. That program...
is an example of the success of community-based health programs (Schlippel & Flahault, 2010).

Coronavirus disease (Covid-19) develops from Wuhan City, Hubei Province, China, at the end of December 2019 (Ali & Alharbi, 2020), which eventually expanded into a global disaster (Wu & McGoogan, 2020). In early March, the World Health Organization (WHO) declared the new disease a global pandemic. Covid-19 is a contagious respiratory disease with the same route and method of transmission as influenza (Wu D., Lu, Liu, Zhang, & Luo, 2020). The world is panicking because of its rapid spread, causing patients with heavy burdens to enter the hospital where there are limited facilities to treat patients with severe disorders simultaneously. Covid-19 is considered the most critical global health disaster of the century and the biggest challenge facing humanity since World War 2 (Cakraborty & Maity, 2020).

Covid-19 harms human life globally. This pandemic not only caused infection and death but also wreaked havoc on the global economy on a scale not seen since the Great Depression (Laing, 2020). Social restrictions, self-isolation, and travel restrictions as a result of COVID-19 caused a reduction in labor in all economic sectors and caused many jobs to be lost. Schools have closed, and demand for commodities and manufactured products has declined (Nicola, et al., 2020). The social isolation measures of COVID-19 also have a profound impact on the psychological and mental well-being of individuals throughout world society (Alradhawi, Shubber, Sheppard, & Ali, 2020). Covid-19 also causes a reduction in the recycling process. It increases the amount of waste, further endangers the contamination of physical space (water and soil), and air pollution (Zambrano-Monserrate, Ruano, & Sanchez-Alcalde, 2020).

RESEARCH QUESTIONS
1) What epidemics have occurred in the world?
2) What we can learn from these epidemics?

AIMS
For this reason, this study aims to find out: what epidemics have occurred in the world and what we can learn from these epidemics.

METHODS
This research is a systematic literature review (SLR) study. In implementing SLR, there are several stages carried out in this study, namely designing the review, conducting the review, analysis, and writing the review (Guz & Rushchitsky, 2009). The researchers collected the data from various books and articles published in national and international journals that discuss epidemics of infectious and COVID-19 diseases. The researchers analyzed the collected data qualitatively by following an interactive analysis model consisting of three stages, namely data reduction, data display conclusion drawing/verification (Miles, Huberman, & Saldana, 2014).

RESULTS

Repeated Pandemic History
Infectious diseases that spread into epidemics or pandemics, always recurring in human history, can be with the same cause or different causes. This contagious disease is caused by microorganisms that are well known or not well known. In the past, many microorganisms were unknown and only recorded as symptoms of illness. Hippocrates was one of the foremost doctors in the past and considered the father of the world of modern medicine, also noted the epidemic in his era. His work includes references to infectious diseases that range from general observations about the nature of infections, cleanliness, epidemiology, and immune responses, to detailed descriptions of syndromes such as spondylitis tuberculosis, malaria, and tetanus (Pappas, Kiriaze, & Falagas, 2008).

An example is the Athenian Plague, which occurred 430 to 426 BC (BC), during the feud between Athens and Sparta (Peloponnesian War). This outbreak began in Ethiopia and spread to Egypt and Greece. Early symptoms of this outbreak are headaches, conjunctivitis, reddish spots on the body, and fever. The sufferer will then cough up blood and will suffer from severe abdominal pain. (Huremovic, 2019) If you see the symptoms, this disease is similar to measles, but some experts refer to this as the Ebola virus hemorrhagic fever. (Huremovic, 2019) However, DNA examination of the ancient dental pulp from the victims of this pandemic led to the conclusion that typhoid fever as a possible cause of the Athenian Plague outbreak (Papagrigorakis, Yapijakis, Synodinos, & Baziotopoulou-Valavani, 2006).

The second known outbreak occurred after Christ, during the reign of Marcus Aurelius in Rome, and the suspected cause was smallpox or smallpox. This disease entered Rome from soldiers returning from Asia, Egypt, Greece, and Italy. This outbreak spread rapidly and paralyzed Roman economic and military joints. This outbreak lasted until the death of Marcus Aurelius in 180 AD and possibly until the beginning of the Commodus reign (Haas, 2006). This outbreak is known as the Antonine outbreak and is also known as the Galen outbreak. (Huremovic, 2019) Galen, Greek physician and author of Methodus Medendi, witnessed the plague and contributed to recording symptoms. Common symptoms are fever, diarrhea, vomiting, thirst, swollen throat, and coughing (Horgan, 2019).

The third outbreak was the bubonic plague caused by Yersinia Pestis, known as the Justinian plague. This outbreak also occurred in Roman rule, especially in coastal areas, primarily found on the coast of the Mediterranean Sea (Harbeck, et al., 2013). There are many centers of trade between regions. Then this outbreak spreads to other areas. The emergence of an epidemic was suspected in 541 AD. In 600 AD, 40 percent of the Roman Empire population was reduced, even in the city of Constantinople exceeding 60 percent. (Huremovic, 2019) Eight hundred years later; Yersinia Pestis also caused the Black Death plague and proved that rodent species worldwide represent an essential reservoir of the recurring appearance.
of Yersinia Pestis in the history of the world's human population (Wagner et al., 2014). Millions of people have died throughout history due to this infection (Roberts & Buikstra, 2019). Therefore, Yersinia Pestis can be considered as one of the bacteria that causes the deadliest disease in human history (Ditchburn & Hodgkins, 2019).

After those years, many outbreaks that occurred in the world are noted below:

Table 1. The plague that happened in the world

<table>
<thead>
<tr>
<th>NO</th>
<th>Year of Plague</th>
<th>Plague Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>1347 AD</td>
<td>Bubonic plague or Black Death Plague. Occurs in Europe and Asia, with mortality 30 to 50% of the world's population.</td>
</tr>
<tr>
<td>2.</td>
<td>Early 1500 AD</td>
<td>The beginning of smallpox in the Americas</td>
</tr>
<tr>
<td>3.</td>
<td>1881 AD</td>
<td>The fifth cholera pandemic worldwide</td>
</tr>
<tr>
<td>4.</td>
<td>1918 AD</td>
<td>Pandemic Influenza Spanish Flu. Global occurrence with the number of deaths 20 million - 100 million deaths (111 - 555 deaths per 10,000 people)</td>
</tr>
<tr>
<td>5.</td>
<td>1957 AD</td>
<td>Asian Influenza Pandemic. Global occurrence with the number of deaths 0.7 million - 1.5 million (24 - 51 deaths per 10000 people)</td>
</tr>
<tr>
<td>6.</td>
<td>1968 AD</td>
<td>Hong Kong Influenza Pandemic. Global occurrence with 1 million deaths (28 deaths per 10,000 people)</td>
</tr>
<tr>
<td>8.</td>
<td>2003 AD</td>
<td>Severe Acute Respiratory Syndrome occurs in 37 countries out of 4 countries with 8098 cases and 744 deaths.</td>
</tr>
<tr>
<td>9.</td>
<td>2009 AD</td>
<td>Pandemic Influenza Swine Flu with 151 700 - 575 500 deaths.</td>
</tr>
<tr>
<td>10.</td>
<td>2012 AD</td>
<td>Middle East Respiratory Syndrome (MERS) occurs in 22 countries with 1879 cases and 659 deaths.</td>
</tr>
<tr>
<td>11.</td>
<td>2013 AD</td>
<td>Ebola virus in West Africa (10 countries) with 28646 cases and 11323 deaths.</td>
</tr>
<tr>
<td>12.</td>
<td>2015 AD</td>
<td>Zika virus pandemic occurred in 76 countries, with 2656 cases of microcephaly or central nervous system malformations.</td>
</tr>
</tbody>
</table>

Adapted from (Madhav, Oppenheim, Gallivan, Mulembakani, Rubin, & Wolfe, 2017)

In the medical literature of the Islamic world, there were many outbreaks called Tha’un from the earliest times of Prophethood up to the 13th century Hijri (H), as mentioned below:

Table 2. Plague in the medical literature of the Islamic world

<table>
<thead>
<tr>
<th>NO</th>
<th>Year of Plague</th>
<th>Plague Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>1 H/7 Century</td>
<td>6th year of Hijri Tha’un Syairawiyah in Mada’in (Persia), 17th year H / 638 AD Tha’un Amwas (the name of the village between Quuds and Ramlah) is in Syam, which claimed 25 thousand people. Also died were several companions of the Prophet such as Abu Ubaidah, Mu’adz bin Jabal, Abu Malik Al-As’ary, Ya’zid bin Abi Sufyan, Al-Harith bin Hisham, Suhaill bin Amr, and others. Year 49 H, 53 H and 66 H / 669, 673 CE and 686 CE Tha’un in Kufa, in Hasanah and Egypt Year 53 D / 673 CE Tha’un Al-Jarf in Basrah, which claimed tens of thousands of lives. 82, 84, 85, 86, 87 AH (701, 703, 704, 705, 706 CE) Tha’un in Basra who claimed many lives. 100 H / 718 AD Tha’un al-asyraf because many young people died.</td>
</tr>
<tr>
<td>2.</td>
<td>2 H/8 Century</td>
<td>107 H / 725 AD in Syam 115 H / 733 AD in Syam 127 H / 745 AD Tha’an Ghurab 131 H / 749 is called Tha’un Sullam bin Qutaibah Year 134 H / 751 AD is called Tha’un Rayy 146 H / 763 AD in Baghdad</td>
</tr>
<tr>
<td>3.</td>
<td>3 H/9 Century</td>
<td>221 H / 836 AD in Basrah. 249 H / 863 AD in Iraq.</td>
</tr>
<tr>
<td>4.</td>
<td>4 H/10 Century</td>
<td>301 H / 913 AD 324 H / 936 AD in Isfahan. 346 H / 957 AD</td>
</tr>
<tr>
<td>5.</td>
<td>5 H/11 Century</td>
<td>406 H / 1015 AD in Basrah. 423 H / 1032 AD in India and Asia.</td>
</tr>
</tbody>
</table>
Environmental Influences for Future Epidemics and Pandemics

Indonesia, as a developing country with a large population, has a great environmental threat to the spread of disease. Ecological changes and social changes will affect the availability of clean water, air, and food as well as adequate shelter for children. (Haryanto, 2020) Despite significant progress towards clean water and sanitation, there are still areas that lack clean water and proper hygiene. And around 6 - 57% of water samples in Jakarta, 0 - 55% in Bekasi, Tangerang, and Cilegon have coliform and fecal Coli bacteria. Chemical contamination is found in 0 - 50% of water samples in Jakarta, 25-100% of water samples in Bekasi, Bogor, Karawang, Tangerang, and Cilegon. (Haryanto, 2020). The results of the Basic Health Research (Riskesdas) in 2018 stated that there was still 2.4% of the population with clean water use criteria that were less and very less. (Ministry of Health of the Republic of Indonesia, 2018) This research also shows that 33.5% of the population carelessly disposes of feces. The primary sewage from the bathroom or washing area at home is not yet in a closed shelter. Around 51% of the population carelessly disposes of feces. The primary sewage from the bathroom or washing area at home is not yet in a closed shelter. Around 51% of the population carelessly disposes of feces. (Haryanto, 2020)

Climate change also affects the increasing number of cases of vector-borne diseases, such as Dengue Fever (D). Apart from infectious diseases transmitted through vectors, contagious diseases from water and food are the other main categories that are thought to be most affected by climate change. (Kurane, 2010). Climatic conditions (such as temperature and humidity) and population density can affect virus transmission (Dalziel, et al., 2018). Meteorological factors such as humidity, visibility, and wind speed can affect environmental stability, or affect the viability of viruses (Tosepu, et al., 2020). Furthermore, climate change
dramatically affects public health both directly and indirectly by increasing the incidence and intensity of natural disasters, affecting developing countries through extreme weather events and sea-level rise, water crisis and food insecurity (Ashrafuzzaman & Furini, 2019).

Population growth and pollution of water, air, and soil contribute to the increasing number of human diseases throughout the world (Pimentel, et al., 2007). Population growth, especially in urban areas, and not accompanied by inadequate public service services coupled with ecological changes due to global warming, erroneous agricultural practices, and deforestation cause dynamic transmission of vector transmitted diseases. (Haryanto, 2020). The emergence and re-emergence of vector-borne diseases in the past 40 years has been driven by population growth, urbanization, globalization, and a lack of public health infrastructure (Ramalho-Ortigao & Gubler, 2020). The demographic structure of a population is the primary determinant of the pattern of contact and hence the spread of infectious diseases, and therefore the design of effective control measures (Geard, et al., 2015). One clear example in Indonesia is the House Index (HI), where the Aedes aegypti increased from 75.9% in 2005 to 83.5% in 2007. (Haryanto, 2020). The increase in temperature is in line with the increasing number of dengue cases in Indonesia (Figure 1)

Climate change to pathogenic microorganisms can be direct, affecting the endurance, and reproduction of pathogens and the life cycle. Climate change is also indirect, such as its influence on pathogenic habitats, the environment around pathogens, and competitors from pathogens. Besides, climate factors also affect the transmission of infectious diseases by changing human behavior (Waits, Emelyanova, Oksanen, Abass, & Rautio, 2018). Although in some cases, increasing the temperature can increase the mortality rate of the pathogen.

Climate change affects humidity, which will affect vectors/hosts as well. Many vector-borne infectious diseases are found to be associated with rainfall. The development of mosquito larvae as vectors is increasing rainfall and increasing temperatures. (Wu X., Lu, Zhou, Chen, & Xu, 2016) (Figure 2).

DISCUSSION
A literature review has identified 1415 species of infectious microorganisms that are pathogenic (causing disease) in humans. (Taylor, Latham, & Woolhouse, 2001) Of the 1415 types of microorganisms, there are 217 viruses and small
particles (prions), 528 bacteria and rickets, 307 fungi, 66 protozoa, and 287 types of worms. About 61% (968 species) live in animals and can be transmitted to humans (zoonoses), and 175 other species cause diseases that can appear at any time. Of these, 132 are zoonotic. (Taylor, Latham, & Woolhouse, 2001)

Microorganisms, especially types of viruses, usually evolve to cause new diseases. It is not well known how these adaptations and evolutionary changes occur. However, some viruses can spread from human to human without evolutionary changes such as Ebola. (Morse, et al, 2012) Transmission of air through droplets and aerosols is one way of spreading the virus efficiently among humans, causing outbreaks challenging to control. (Kutter; Spronken; Fraaij; Fouchier; & Herfst, 2018). Changes in the environment, social or socio-economic changes affect the dynamic changes of the transmission of these pathogenic microorganisms to humans, or the occurrence of the transfer of these microorganisms to other species (referred to as stage 1). Phase 2 is regional, where viruses that can move from animals to humans will disrupt local or regional communities. Subsequently, step 3 will occur; where transmission has occurred from humans to humans and a more comprehensive range of disease areas (global). (Morse, et al, 2012)

Climate change is real. Scientists estimate that Indonesia will likely be one of the regions most affected by climate change (Irwansyah, 2016). Air pollution with carbon dioxide emissions affects air quality, especially in urban areas. The transportation sector contributes 80% to air quality coupled with air pollution from industry, forest fires, and other domestic activities. (Haryanto, 2020) Diseases of acute respiratory tract infections (ARI), bronchial asthma, bronchitis, and eye and skin irritation are thought to originate from this air pollution. National ARI prevalence is 12.8%. (Ministry of Health of the Republic of Indonesia, 2018).

Globally, children are estimated to suffer 88% of diseases due to climate change. The weaker they are, the higher the burden (Philipsborn & Chan, 2018). With climate change, the strain on mental health in children and families can be expected to increase. Drought and poverty can cause an exodus of people from various regions so that the escalation of social tensions in the mobile society will also increase (Dyregrov & Yule, 2018).

CONCLUSION AND RECOMMENDATIONS

Based on the findings in this study, it concludes that: (1) Plague or pandemic is not something that has just happened. Before and after, there was an outbreak in the history of human life. Outbreaks and pandemics usually recur; (2) Infectious diseases that become epidemics or pandemics are caused by pathogenic microorganisms that can adapt (evolution) and have more ability to be able to transmit from human to human quickly. Environmental changes and ecosystem changes have an impact on the occurrence of epidemics, and climate change affects ecological and ecosystem changes. So that means that outbreaks will probably continue. Given the potential for outbreaks to recur in the future, our future generations, namely children, must be given the correct knowledge and understanding in dealing with an epidemic or pandemic. It is vital to ensure that the next generation can carry out mitigation efforts properly to reduce the risk of an epidemic or pandemic.

REFERENCES


