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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 (Schlipköter & 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 in 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

NO	Year of Plague	Plague Description
1.	1347 AD	Bubonic plague or Black Death Plague. Occurs in Europe and Asia, with mortality 30 to 50% of the world's population.
2.	Early 1500 AD	The beginning of smallpox in the Americas
3.	1881 AD	The fifth cholera pandemic worldwide.
4.	1918 AD	Pandemic Influenza Spanish Flu. Global occurrence with the number of deaths 20 million - 100 million deaths (111 - 555 deaths per 10,000 people)
5.	1957 AD	Asian Influenza Pandemic. Global occurrence with the number of deaths 0.7 million - 1.5 million (2.4 - 5.1 deaths per 10000 people)
6.	1968 AD	Hong Kong Influenza Pandemic. Global occurrence with 1 million deaths (2.8 deaths per 10,000 people)
7.	1981 AD	The HIV AIDS Pandemic begins.
8.	2003 AD	Severe Acute Respiratory Syndrome occurs in 37 countries out of 4 countries with 8098 cases and 744 deaths.
9.	2009 AD	Pandemic Influenza Swine Flu with 151 700 - 575 500 deaths.
10.	2012 AD	Middle East Respiratory Syndrome (MERS) occurs in 22 countries with 1879 cases and 659 deaths.
11.	2013 AD	Ebola virus in West Africa (10 countries) with 28646 cases and 11323 deaths.
12.	2015 AD	Zika virus pandemic occurred in 76 countries, with 2656 cases of microcephaly or central nervous system malformations.

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

NO	Year of Plague	Plague Description
1.	1 H/7 AD Century	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 Quds 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--Asy'ary, Yazid bin Abi Sufyan, Al-Harith bin Hisham, Suhail 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-Jarif 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.
2.	2 H/8 AD Century	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
3.	3 H/9 AD Century	221 H/836 AD in Basrah. 249 H/863 AD in Iraq.
4.	4 H/10 AD Century	301 H/913 AD 324 H/936 AD in Isfahan. 346 H/957 AD
5.	5 H/11 AD Century	406 H/1015 AD in Basrah. 423 H/1032 AD in India and Asia.

		425 H/1034 AD in Shiraz, Wasith, Ahwaz, Basrah and Baghdad. 433 H/1041 AD in Mousil, Algeria, and Baghdad. 449 H/1057 AD in Bukhara, Azerbaijan, Ahwaz, Wasith, Basrah, and Samarkand. 452 H/1060 AD in Hijaz and Yemen. 455 H/1063 AD in Egypt. 469 H/1076 AD in Damascus. 478 H/1085 AD, it began in Iraq and spread to the whole world.
6.	6 H/12 AD Century	575 H/1179 AD in Baghdad. 597 H/1200 AD in Egypt
7.	7 H/13 AD Century	633 H/1235 AD
8.	8 H/14 AD Century	720 H/1320 AD in Egypt. 749 H/1348 AD in Makkah. 764 H/1362 AD in Cairo and Damascus. 769 H/1367 AD 771 H/1369 AD in Damascus. 781 H /379 AD and 783 AH/1381 AD in Egypt. 791 H/1389 AD
9.	9 H/15 AD Century	809 H/1406 AD in Egypt 813 H/1410 AD, 819 H/1416 AD, 821 H/1418 AD 822 H/1419 AD, 827 H/1423 AD in Quds. 833 H/1429 AD in Egypt. 841 H/1437 AD, 849 H/1445 AD, 853 H/1449 AD 859 H/1454 AD, 864 H/1459 AD, 873 H/1468 AD, 886 H/1481 AD in Andalusia. 897 H/1491 AD in Quds.
10.	10th century	969 H/1561 AD in Bait al-Maqdis and its surroundings. 980 H/1572 AD to 982 H/1574 AD 987 H/1579 AD 995 H/1586 AD
11.	11th Century/17 AD	1028 H/1618 AD in Quds and surrounding
12.	12th Century/18 AD	1156 H/1742 AD 1174 H/1760 AD 1200 H/1785 AD in Bait al-Maqdis and surroundings.
13.	13th Century H	1228 H/1812 H

Adapted from (Butar Butar, 2020)

Apart from the data collection that is quite different from the historical documents above, it indicates that a pandemic or outbreak will recur in human life. Almost all cases are caused by microorganisms (infectious disease). Predicting microorganisms that will become pathogenic and cause global pandemics is very difficult. Microorganisms have various ways to enter the human body, ranging from blood and bodily fluids, through vectors, fecal-oral to through the respiratory tract. When an evil microorganism (from now on referred to as a pathogen) can cause a pandemic, it will have more ability than other microorganisms and is generally able to spread through the airways, ready to spread even during incubation. At the same time, there is no immunity in humans. (Adalja, Watson, Toner, Cicero, & Inglesby, 2019)

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, wastewater discharges in the bathroom/washing place have flowed directly to the drain/river, and approximately 18.9% flow straight without storage (on the ground). (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)

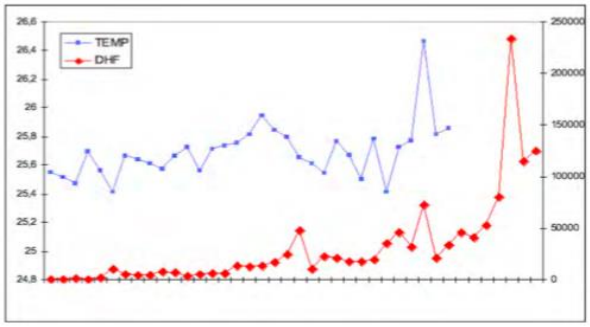

Figure 1. Changes (increases) in temperatures have occurred since 1998 and changes (improvements) in dengue cases in Indonesia. Taken from (Haryanto, 2009)

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).

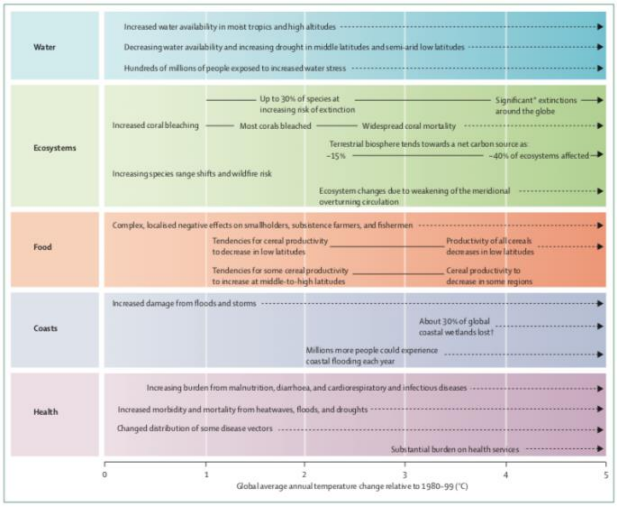

Figure 2. Effects of temperature changes on health, the coast, food, ecosystems, and water, Taken from (Costello, et al., 2009)

Climate change can affect the stability of the human immune system and facilitate the transmission of pathogens. Climate change influences disease transmission by shifting the vector's geographical range and by shortening the incubation period for pathogens. Increased temperatures associated with climate and sea level will cause an increase in waterborne diseases and toxins, such as cholera poisoning and seafood (Bezirtzoglou, Dekas, & Charvalos, 2011). Climate change also affects harvests, malnutrition, hunger, increased mobility of the population due to disasters and conflict. (Wu X. , Lu, Zhou, Chen, & Xu, 2016).

If we look at one infectious disease, especially on children, the fact shows that: an increase in diarrhea cases with 1.6 million deaths of children under five years, an increase in gastrointestinal cases in the United States (2 to 19 million cases) and related to water drinking with 19 000 cases of food originating. Even for virus infection that the vaccine is already available still can be a problem. For example, Cholera cases that remain a problem and are affected by climate change. The number of cholera cases worldwide is 3 to 5 million, with 100 000 to 120 000 deaths every year, especially children. (Ahdoot & Pacheco, 2015)

Extreme weather, such as hurricanes Katrina and Rita, caused 5000 children are away from their families. Only in America, the separated children joined the family after six months. Flooding due to sizable rainfall in Pakistan in 2010 caused 10 million refugees and over 100,000 children at risk of death from malnutrition. (Ahdoot & Pacheco, 2015)

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% (868 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 always 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

1. Adalja, A. A., Watson, M., Toner, E. S., Cicero, A., & Inglesby, T. V. (2019). Characteristics of microbes most likely to cause pandemics and global catastrophes. Current Topics in Microbiology and Immunology, 424, 1–20.
2. Ahdoot, S., & Pacheco, S. E. (2015). Global climate change and children's health. Pediatrics.
3. Ali, I., & Alharbi, O. M. (2020). Disease, management, treatment, and social impact. Science of The Total Environment, 728, 1-6.
4. Alradhawi, M., Shubber, N., Sheppard, J., & Ali, Y. (2020, June). Effects of the COVID-19 pandemic on mental well-being amongst individuals in society- A letter to the editor on "The socio-economic implications of the coronavirus and COVID-19 pandemic: A review". International Journal of Surgery, 78, 147-148.
5. Ashrafuzzaman, M., & Furini, G. L. (2019, June). Climate change and human health linkages in the context of globalization: An overview from global to southwestern coastal region of Bangladesh, 127, 402-411.
6. Bezirtzoglou, C., Dekas, K., & Charvalos, E. (2011, December). Climate changes, environment and infection: Facts, scenarios and growing awareness from the public health community within Europe. Anaerobe, 17(6), 337-340.
7. Brossollet, J., & Mollaret, H. H. (1994). Pourquoi la peste ? Le Rat, la Puce et le Bubon. Paris: Gallimard.
8. Butar Butar, A. R. (2020). Medical literature-pandemic in Islamic world.
9. Cakraborty, I., & Maity, P. (2020). COVID-19 outbreak: Migration, effects on society, global environment and prevention. Science of the Total Environment, 728, 1-7.
10. Cook, D. N. (1998). Born to die, diseases and new world conquest 1492-1650. Cambridge, UK: Cambridge University Press.
11. Costello, A., Abbas, M., Allen, A., Ball, S., Bell, S., Bellamy, R., et al. (2009). Managing the health effects of climate change. The Lancet.
12. Dalziel, B. D., Kissler, S., Gog, J. R., Viboud, C., Bjørnstad, O. N., Metcalf, C. E., et al. (2018, October 05). Urbanization and humidity shape the intensity of influenza epidemics in U.S. cities. Science, 362(6410), 75-79.
13. Ditchburn, J.-L., & Hodgkins, R. (2019, September). Yersinia pestis, a problem of the past and a re-emerging threat. Biosafety and Health, 1(2), 65-70.
14. Dobson, A. P., & Carper, E. R. (1996). Infectious Diseases and Human population History: establishment of disease has been a side effect of the growth of civilization. BioScience, 46(2), 115–126.
15. Dyregrov, A., & Yule, W. (2018). Children and natural disasters. European Journal of Psychotraumatology, 9(1500823), 1-3.

16. Fiore, A. E., Bridges, C. B., Katz, J. M., & Cox, N. J. (2013). Inactivated influenza vaccines. In S. A. Plotkin, W. A. Orenstein, & P. A. Offit (Eds.), Vaccines (6 ed., pp. 257-293). Saunders.
17. Fry, M. (2016). Avery, MacLeod, and McCarty Identified DNA as the Genetic Material: A Celebrated Case of a Clinical Observation That Led to a Fundamental Basic Discovery. In M. Fry, Landmark Experiments in Molecular Biology (pp. 41-110). Academic Press.
18. Geard, N., Glass, K., McCaw, J. M., McBryde, E. S., Korb, K. B., Keeling, M. J., et al. (2015, December). The effects of demographic change on disease transmission and vaccine impact in a household structured population. Epidemics, 13, 56-64.
19. Guz, A. N., & Rushchitsky, J. J. (2009). Scopus: A system for the evaluation of scientific journals. International Applied Mechanics, 45(4), 351–362.
20. Haas, C. (2006, April-May). The Antonine plague. Bulletin de l'Académie Nationale de Médecine, 190(4-5), 1093-1098.
21. Harbeck, M., Seifert, L., Hänsch, S., Wagner, D. M., Birdsell, D., Parise, K. L., et al. (2013). Yersinia pestis DNA from Skeletal Remains from the 6th Century AD Reveals Insights into Justinianic Plague. Plos Pathogens, 9(5), e1003349.
22. Haryanto, B. (2009). Climate Change and Public Health in Indonesia Impacts and Adaptation Budi Haryanto Austral Policy Forum 09-05S. Nautilus Institute Australia.
23. Haryanto, B. (2020). Indonesia: Country report on children's environmental health. Reviews on Environmental Health.
24. Horgan, J. (2019, may 2). Antoine Plague. Retrieved from Ancient history Encyclopedia: https://www.ancient.eu/Antonine_Plague/
25. Huremovic, D. (2019). Brief History of Pandemics (Pandemics Throughout History). Psychiatry of Pandemics, May 16, 7–35.
26. IFRC. (2018). Major epidemic And Pandemic Diseases.
27. Irwansyah. (2016, July). What do scientists say on climate change? A study of Indonesian newspapers. Pacific Science Review B: Humanities and Social Sciences, 2(2), 58-65.
28. James, S. H., & Whitley, R. J. (2017). Influenza Viruses. In J. Cohen, W. G. Powderly, & S. M. Opal (Eds.), Infectious Diseases (4 ed., Vol. 2, pp. 1465-1471.e1). Elsevier.
29. Kurane, I. (2010, December). The Effect of Global Warming on Infectious Diseases. Osong Public Health and Research Perspectives, 1(1), 4-9.
30. Kutter, J. S., Spronken, M. I., Fraaij, P. L., Fouchier, R. A., & Herfst, S. (2018, February). Transmission routes of respiratory viruses among humans. Current Opinion in Virology, 28, 142-151.
31. Laing, T. (2020). The economic impact of the Coronavirus 2019 (Covid-2019): Implications for the mining industry. The Extractive Industries and Society.
32. Madhav, N., Oppenheim, B., Gallivan, M., Mulembakani, P., Rubin, E., & Wolfe, N. (2017). Pandemics: Risks, Impacts, and Mitigation. In Disease Control Priorities, Third Edition (Volume 9): Improving Health and Reducing Poverty.
33. Mamelund, S.-E. (2017). Influenza, historical. In S. R. Quah (Ed.), Reference Module in Biomedical Sciences (2 ed., pp. 247-257). Academic Press.
34. Martin, P. (2008, September–October). Epidemics: Lessons from the past and current patterns of response. Comptes Rendus Geoscience, 340(9-10), 670-678.
35. Miles, M. B., Huberman, A. M., & Saldana, J. (2014). Qualitative Data Analysis: A Methods Source Book. California: Sage Publications, Inc.
36. Ministry of Health of the Republic of Indonesia. (2018). Basic Health Research 2018. Jakarta: Ministry of Health of the Republic of Indonesia.
37. Morse, S. S., Mazet, J. A., Woolhouse, M., Parrish, C. R., Carroll, D., Karesh, W. B., et al. (2012). Prediction and prevention of the next pandemic zoonosis. The Lancet.
38. Nicola, M., Alsafi, Z., Sohrabi, C., Kerwan, A., Al-Jabir, A., Iosifidis, C., et al. (2020, June). The socio-economic implications of the coronavirus pandemic (COVID-19): A review. International Journal of Surgery, 78, 185-193.
39. Papagrigorakis, M. J., Yapijakis, C., Synodinos, P. N., & Baziotopoulou-Valavani, E. (2006). DNA examination of ancient dental pulp incriminates. International Journal of Infectious Diseases, 10, 206—214.
40. Pappas, G., Kiriaze, I. J., & Falagas, M. E. (2008). Insights into infectious disease in the era of Hippocrates. International Journal of Infectious Diseases, 12, 347-350.
41. Philipsborn, R. P., & Chan, K. (2018). Climate change and global child health. Pediatrics, 141, e20173774.
42. Phillips, H., & Killingray, D. (2003). The Spanish Influenza Pandemic of 1918–19: New Perspectives. In H. Phillips, & D. Killingray (Eds.). London.
43. Pimentel, D., Cooperstein, S., Randell, H., Filiberto, D., Sorrentino, S., Kaye, B., et al. (2007). Ecology of increasing diseases: Population growth and environmental degradation. Human Ecology, 35, 653-668.
44. Ramalho-Ortigao, M., & Gubler, D. J. (2020). Human Diseases Associated With Vectors (Arthropods in Disease Transmission). In E. T. Ryan, D. R. Hill, T. Solomon, N. E. Aronson, & T. P. Endy (Eds.), Hunter's Tropical Medicine and Emerging Infectious Diseases (10 ed., pp. 1063-1069). Elsevier.
45. Roberts, C. A., & Buikstra, J. E. (2019). Bacterial Infections. In J. E. Buikstra (Ed.), Ortner's Identification of Pathological Conditions in Human Skeletal Remains (3 ed., pp. 321-439). Academic Press.
46. Schlipköter, U., & Flahault, A. (2010). Communicable diseases: Achievements and challenges for public health. Public Health Reviews.
47. Targonski, P. V., & Poland, G. A. (2017). Influenza. In S. R. Quah (Ed.), International Encyclopedia of Public Health (2 ed., pp. 238-246). Academic Press.
48. Taylor, L. H., Latham, S. M., & Woolhouse, M. E. (2001). Risk factors for human disease emergence. Philosophical Transactions of the Royal Society B: Biological Sciences.
49. Tosepu, R., Gunawan, J., Effendy, D. S., Ahmad, L. A., Lestari, H., Bahar, H., et al. (2020). Correlation between weather and Covid-19 pandemic in Jakarta, Indonesia. Science of The Total Environment, 725, 138436.
50. Treanor, J. J. (2015). Influenza (including avian influenza and swine influenza). In J. E. Bennett, R. Dolin, & M. J. Blaser (Eds.), Mandell, Douglas, and Bennett's Principles and Practice of Infectious Diseases (8 ed., Vol. 2, pp. 2000-2024.e6). Saunders.

51. Tulchins, T. H., & Varavikova, E. A. (2015). Communicable diseases. In T. H. Tulchins, & E. A. Varavikova, The New Public Health (3 ed., pp. 149-236). Academic Press.
52. Wagner, D. W., Klunk, J., Harbeck, M., Devault, A., Waglechner, N., Sahl, J. W., et al. (2014, April). Yersinia pestis and the Plague of Justinian 541–543 AD: a genomic analysis. The Lancet Infectious Diseases, 14(4), 319-326.
53. Waits, A., Emelyanova, A., Oksanen, A., Abass, K., & Rautio, A. (2018, December). Human infectious diseases and the changing climate in the Arctic. Environment International, 121(1), 703-713.
54. Wu, D., Lu, J., Liu, Y., Zhang, Z., & Luo, L. (2020). Positive effects of COVID-19 control measures on influenza prevention. International Journal of Infectious Diseases, 95, 345-346.
55. Wu, X., Lu, Y., Zhou, S., Chen, L., & Xu, B. (2016). Impact of climate change on human infectious diseases: Empirical evidence and human adaptation. Environment International.
56. Wu, Z., & McGoogan, J. M. (2020). Characteristics of and important lessons from the coronavirus disease 2019 (COVID-19) outbreak in China: summary of a report of 72 314 cases from the Chinese Center for Disease Control and Prevention. Jama, 323(13), 1239-1242.
57. Zambrano-Monserrate, M. A., Ruano, M. A., & Sanchez-Alcalde, L. (2020). Indirect effects of COVID-19 on the environment. Science of The Total Environment, 728.