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INFECTIOUS DISEASE – A CHALLENGE FOR INTERNATIONAL SECURITY

Abstract

One of the events that may be the source of a natural disaster are human infectious diseases. Many of the diseases that contributed to the epidemic have been noticed and named since ancient times. The first two decades of the 21st century saw the emergence of a succession of new epidemics. Between November 2002 and July 2003, the SARS virus, which originated in southern China, infected around 8,000 people in 29 countries, killing 774 of them. In December 2019, the coronavirus SARS-CoV-2, responsible for the emerging epidemic of respiratory infections, causing COVID-19 disease, was identified for the first time in Wuhan, China. Infectious diseases pose difficulties in combating them due to the global nature of transport and trade, especially in food. Widespread travel, migratory movements resulting from poverty and political and social instability, or huge agglomerations of people combined with poverty zones on the periphery all lead to the spread of many infectious diseases. Currently, the epidemiology of infectious diseases continues to pose a significant challenge, not only for developing countries, but for the entire international community, due to the emergence of new disease entities.

Key words

human infectious diseases, SARS-CoV-2, COVID-19, epidemic

Introduction

A challenge to the security of modern countries is posed by so-called social threats, often interchangeably referred to as socio-cultural or civilization threats. The war in Ukraine, combined with poverty and the lack of prospects of improving living conditions in underdeveloped countries, is becoming the cause of mass migration, both legal and illegal, to rich countries. Moreover, mass migration from poor and underdeveloped countries is the result of conflicts, political persecution, the phenomenon of "decaying" countries, and environmental devastation. As experience shows, migration and demographic changes can cause shifts in traditional social structures, as well as social and political tensions in countries with a high percentage of immigrants. Also in Poland, legal migration shows an upward trend, which is reflected in a systematic increase in the number of refugees coming to the Republic of Poland, especially from Ukraine. The increase in migration is accompanied by the development of illegal immigration. It should be added that illegal border crossing takes place mainly with the participation of international, organized crime groups.

In the area of common security threats, the primary goal of the state's activity is to provide citizens with conditions for a better life in a healthy environment by protecting nature, including stimulating the processes of sustainable development. The most common phenomena that threaten human life, health and property are natural disasters[1]. Natural disasters, both unpredictable and untamed, affect thousands of people around the world every day. Regardless of whether a fire breaks out, water spills, a building collapses, or an infectious disease occurs in humans, animals or plants; regardless of the extent of the damage, and regardless of whether they strike in a predictable manner, or by surprise, spread slowly or suddenly or if their consequences are visible or invisible, they always bring dramatic consequences and a feeling of powerlessness and helplessness. At this point, it is necessary to refer to the events that took place in 2011. Then, after a strong earthquake off the coast of Japan, a devastating wave flooded coastal cities and industrial areas, thus taking thousands of lives. The quakes resulted in an emergency shutdown of four nuclear reactors, and further reactor damage incidents threatened the safety of millions of citizens. It turned out, however, that an efficient, effective and stable state, as well as institutions carrying out tasks on its behalf, allowed for a quick rescue operation, counteracting the effects of the accident and evacuating residents from areas at risk of a recurring quake or radiation coming from the damaged blocks of the nuclear power plant. In this case, despite the great tragedy, the security can be praised, because the state itself and the institutions established to carry out tasks were effective both in counteracting further threats and in mitigating the consequences of the crisis. The natural disaster that occurred in 2010 in Haiti was a different event in its assessment. In this case, the state failed to perform the necessary duties to its citizens. Here we can point out, first of all, the lack of an organized and coordinated rescue operation, medical care or vigilance for the

[1] *Bezpieczeństwo RP w ujęciu systemowym*, (ed.) B. Wiśniewski, S. Zalewski, Bielsko-Biała 2006, p. 29.

safety of the population. The presented approach shows the close interdependence of national security with the socio-economic development of the country[2].

History of human infectious diseases

One of the events that may be the source of a natural disaster are human infectious diseases. Many of the diseases that contributed to the epidemic have been noticed and named since ancient times. Some researchers consider the plague that devastated Athens during the Peloponnesian War (431–404 BC) to be the first documented pandemic. It killed two-thirds of the Athenian population and weakened the city-state to such an extent that the Spartan coalition was victorious. In turn, in 412 BCE a dangerous infection occurred in the port city of Perinth in the northern Peloponnese. Hippocrates, who lived at the time, noticed common symptoms in the form of coughing, sore throat and aches in other parts of the body, as well as difficulty in swallowing. This is probably how the influenza epidemic was first described.

Cholera, which affected practically every corner of the world in the 19th century, was also first described by Hippocrates. The disease, which was difficult to diagnose and, if untreated, could kill in as little as a few hours, was transmitted through bacteria found in contaminated water supplies. Seven cholera pandemics have swept through the world since 1817. They affected, among others, the people of Russia, where the plague killed more than a million people, Spain, Indonesia, China and the United States. Appearing among British soldiers, it was carried to India, where it took millions more lives. Only in the mid-19th century, in 1840, the English physician John Snow discovered that the cause of the epidemic in London was contaminated drinking water. Thanks to his discovery, sanitary standards improved, and the first vaccine was developed at the end of the century. According to WHO estimates, cholera affects 1.3 to 4 million people each year, and almost 143 thousand dies.

Also, before our era, around the year 224, in the central and west Asia the so-called black death, was first reported, caused by Yersinia pestis[3] bacteria, transmitted by fleas feeding on small rodents. It owes its name to the most specific symptoms, which are dark spots on the patient's body. China was most likely the source of the plague. For several centuries, it did not leave that region. It was not until the 6th century that rats infected with the plague appeared on board of the merchant ships that entered Constantinople. It began then, considered to be one of the deadliest pandemics in the history of the world, the so-called plague of Justinian. Over two hundred years, when the population of the whole world at the time of the outbreak of the plague did not exceed 200 million people, it killed from 25 to 50 million people. In the 14th century, a plague hit Europe, killing a third of its population. In Florence alone, between 45 and 75% of the population died within six months, and

[2] See R. Socha, *Współczesne postrzeganie zagrożenia*, [in:] *Zarządzanie kryzysowe. Teoria, praktyka, konteksty, badania*, (ed.) J. Stawnicka, B. Wiśniewski, R. Socha, Szczytno 2011, p. 19–30.

[3] It is named after Swiss bacteriologist Alexandre Yersin, who in 1894 identified the bacteria that causes the disease.

in Hamburg, London and Paris every second person died. In 1855, another plague pandemic began in the Chinese Yunnan province, which spread, among others, to India. Its total harvest was 12 million victims, including over 10 million in India alone. In the late 19th century, the Swiss bacteriologist Alexandre Yersin identified the bacteria that caused the disease, and a vaccine against the plague was developed in India[4].

The Spanish epidemic that decimated humanity between 1918 and 1919 is often referred to as the most terrible pandemic to have hit the world. Half a billion people were infected with the H1N1 virus, which at that time was one third of the world's population. The interesting fact is that although the epidemics probably caused more victims than the World War I, it did not get as bad press as many other epidemics that hit the world. The methods of fighting the epidemic were similar to those used in the fight against the epidemic caused by the SARS-CoV-2 coronavirus, particularly quarantine was introduced, patients were placed in isolation, disinfection was carried out and the frequency of public events was limited. As a result, the plague was gone. It was not until 2005 when the source of the virus was found to be birds, from which the virus transferred to pigs and then to humans.

The first two decades of the 21st century saw the emergence of a succession of new epidemics. Between November 2002 and July 2003, the SARS virus, which originated in southern China, infected around 8,000 people in 29 countries, killing 774 of them. In 2009, there was an outbreak of what is commonly known as swine flu, a variant of the same virus that caused the Spanish flu. On the 11th of June 2009 WHO declared a pandemic state for the first time in 41 years. In turn, between December 2013 and January 2016, there was an attack of the Ebola virus, which sickened 28,646 people and killed 11,323 of them[5]. As the World Health Organization (WHO) stressed, further attacks by new viruses are only a matter of time. And we have lived to see it. In December 2019, the coronavirus SARS-CoV-2, responsible for the emerging epidemic of respiratory infections, causing COVID-19 disease, was identified for the first time in Wuhan, China.

Human infectious diseases in the XXI century

Currently, the advancement of medicine, including the invention of vaccines, makes us much better equipped to prevent and control infectious diseases than we used to be. On the other hand, "globalization and unlimited opportunities for rapid movement of people around the world create a number of threats to human health and life, including for Polish citizens. Their source may be, among others drug-resistant bacteria and viruses with significant negative health, economic and social consequences, as exemplified by the SARS-CoV-2 coronavirus pandemic. The challenge in this area is the efficient, adequate to the needs, action of state authorities in combating epidemic threats and their consequences, and the

[4] K. Farrel, *Demony pandemii. Choroby zakaźne gnębią ludzkość od tysięcy lat*, „Fokus Wiedza" 2000, no.: 1, p. 20–25.

[5] Ibidem

appropriate preparation of procedures, as well as the availability of an appropriate number of medical personnel and protective measures"[6].

Infectious diseases pose difficulties in combating them due to the global nature of transport and trade, especially in food. Widespread travel, migratory movements resulting from poverty and political and social instability, or huge agglomerations of people combined with poverty zones on the periphery all lead to the spread of many infectious diseases. Moreover, numerous natural disasters occurring in the world may cause mass incidence of infectious diseases. An additional problem is the spread of sexually transmitted diseases. A separate challenge is related to the reduced human immunity due to the aging of the population or immunosuppressive treatment[7].

The first two decades of the 21st century are a time when the epidemiological situation in the world and in Poland is systematically becoming more and more difficult due to the increasing risk of new and recurring infections and infectious diseases, against which no effective drugs or vaccines have yet been developed. The year 2020 shows the great threat to public health posed by infectious diseases that can be "imported" to the countries from geographically distant regions of the world. Infectious diseases, which can be spread through acts of terror using biological pathogens, are also a threat. According to the World Health Organization, infections and infectious diseases are still among the leading causes of morbidity and mortality in the world. The consequence of the overuse and irrational use of antibiotics, both in therapy and in the prevention of infections, is the increase in resistance of biological pathogens, which in turn generates an increase in expenditure by the state on health care. For the society, the importance of the problem of infections is enormous and concerns many aspects of social life, in particular medical, legal and economic. Therefore, the functioning of an efficient system of comprehensive supervision over infections and infectious diseases is one of the priorities of the health care systems in the world[8].

On the threshold of the third decade of the 21st century, on March 11, 2020, the World Health Organization announced a global pandemic caused by a new species of virus called SARS-CoV-2, which causes COVID-19 disease. SARS-CoV-2 is a virus that belongs to the coronavirus family. The coronaviruses known so far to cause infection in humans are viruses that cause symptoms primarily in the respiratory system. By 2019 of the six viruses known to cause infections in humans, four lead to a mild cold (229E, OC43, NL63, HKU1) and two can cause life-threatening acute respiratory failure (SARS-CoV and MERS).

The SARS-CoV-2 coronavirus emerged in Wuhan, China in mid-December 2019. However, already in November 2002, also in China, in Guangdong Province emerged a new species of coronavirus identified as

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[6] *National Security Strategy of the Republic of Poland* approved from 2020, p. 9.

[7] https://www.synevo.pl/biblioteka-pacjenta/epidemiologia/ (access: 15.05.2020).

[8] See Explanatory Memorandum to the Draft Law on the Prevention and Control of Infections and Infectious Diseases in Humans, p. 1-3 3 (source: https://bip.kprm.gov.pl/ftp/kprm/dokumenty/071025u1uz.pdf, access: 10.04.2020).

SARS-CoV – from English language *severe acute respiratory syndrome coronavirus*, which causes severe acute respiratory distress syndrome. Transmission of the virus between individuals started occurring at a rapid pace. There were also mass infections[9]. One of the infected doctors passed on the virus to 17 people during a trip to Hong Kong, which led to transmission of the virus outside China. In one season, 8273 people from 37 countries were infected. 775 people suffered death. Interestingly, on July 5, 2003, less than eight months after the virus was first identified, the WHO announced the eradication of the SARS-CoV virus, i.e., the complete eradication of the infectious disease worldwide. The sudden disappearance of the virus is explained in two ways. First, human coronavirus infections are seasonal, with the highest frequency in winter and early spring. Hence, it can be assumed that the end of the epidemic falling in July was no coincidence. Secondly, the symptoms of infection are relatively pronounced and are evident before the patient enters the most infectious phase of the disease. Thus, the use of effective measures to prevent the transmission of the virus and the isolation of patients may have led to the disappearance of the virus [10].

The concept of "epidemic"

Aiming to present the essence of the state of epidemic threat and the state of epidemics in the context of the functioning of the country under emergency conditions, further consideration should begin with the clarification of the concept of "epidemic". The word "epidemic" derives from the Greek from epi-demos, meaning "among the people," and was probably originated by Hippocrates. Hundreds of years later, another was created – pandemic, from pan-demos, meaning "all the people". In a general sense, an epidemic is the occurrence in a community or region of cases of a disease with a frequency that clearly exceeds that normally expected in that place and time[11]. A similar, but slightly broader approach is presented by the legal definition contained in the Act of 2008 on preventing and control of infections and infectious diseases in humans, according to which an epidemic is the occurrence of infections or cases of an infectious disease in a given area[12] in a clearly greater number than in the previous period or the occurrence of infections or infectious diseases that have not occurred so far[13]. The Act also introduces the concept of an epidemic threat, which should be understood as the emergence of conditions or indications in a given area that point to the risk of an epidemic.

When describing an epidemic, it is therefore necessary, first and foremost, to determine precisely the time when the cases of the disease occurred and the geographic region. Determining whether an

[9] A 44-year-old man hospitalized in Guangzhou has infected 19 relatives and more than 50 members of the medical staff during his illness.

[10] M. Kurdziel, M. Bijak, *Działania policyjne w środowisku COVID-19*, Warszawa 2020, p. 8.

[11] See P. Bress, *Public health action in emergencies caused by epidemics. A practical guide*, World Health Organization, Genewa 1986.

[12] Infection is the occurrence of conditions or indications in a given area that point to the risk of an epidemic (source: Act on Prevention and Control of Infections and Infectious Human Diseases of December 5, 2008 (Dz.U. 2020, item 1845), art. 2, point 32).

[13] Act on Prevention and Control of Infections…, art. 2 point 9.

epidemic is occurring also depends on the level of expected disease incidence in a given area during a given season. In contrast, a small number of cases of a previously unrecognized disease, coinciding in time and space, may be sufficient to speak of an epidemic.

Epidemics can come from a single source or be continuous in nature. In the first case, susceptible individuals are exposed more or less simultaneously to a single source of infection. This results in a rapid increase in the number of new cases of the disease in a short period of time. In contrast, in epidemics of a continuous nature, diseases are passed from person to person, hence the initial increase in the number of new cases occurs more slowly than in single-source epidemics[14].

Conclusions

The study of the course of development and spread of diseases in a given area, in a given population is dealt with by epidemiology[15]. The origins of epidemiology date back to the time of Hippocrates, when the idea was expressed, that environmental factors can affect the occurrence of a disease. However, it was not until the 19th century that the phenomena that determined the spread of a disease in certain human populations began to be studied intensively. John Snow, based on his analysis of the whereabouts of everyone who died of cholera in London between 1848-1849 and 1853-1854, developed a theory on the spread of infectious diseases, suggesting that cholera could be transmitted by contaminated water. Through the results of his research, he encouraged authorities to make improvements in water supply even before the microorganisms were discovered, which had a direct impact on the implementation of social policy. From the mid-19th century onward, the applied approach of comparing disease rates in human populations began to become a frequent source of information needed to take appropriate action. In the late 19th and early 20th centuries, this type of approach was increasingly used. This method, applied mainly to infectious diseases, became an important instrument in portraying the relationship between environmental conditions or factors and certain diseases. The roots of modern epidemiology go back to the 1950s, when studies were conducted on the relationship between smoking and lung cancer. The clinical observations carried out at the time extended the interests of epidemiology to chronic diseases.

The subject of research in epidemiology is the human population. This population can be defined both in geographic and other terms, for example, as a specific group of hospital patients, employees of a workplace that make up the unit of study, etc. The most commonly used population in epidemiological studies is the population living in a certain area, at a given time. This population then forms a base from which subgroups are selected based on criteria such as gender, age, ethnicity, etc. In the broadly understood problem of

[14] *Basics of epidemiology*, translated by N. Szeszeni-Dąbrowska, Institute of Occupational Medicine, Łódź 1996, p. 111-113.

[15] Epidemiology is the science of the prevalence and determinants of health-related diseases, conditions or events in specific populations (source: J.M. Last, *A dictionary of epidemiolog. 2nd ed*., Oxford University Press, 1988); about the prevalence and determinants of diseases, health disorders and health phenomena in specific human populations, and a system of activities that use the information obtained to reduce identified health problems in the population.

public health, the application of epidemiology is manifold[16].

Currently, the epidemiology of infectious diseases continues to pose a significant challenge, not only for developing countries, but for the entire international community, due to the emergence of new disease entities. Without a doubt, acquired immune deficiency syndrome (AIDS) can be counted among the most tragic of the newly described infectious diseases of the late 20th century.

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[16] *Basics of epidemiology…*, p. 1–5.