



Slovenian
Medical
Journal

COVID-19 – »The perfect storm?«

Covid-19 – »Popolna nevihta?«

Tatjana Lejko Zupanc^{1,2}



Tatjana Lejko Zupanc

¹ Department of Infectious Diseases and Febrile Illnesses, University Medical Centre Ljubljana, Ljubljana, Slovenia

² Department of Infectious Diseases and Epidemiology, Medical Faculty, University of Ljubljana, Ljubljana, Slovenia

Correspondence/ Korespondenca:

Tatjana Lejko Zupanc, e:
tatjana.lejko@klj.si



Infectious diseases have been accompanying mankind throughout the history. They had an impact on major historical events, accompanied great wars and human migration, and frequently changed the course of history. They cut painfully into our historic memory, and still instil fear to this very day. The last major global pandemic with a sporadic course that took hold of the globe in just a few months, was the Spanish flu. It caused more than ten million deaths and became a synonym for a pandemic disease. Even though we experienced individual outbreaks of infectious diseases after that pandemic (SARS, Ebola, bird flu, etc.), and the AIDS pandemic, the flu is still perceived as the basic pandemic infectious disease, which can be curbed with timely and appropriate planning. In 2002, we first discovered that the coronaviruses have the capability of causing a fast-spreading and lethal epidemic. It is no surprise that global experts in infectiology, microbiology, and epidemiology were very concerned when a new coronavirus was discovered in China at the end of last year, one genetically very similar to the SARS coronavirus from 2002, thereby becoming known as SARS-CoV-2. It became clear very quickly that this is a new agent and a new disease, that this disease is highly contagious, and can cause life-threatening infections in older people and those with comorbidities. The epidemic of the disease named COVID-19 spread very quickly beyond Chinese borders and had an impact on practically the whole world. In Slovenia, we had the first proven cases of infection in early March. Very soon it became clear that we were not only dealing with a viral pneumonia, but with a new disease that had manifested in numerous forms, from asymptomatic to severe forms of bilateral pneumonia, ARDS and numerous early and late onset complications. There was no reliable data on the incubation period, on the duration of contagiousness, on the method of transmission, pathogenesis, risk factors and the course of the disease, nor about clinical signs and particularities, laboratory examinations and the role of microbiological

examinations. Many of these things are still not completely understood even with intensive research work in laboratories and clinical practice across the world. The molecular test, the gold standard for proving the presence of the SARS CoV-2 virus, was available in Slovenia before the epidemic. The high sensitivity of the test brought new questions, as patients can have a positive test long after they no longer manifest any symptoms, even when they are no longer infectious.

Coronaviruses are single-helix RNA viruses, divided into 4 groups (the alpha, beta, gamma, and delta coronaviruses). Together with the novel coronavirus, 7 types of coronaviruses cause infections in humans. They are frequent agents of winter cold diseases. Three coronaviruses (SARS-CoV-1, MERS-CoV, and SARS-CoV-2) can cause severe pneumonia and all three have caused major outbreaks. The cellular receptor for the virus is the angiotensin-converting enzyme II (ACE2), which is strongly expressed in the mucosa of the respiratory tract. The incubation period of the disease is 2 – 14 days, mainly the period between the 5th and 7th day. The first signs are non-specific symptoms in the respiratory system, muscle pain and increased body temperature. Many patients also report losing the senses of smell and taste. After approximately 7 days, there is an exacerbation in some cases that can lead to acute respiratory distress and death. The radiogram of the lungs or a computed tomography (CT) scan of the thoracic cavity shows bilateral infiltrates, which are spreading from the periphery towards the hili. Many aspects of the disease have been described with complications in the cardiovascular system, with a tendency towards thrombotic events and kidney failure. It may affect any organ system. An especially dangerous event is the so-called silent hypoxaemia, as the affected person does not feel the lack of oxygen in their blood, and often arrives at the hospital in such a severe state that they require intubation and artificial ventilation. Hospitalisations are long, and artificial ventilation frequently lasts several weeks. The

most important factors for a severe course of the disease and death are the patient's age and the presence of some comorbidities, especially hypertension, cardiovascular diseases, diabetes, and obesity.

Many people fall ill with a very temperate clinical picture, similar to a cold. Approximately 10 – 20% of patients with clinical signs and symptoms require hospitalisation, and about 5% hospitalisation in an intensive care unit. The data on mortality depends on the population types, with the highest rate among the elderly. Considering the results of studies, we can estimate so far that approximately 20 – 40% of people have an asymptomatic infection. Those infected begin transmitting the infection at least one day before the onset of the signs of the disease. The infectivity is the highest for the first few days of the disease, and after 20 days from the onset of symptoms, it was not proven in even the most severely diseased and immunocompromised patients. Persons manifesting no symptoms can safely return to their work environment 10 days after a positive swab.

The novel coronavirus transmits among humans mainly through droplets. However, because virus-containing droplets, i.e., fomites, remain on surface, transmission is also possible through hands. Virus' RNA has been discovered in excretions of the respiratory system, blood, urine, saliva, tears, faeces, and swabs of the anus. There is no proof that the virus would be generally transmitted aerogenically; however, there is evidence that the method of transmission is mixed, through droplets and aerosol. The definitions of aerosol are changing, with growing knowledge about the dynamics of particle movement in aerosol and the ability of viruses to survive in an aerosol. Mask use has proven to be a highly effective measure for preventing the transmission of the disease; however, at least in the beginning, this measure was not accepted well, as wearing masks in our society is not a cultural norm, unlike in Asian countries. Hand hygiene has long been among the most recognised measures for preventing infections in general. It is known that the virus can be present on a surface, but it depends on the type of surface, temperature, and humidity of the environment. Therefore, proper hand hygiene is among the most important measures. Maintaining hand hygiene by using an alcohol-based disinfectant is effective and does not require a lot of time. Because coronaviruses are surrounded by a lipid envelope, they are fairly sensitive to alcohol.

The number of patients in the country began rising steeply in the spring; however, after

the introduction of epidemiological measures (closing services, schools, preschools and borders, prohibition of movement between municipalities, and the prohibition of gatherings in public spaces, the use of masks and disinfection of surfaces and hands, ensuring a safe distance between people, etc.), it began gradually declining after 1 April. In May, it became clear that the epidemic was under control but still not completely over. Every country approached the problem of the epidemic in its own way. Many looked towards the measures that were used in Asian countries, which were successful, but at the cost of strict limitations to public life. In the spring part of the pandemic, there was not much cooperation between countries; there were even issues with the supply of the already-paid equipment for managing the epidemic. On 31 May 2020, the COVID-19 epidemic was declared over, even though individual cases cropped up during the summer. At the start of the school year and with autumn, the epidemiological picture once again took a turn for the worse. The second wave of the epidemic is not yet under control. It is much more severe than the one in the spring, and has already taken more than 1,000 lives, especially in the population aged over 75. In spite of the adoption of similar measures as in the spring, the epidemiological picture is not improving as of the time this issue of the Slovenian Medical Journal is being completed.

The epidemic caused by the SARS-CoV-2 virus has significantly affected the operation of the Slovenian healthcare system. The introduction of protective measures when treating patients, potentially infected with the SARS-CoV-2 virus, has completely altered the daily work of all healthcare employees, the method of work in medical institutions, and in many other places of the society. We were soon faced with outbreaks in healthcare institutions and nursing homes, and with diseased healthcare workers and colleagues, as well as their patients and wards. We faced the catastrophic consequences of the outbreak of the virus in closed institutions, where there were a lot of people with significant risk factors for a severe outcome. Healthcare institutions carry the biggest load when treating patients with infectious diseases, and during an epidemic. The SARS outbreak in 2002 demonstrated that healthcare workers (HW) were not appropriately educated and did not have a grasp of the safety procedures. Even the experience with the recent onset of a highly contagious disease (Ebola) has shown that in the developed world, the preparedness and qualifications of healthcare workers were insufficient for managing a

highly contagious disease. In the event of Ebola, the lack of knowledge and inappropriate training led to severe exaggerations and inappropriate procedures. This brings forward two types of questions; namely, how prepared are healthcare workers to face the disease that can have a life-threatening effect on their health; and secondly, how prepared are healthcare organisation for the inflow of a large number of infected patients with life-threatening symptoms. WHO has issued recommendations for the preparedness of healthcare institutions for an epidemic. The state and healthcare institutions must have appropriate plans prepared that define preparedness at the onset of a large number of patients with infectious diseases. When making the plans, we have to take into account the ethical and legal principles, the risk assessment and the assessment of the capacities for epidemiological monitoring, laboratory diagnostics, treatment and disease prevention. The plan must define the pathways for treatment, premises, equipment, and the method of ensuring a sufficient capacity of trained healthcare workers and appropriate amounts of medicines. It is very important to verify these plans, test them, and adjust them accordingly. The guidelines of the World Health Organization (WHO), revised in 2009, especially emphasize the significance of ethical principles, such as fairness, freedom, and solidarity. The guidelines state that when measures limit an individual's rights and civil liberties (e.g., isolation or quarantine), they have to take into account the justification of such a measure, and the measures have to be reasonable and proportionate, fair, must not discriminate, and most not be in conflict with national or international laws.

The measures that individual countries have adopted for preserving critical capacities of their healthcare also included limiting the provision of non-emergency medical procedures. Halting a service of such importance as healthcare naturally opens numerous questions also regarding morality and ethics. Local authorities in Wuhan, China did not at first recognise the epidemiological potential of COVID-19; however, they soon adopted drastic measures that would trigger reservations related to protecting human rights in most Western countries. The Chinese also introduced the use of PPE in a scope that was planned for highly contagious diseases, such as the plague and cholera. Routine dental treatment was halted in January, and emergency dental procedures were only performed when using strict personal protection and after introducing certain measures for reducing aerosol formation, e.g., aspiration with a high

volume, etc. Similar measures were already used during the SARS epidemic. They strongly emphasised the importance of the measures to reduce the transmission people with no or little symptoms (self-isolation, maintaining a safe distance, stricter hygiene measures).

Opinions also differ regarding the proportionality of the measures and the sustainability of those measures demanding distancing. Governments are especially weighing between the measures to save lives and the risks for exacerbating economic conditions. The population naturally responds positively when this is a question of saving lives. Healthcare workers have the moral duty to take care of the patients. Numerous other professions have no such qualms. However, one should ask, what risks are healthcare workers and their colleagues obligated to accept under the circumstances such as the COVID-19 pandemic. Most countries where the disease has spread unabatedly, have adopted the position that even infected people with few symptoms or even those without them are important in spreading the infection; therefore, appropriate PPE is required to perform high-risk procedures. Too often, however, it happens that there is a lack of such protective equipment, and healthcare workers are exposed to excessive risks. Because of this, it is right that at least in the starting phase of an epidemic, when there is no vaccine yet, and when personal protective equipment is in short supply, we reduce the exposure of the staff by temporarily halting a provision of non-emergency medical procedures.

Because of the growing number of patients with COVID-19 and deaths from COVID-19 across the globe, many commentators have described this ongoing pandemic as the “perfect storm”. This is a much-exaggerated metaphor that evokes a feeling of unpredictability. A “perfect storm” is actually defined as “a particularly violent storm arising from a rare combination of adverse meteorological factors”, or as “the worst possible or especially critical situation caused by a combination of many negative and (usually) unpredictable contributing factors”. Susan Sontag claims that the metaphors that are generally used to describe a disease profoundly shape our experience with that disease. The modern cultural discourse on diseases such as cancer or AIDS, for example, creates a fear and stigma that hinder the medical care and marginalise these patients. Similarly, a metaphor like “the perfect storm” can incorrectly focus our concepts of dealing with the pandemic, and thereby our approach to fighting new pandemics. Such terminology unfortunately creates the appear-

ance that the public health approach is more reactive than proactive, more reductive than comprehensive, alleviating, and empowering. Even though the dramatic impact of this metaphor can be attractive, the phrase “the perfect storm” indicates the terms coincidence and unpredictability, which can actually undermine our ability to control the COVID-19 pandemic and future outbreaks of disease. Repeating occurrences of zoonotic infections, such as the severe acute respiratory syndrome (SARS), the H1N1 flu, the Middle East respiratory syndrome (MERS), Zika and Ebola, as well as the resurgence of old infectious diseases, such as measles and cholera, are signs that new global pandemics should be expected. At the same time, there is a growing awareness of the complex ecological relations between people, animals, and our environment. Outbreaks of zoonotic diseases reflect the complex changes in ecosystems that are largely a consequence of human action. In spite of all these facts, each of these sudden epidemics was accompanied with media headlines purporting “the perfect storm”. This somewhat reduces the trust in our capability of forecasting and preventing epidemics even before they occur. Designating pandemic as “the perfect storms” would actually mean that the healthcare crisis wholly surpasses the capacities of human action, and therefore somehow releases us from the responsibility for the frequency of oncoming zoonoses and extreme weather phenomena, as well as the responsibility for disproportionate effects of these crises on the most vulnerable people on the planet. In the context of public health, the concept of the so-called “perfect storm” emphasises the power of coincidences that is apparently greater than effective endeavours for public health. However, past outbreaks have clearly demonstrated that long-term investments in tracking and monitoring the disease, scientific research and focus on the public healthcare infrastructure are key to managing the next upcoming public health threat. These strategies do not always match our biomedical paradigm, focused on targeted procedures, such as the development of vaccines and therapy. Nevertheless, basic, non-specific practices for preventing epidemics

and for the preparedness for epidemics are essential for the control of infectious diseases.

Epidemics are not merely natural events. They are also the consequence of human actions, both in their onset, as well as in their spread and management. If we treat every new epidemic as a “perfect storm”, it is that much more difficult to institute the belief that we can prepare for the next crisis. During the pandemic, there have been numerous problems and conflicts also partially due to psychosocial issues brought on by the pandemic and related numerous limitations in everyday life. The COVID-19 pandemic is the first in a globalised and digitalised society. The amount of information passing through all possible channels is exceptional. Even in established publications, expert articles are published before they have been properly peer reviewed or only after a superficial overview; still, the general media and social networks quote them directly from the internet. These are perfect conditions for unverified or even false information to flourish, with so-called influencers gaining traction by sharing their personal beliefs with groups of like-minded people. They frequently oppose measures adopted by epidemiological experts. This has a negative impact on public opinion and on how people behave. The general accessibility to information significantly increases the pressure on the medical establishment, on manufacturers of medicines and vaccines, and on researchers who feel forced to provide a response to the problem quickly, and perhaps also too early. We have learned that in medicine it is especially important to have a foundation of facts, supported by evidence. Unverified information often results in doubt on the correctness of the adopted measures, no matter how deliberate they are. Measures only work when people diligently adhere to them.

COVID-19 may be a disease caused by a new virus; however, such outbreaks have been long since expected. Preparing for the next pandemic will require numerous diverse reforms, and especially the recognition that the healthcare system must be versatile enough to prepare for such events.

Cite as/Citirajte kot: Lejko Zupanc T. COVID-19 – »The perfect storm?«. *Zdrav Vestn.* 2020;89(11–12):587–90.

DOI: <https://doi.org/10.6016/ZdravVestn.3197>



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