

Technical Report 1



COVID-19: the first coronavirus pandemic

Maheeka Seneviwickrama^{1*}, Dharshini Kantharuban², Chithramali Rodrigo³, Bhumini Karunarathna³, Ishanka Talagala³, Indumini Gunatilake⁴, Pushpa Jayawardana⁵, Sampatha Goonewardena¹

¹ Department of Community Medicine, Faculty of Medical Sciences, University of Jayewardenepura, Sri Lanka; ² Provincial Director of Health Services Office, Eastern Province, Sri Lanka; ³ Ministry of Health, Sri Lanka; ⁴ Postgraduate Institute of Medicine, University of Colombo, Sri Lanka; ⁵ No affiliation

*Correspondence: maheeka@sjp.ac.lk

 <https://orcid.org/0000-0002-4182-284X>

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Highlights

- Definition of pandemic is subjected to debate and lead to confusion and criticism.
- Disease outbreaks due to corona viruses are increasing.
- Public health implications of pandemics are massive.

Definition of a pandemic

The word “pandemic” comes from the Greek word “pan-”, which means “all” and “demos,” which means “people or population”. Combining the two words together, it becomes “pandemos” meaning “all the people” (1). The World Health Organization (WHO) defines it as “worldwide spread of a new disease” (2). The most widely accepted definition of pandemic is by the International Epidemiological Association (IEA) which defines a pandemic as “an epidemic occurring worldwide, or over a very wide area, crossing international boundaries and usually affecting a large number of people” (3).

Controversies related to the definition of pandemic

A definition that takes into consideration the disease transmission, high attack rates and explosiveness,

minimal population immunity, novelty, infectiousness and severity is proposed to be the most appropriate (4-6). However, as cited by Morens & colleagues (4), a pandemic has been defined as an “extensive epidemic”; “epidemic over a very wide area and usually affecting a large proportion of the population”; and “distributed or occurring widely throughout a region, country, continent or globally”. It is obvious from the above that the definitions are imprecise and ambiguous. As a result, scientists, agencies and media have come up with different interpretations of the term epidemic, without coming to consensus. However, the IEA and WHO definitions, and most other definitions have one common feature, i.e. “the wide geographic spread”.

The classical definition of pandemic has been subjected to much criticism due to non-inclusion of population immunity, virology and disease severity into consideration (4-6). Going by that definition,

seasonal epidemics across international boundaries affecting a large number of people can also be considered as pandemics (6).

Two critical competing perceptions have been observed regarding the IEA definition of a pandemic, namely 'pandemic as a function of geography and virology, versus disease severity' (7). In this definition, the term 'usually affecting' is vague - does this mean even in the absence of a 'large number of people being affected', and if 'the disease has spread over a very wide area, crossing international boundaries', should it be considered a pandemic? In addition, absence of agreement on the following terms is also confusing:

- I. 'a very wide area, crossing international boundaries' or 'worldwide spread'- how many countries/boundaries?
- ii. 'a large number of people'- how many?

Following outbreaks of the recent past support the above arguments:

- Severe Acute Respiratory Syndrome (SARS) outbreak in 2002/2003 spreading over 26 countries affecting 8,437 cases worldwide with 813 deaths attributable to the disease (8) not declared as a pandemic
- Middle East Respiratory Syndrome (MERS) with 2,494 laboratory confirmed cases and a 34.4% case-fatality rate (858 associated deaths) across 27 countries being labelled as 'pandemic prone disease' (9)

The WHO definition of pandemic influenza had been criticized by Doshi as being 'elusive' (5). The reason behind this was labelling H1N1 infection in 2009 as a pandemic, despite the outbreak having less serious consequences than expected by the experts. In response, Kelly had counter argued and has referred to the classical epidemiologic definition by IEA (6). Due to these controversies, the WHO has introduced a six-phase approach to define a pandemic, with special reference to influenza to make it more understandable, precise and to be easily incorporated into existing preparedness and response plans (10).

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Origin of pandemics

Pandemics consist of two types of risks, namely 'spark risk' that is related to the origin of the outbreak and 'spread risk' that is how likely it is to spread through human populations (11). A spark risk may occur through accidental animal to human transmission of a zoonotic pathogen either through domesticated or wildlife animals. Human activities such as livestock, hunting of wild animals, killing animals for industrial and commercial purposes and encroachment into wildlife habitats. Spread risk is based on pathogen and human population specific factors. Pathogen-specific factors include genetic adaptation and mode or transmission. The human population-specific factors include susceptibility to infection, patterns of mobility (travel, trade and migration), the density of the population, lack of or ineffectiveness of preparedness and response strategies (11).

An increasing frequency of pandemics of viral origin have been reported over the last century (11-12). Lowered immunity levels due to environmental pollution making people more vulnerable to infections and globalization leading to numerous social and economic changes facilitating the emergence and spread of these hitherto unknown viruses, has been implicated as possible explanations for these rising trends (11-12).

With the advancement in transportation and mobility sector, the locally occurring epidemics can rapidly spread worldwide. Contrary to the above, technology advancement has also paved the path for improved measures in disease surveillance, risk communication, prevention/ control and research into new vaccines and medicines required to prevent and treat these virulent viral conditions (11-12). The above developments determine the capacity to mitigate the spread of outbreak, thus preventing it reaching pandemic levels.

History of pandemics

Historical records indicate that there have been approximately 3-4 influenza like pandemics every century, going back to 1500 AD. Information regarding the causative organism however has not been available until the 20th century. It is currently shown that pandemics of viral origin are becoming more prominent (11-12).

● Pandemics of the 20th century

There have been three pandemics during the 20th century caused by different strains of the influenza A virus: 'Spanish flu' (H1N1) between 1918-20, 'Asian flu' (H2N2) between 1957-58 and 'Hong Kong flu' (H3N2) between 1968-70 (12).

The 'Spanish flu' has been reported as the first pandemic to occur during the 20th century (13). Its origin is suspected to be in China/America. Considered to be the most severe pandemic of the century, 'Spanish flu' is estimated to have caused 20–50 million deaths (1).

In February 1957, 'Asian flu' raised its head from Yunnan Province of China and reached pandemic status within four months, spreading over 20 countries. The estimated number of deaths has been 1-4 million during this epidemic (1).

In 1968, the 'Hong Kong flu' named after the place of origin, started to spread across globally. Number of deaths due to this pandemic is estimated to have been 1-4 million, similar to that of 'Asian flu' (1).

● Pandemics of the 21st century

'Swine flu' is the first pandemic of the 21st century which originated in Mexico and the USA in 2009. Influenza A (H1N1) was identified as the causative agent (14). All continents got affected and 168 countries and overseas territories/ communities have reported at least one laboratory confirmed case (15).

COVID-19, the present pandemic due to a novel coronavirus, SARS-CoV-19, is the second pandemic of this century. In the 21st century, there were two

corona viral outbreaks before the present COVID-19 pandemic. The first corona viral outbreak was SARS, which originated in Guangdong Province, China in 2002. It later spread across 26 countries causing 8437 cases and 813 deaths attributable to the disease by 2003 (8).

The second corona viral outbreak of the 21st century was MERS, a severe respiratory disease which originated in the Middle East region in 2012. . This was considered as a pandemic-prone disease, with outbreaks spanning 27 countries (9).

Why did the WHO label COVID-19 outbreak a pandemic?

Criteria considered by the WHO to declare an outbreak as a pandemic include geographical spread, disease severity and impact on the society (16). Amidst the growing concerns regarding the global situation of COVID-19, the WHO Director-General on 24 February 2020 stated:

“For the moment, we are not witnessing the uncontained global spread of this virus, and we are not witnessing large-scale severe disease or death” (16).

On 11 March 2020, the WHO Director-General declared COVID-19 as a pandemic after closely monitoring the exponential rise of the cases outside China and of the number of affected countries: within the preceding 2 weeks, 13-fold increase in the number of cases outside China with tripling the number of affected countries, evidence of uncontained global spread (17).

Public health implications of pandemics

● Morbidity

High morbidity rates depending on the type of pandemic can be observed as a consequence. In addition, psychological stress and anxiety due to the fear of development of complications, disabilities and death are common. Lock down leading to social isolation and financial hardships also precipitates the development of psychological morbidity (18).

● Mortality

Pandemic causes significant increase in years of life lost (YLL) (12). Mortality is observed to be higher for low- and middle-income countries than in higher income countries due to multiple factors including health service response capacity (11).

● Impact on health services

Disruption to routine health programmes such as chronic disease follow-up, antenatal care and immunization during outbreaks is well documented. In addition, 'worried well' seeking care leads to further over-burdening of the health system (11). Reduction in the availability of healthcare providers also occurs due to fear absenteeism, being ill or death caused by the pandemic. Psychological conditions among healthcare providers are also reported due to increased workload and working under resource poor settings with the risk of getting the infection (19).

● Social impact

Evidence suggests that pandemics can fuel existing socio-political tensions causing riots against governments and discrimination against marginalized populations (11). Increased incidence of domestic violence, gender-based violence and child abuse during a pandemic is another area of public health concern. Psychological stress associated with movement restrictions, financial problems, isolation and overcrowding have been identified as precipitating factors (20).

● Economic impact

In order to contain the spread of pandemic, many countries across the world impose travel restrictions and social distancing measures such as imposition of curfew (11). These result in long lasting repercussions on the global economy. The World Bank has warned that as much as 60 million people will be pushed into extreme poverty as a result of the disruption caused by COVID-19 (21).

Recommendations

'Pandemic' needs to be defined more objectively to avoid undue confusion. Evidence-based preparedness plan is crucial for every country to deal with the pandemics from the outset. Risk communication plays a significant role in the outbreak management. Vulnerable populations to be given special emphasis during pandemics.

Author Declaration

Author contributions: MS drafted the manuscript and other authors helped with literature search. All authors agreed to be accountable for all aspects of the work and approved the final manuscript for submission.

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