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Pandemics as a risk factor for world: An overview of an Era of Corona Virus

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Abstract

Pandemics are wide-ranging contagious outbreaks which usually affect a copious amount of population. The novel coronavirus (2019-nCoV) or the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) cases have been confirmed in many countries due to which the WHO has declared COVID19 as a pandemic. In December 2019 COVID19 emerged in Wuhan, China. It is transmitted from human to human but the path this virus took to setup human infection remains a mystery. COVID19 is a highly contagious disease it can spread faster than its ancestors the severe acute respiratory syndrome coronavirus SARS-CoV and Middle East respiratory syndrome coronavirus (MERS-CoV). As of 3 November 2020, there were 47,609,932 confirmed cases with 1,215,586 deaths globally. The standard laboratory test for the diagnosis of COVID19 is a Real-Time reverse-transcription polymerase chain reaction (rRT-PCR). An evident antiviral agent against Covid-19 is not found yet so that the treatment is aiming to manage the manifestations and fend off the complications. Currently, the research on the COVID19 is in its primary stages. Numerous researches are going on with the antiviral drugs used to treat other infections to find possible treatment.

Keywords: *Pandemic, Risk factors, COVID19, Origin, Management.*

Introduction

When a disease or health issue occurs in unpredicted numbers, it is called an Outbreak. Pandemics are wide-ranging contagious outbreaks that have the potentiality to cause mortality and morbidity over broad geographic areas and upset the social, economic, and political sectors. It takes more lives and affects more people than epidemic disease. It has been suggested that pandemic has increased over the past century due to increased global travel -integration, changes in land use, and greater exploitation of the natural environment (Johns et al., 2008; Morse, 1995).

The impacts that are put forwarding by the pandemics to the world are vast. A pandemic namely plague (Black Death) caused by *Yersinia pestis* is to blame for the disease that pulls apart Europe from 11347 to 1357. It has taken the lives of about 55 million people. The 2002 severe acute respiratory syndrome SARS has a mortality rate of 800 out of 8000 cases whereas the MERS is an epidemic that caused 800 deaths out of 2500 cases. The 2009 H1H1 pandemic ended with 18500 death. The influenza pandemic of 1818 also known as Spanish flu has occurred as an outbreak from 1918-1919 by taking the lives of 50 million people around the world. Smallpox is another pandemic outbreak that stretched over hundreds of years by killing more than 300 million people in the 20th century alone. Multiple outbreaks notably the 2014 West Africa Ebola outbreak have caused 11310 deaths out of 28616 cases.

And the current coronavirus disease (COVID-19) pandemic with more than 1,221,889 deaths out of 47,929,034 cases till now. Coronaviruses have been reported to cause 5% to 10% of acute respiratory infections. The standard laboratory test for the diagnosis of COVOD19 is a Real-Time reverse-transcription polymerase chain reaction (rRT-PCR). It is transmitted from human to human but the path this virus took to setup human infection remains a mystery. Before declaring officially that the Covid-19 as a pandemic by WHO on 11th March 2020, it has spread to more than 114 countries.

This chapter is discussing the importance of pandemics and its risk-impact factors and the consequences along with the special reference of COVID19, the present threat of our world.

Importance Of Pandemic Preparedness

Pandemics are wide-ranging contagious outbreaks that have the potentiality to cause mortality and morbidity over broad geographic areas and upset the social, economic, and political sectors. The world has come up against assorted remarkable pandemics

such as the Black Death, Spanish flu, HIV/AIDS **(Table 1)**. Pathogens that cause pandemic disease differ in their mode of action, transmission, frequency, severity, and differentiability of associated morbidities. The pandemic potential of pathogens varies extensively in the scale of promising health, socio-political and economic impact, resources, efficiency, and plan of action required for mitigation.

Preparation to overcome a pandemic is a continuous operation of planning, practicing, amending, and translating into action. Hence a pandemic plan is an alive document of lessons learned from a pandemic or any other pertinent outbreaks. There are some key elements to be noticed for pandemic preparedness **(Fig 1)**.

Table 1: World has encountered assorted remarkable Epidemics and Pandemics

Year	Pandemics/ Epidemics	Geographical extent	Widespread morbidity/ mortality	Socio-economic or political impact
1347	**Bubonic plague (Black Death)**	**Eurasia**	**30–50% mortality**	**Probable accelerated termination of the feudal system in Europe**
1500	**Smallpox**	**America**	**50% mortality**	**Demolished native societies, assisting the hegemony of European countries**
1881	**Cholera**	**World-wide**	**1.5 million deaths**	**Ignited outbreaks on Russian tsarist government and medical officials**

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1918	Spanish flu influenza	World-wide	50 million–100 million deaths	GDP loss of 3% in Australia, 15% in Canada, 17% in UK, 11% in US
1957	Asian flu influenza	World-wide	0.7 million–1.5 million deaths	GDP loss of 3% in Canada, Japan, UK, and US
1968	Hong Kong flu influenza	World-wide	1 million deaths	US$23 billion–US$26 billion direct and indirect costs in the United States
1981	HIV/AIDS	World-wide	36.7 million deaths	2–4% annual loss of GDP growth in Africa
2003	SARS	4 continents, 37 countries	8,098 possible cases, 744 deaths	GDP loss of US$4 billion in Hong Kong SAR, China; US$3 billion–US$6 billion in Canada; and US$5 billion in Singapore
2009	Swine flu influenza pandemic	World-wide	151,700–575,500 deaths	GDP loss of US$1 billion in the Republic of Korea
2012	MERS	22 Countries	1,879 symptomatic	US$2 billion loss in the Republic of Korea, triggering

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			cases, 659 deaths	US$14 billion in government stimulus expenses
2013	West Africa Ebola virus disease	10 Countries	28,646 cases, 11,323 deaths	US$2 billion loss in Guinea, Liberia, and Sierra Leone
2015	Zika virus	76 Countries	2,656 reported cases	US$7 billion–US$18 billion loss in Latin America and the Caribbean
2020	Coronavirus	216 Countries	12,25,000 deaths till date	Financial world GDP loss $ 50 billion, and at the end of the year may increase to $ 1 trillion.

Figure 1: Key elements to be noticed for pandemic preparedness

There are some general principles for the acute planning of measurements to overcome any outbreaks.

- Pandemic preparedness, feedback, and assessment should be created on a generic preparedness manifesto, fabrics, techniques, and plan for crisis and emergency management.
- Pandemic preparedness should focus to strengthen the prevailing system rather than creating new ones.
- These criteria should be allocated for adequate resources.
- Business progression schemes and gush magnitude plans have to be developed for the health sectors as a part of pandemic response requirements.
- Response to the pandemic should be evidence-dependent where this is accessible and equivalent to the threat by the IHR.
- All the countries must be approachable and elucidate data for risk assessment provided by WHO, ECDC, and from other countries or sources.

There are several wide classes of pandemic threats when pathogens are truly global and severe. Pandemic influenza viruses are an example of this. Its transmission and mode of action in the host body make challenges for its differential diagnosis. Among all familiar pandemic pathogens, influenza owns the fundamental threat because of its prospecting severity and semi systematic happening since at least the 16th century (Morens et al., 2010).

Origin of Pandemics

Most of the novel pandemics are zoonotic which means the propagation of pathogenic organisms to humans from animals (Murphy, 1998; Woolhouse and Gowtage-Sequeria, 2005). The zoonosis enters into the human host body from both domestic and wild animals through stalking as well as the use of wild species, wild animal

trade, and contact with wildlife by other means (Pike et al., 2010; Dunavan, Diamond and Wolfe, 2007). Zoonotic pathogens vary accordingly based on survival and spread between human hosts. To become a successful human pathogen an animal pathogen needs to evolve into a pathogen efficient of maintaining long-term human-human transmission despite the need for reestablishment from the same animal host. This process can be categorized into five stages (Wolf et al., 2007).

Stage 1

Includes animal microorganisms that are not present in normal conditions. For example malarial plasmodia.

Stage 2

If a pathogen can transmit to the human host under normal conditions but it is not possible to support sustained human to human transmission it includes in the second stage. For example, Bacilli, Nipah, Rabies, West Nile viruses, etc.

Stage 3

If the pathogenic organisms that go through only a few cycles of secondary transmission betwixt human to the human it comes under stage 3. Eg: Ebola, Marburg, human monkey poxviruses, etc.

Stage 4

If the diseases which survive in animals but can undergo a long succession of secondary human to the human transmission without having the intrusion animal hosts, it came under stage 4. Eg: *V cholerae*, Dengue virus, etc.

Stage 5

The diseases which are exclusively for human come under stage 5. For example, it includes pathogens inducing diseases such as HIV infection, smallpox, and tuberculosis.

Risk Factors Of Pandemic

Risk factors of pandemics can be defined as the combined effect of spark risk and spread risk.

Spark risks

When a pathogenic organism is introduced either from domestic animals or wildlife, a zoonotic spark could be aroused. China, Japan, India, USA, Western European countries are the areas in which livestock production is opaque and the zoonotic risks from domesticated animals are dense. Livestock production systems, animal markets, extensive and intensive farming are some of the most important factors which drive for spark disease from domesticated animals (Gilbert et al., 2014, Jones et al., 2014). Wildlife zoonotic risks are giving out in countries like China, India, West, and Central Africa, and Amazon Basin (Jones et al., 2008). The factors which influence wildlife zoonotic risks are mainly behavioural, natural resource extraction, Extension of roads into forests, environmental factors (Wolfe et al., 2005)

Spread Risk

Genetic adaptation and mode of transmission, the density of population and infection susceptibility, patterns of movements (travel, trade migration, speed, etc.) are certain issues in which the danger of pathogenic organism's layout within a population hang on (Sands et al., 2016). The factors that act as the foci for disease transmission are mainly dense population and urban centres (Neiderud, 2015). Besides that indigence,

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social disproportion and the environmental corresponds act as a reason for significant infection (Farmer, 1996). Comorbidities, nutrition deficiency are the factors that affect the immune system whereas requisite sanitation, clean water which increases morbidity and mortality (Toole and Waldman, 1990).

Corona Virus

The genetic material of the SARS-CoV-2 is single-stranded, enveloped positive-sense RNA (ssRNA), this virus belongs to Coronaviruses (CoVs) family, which is known since the 1960s. Humans and animals can be infected by this virus (Singhal, 2019). SARS-CoV-2 has less distinct pathophysiological features, and there is indecision regarding the spread and transmission of the virus (Sohrabi et al., 2020). Wuhan Institute of virology studies reports that the gene sequence similarity between bat coronavirus and SARS-CoV-2 is 96.2%, while other study reports 99% similarity based on pangolins (Wang et al., 2020). There is an assumption that bats and pangolins are likely to be the source of SARS-CoV-2. Though it is yet to be fully explained about the possible source of SARS-CoV-2. However, currently, human to human is the chief source of transmission of SARS-CoV-2 infection (Adhikari et al., 2020; Shen et al., 2020). Close human-to-human contact and droplets are the cause of SARS-CoV-2 spread. The viral RNA can be detected on exteriors and materials including plastic and steel. Recent kinds of literature say that currently, the main source of virus transmission is SARS-CoV-2 patients. Respiratory droplets are the main route of transmission including also airborne transfer from SARS-CoV-2 patients. The host body plays the main role in the transmission of CoVs during the initial viral incubation period (Xiao et al., 2020). And also this virus can be hands-on using virus-contaminated food and by touch surfaces where the virus is present. According to

literature, that SARS-CoV-2 can be transmitted vertically from mother to newborn babies (Adhikari et al., 2020; Bai et al., 2020).

According to epidemiological studies, the most susceptible group for SARS-CoV-2 are elderly citizens, average age of 75 years, with comorbidities and a history of surgical treatment. The viral incubation period ranges from 0-24 days where the first symptom to death is 14 days. Though, SARS-CoV-2 has a long incubation period than other coronaviruses that may increase the risk of virus spread (Adhikari et al., 2020; Weiner, 1987).

In December 2019, a high number of patients were admitted to the hospitals in Wuhan with unidentified aetiology of pneumonia (Wuhan Municipal Health Commission 2019, WHO 2020). The market of seafood and wet animal epidemiologically linked these patients (Bogoch II et al., 2020; Lu et al., 2020). The Chinese Government notified WHO about the epidemic which was later confirmed to be 2019-nCoV on 3 January 2020 (WHO 2020). The number of COVID19 cases increased rapidly in China and outside China then WHO declared the COVID-19 outbreak as a pandemic on 11 March 2020. The normal incubation period was five days ranging up to 14 days from the 1st day and within 11 to 12 days 95% of the patients suffer from the indications of disease after infection. (Li et al., 2020; Wang et al., 2020, Lauer et al., 2020). Though, it has been noted that there can be an asymptomatic carrier of COVID-19 with an incubation period of 19 days (Bai et al., 2020). Real-time reverse transcription-polymerase chain reaction (rRT-PCR) on respiratory samples can be used for the diagnosis of COVID-19 (Drosten et al., 2003; Wang et al., 2020).

Management

Oxygen therapy is characterized as the leading treatment mediation for the sufferer with acute manifestation. Automatic oxygenating is essential for oxygen therapy in some cases, while hemodynamic support is important for controlling the infection

(Cascella et al., 2020). Some investigations suggest that intravenous high-dose vitamin C treatment can significantly benefit the treatment of sepsis and septic pneumonia which appear as lung bruise triggered by hyper-activation of immune effector cells (Erol, 2020). SARS, influenza A (H1N1), avian influenza A (H5N1), and other viral infections can be treated by plasma therapy, similarly, convalescent plasma therapy is also under trial that could be effective against COVID-19 (Roback et al., 2020). Plasma was transfused to five critically ill patients, After 12 days of the treatment and the viral loads were found to have reduced and become negative, while SARS-CoV-2–specific ELISA and nullifying antibody titters increased after the transfusion (Shen et al., 2020).

The World Health Organisation published a record summarizing guidelines and scientific evidence obtained from the preceding documents of HCoVs on 28 January 2020.

Prevention

People who are in close contact with the COVID-19 patients are at a high risk of the infection (WHO 2020). WHO has proposed several deals which are trusted as the utmost effective deterrent action (WHO 2020). These deal incorporate recurrent hygiene of hands with an alcohol-based hand sanitizer if your hands are not visibly dirty or with detergent and water if hands are dirty; avoiding touching your body especially eyes, nose, and mouth; put on a mask and disposing of the mask after usage and maintaining social distance. WHO has also recommended guidelines for the use of facial masks at home, in the community, and the health care centres. Health care labourers are suggested to use N95 masks while dealing with SARS-CoV-2 patients. All those people who are suffering from this disease should use medical masks both in-home and health care centres and properly dispose of the masks to avoid any transmission of the virus (Kooraki et al., 2020).

Response To The Pandemic

The outburst of COVID-19 has steered to the execution of extraordinary public health measures throughout the world. After the epidemic of COVID-19 in Wuhan; China focused on traditional tactics of separation, quarantine, social distancing, and communal containment. They took some aggressive actions including the closure of schools, workplaces, roads, and transit systems, termination of public gatherings, compulsory quarantine of uninfected people without known exposure to COVID-19, and large-scale electronic surveillance to ensure compliance (McCloskey et al., 2020; Wilder-Smith et al., 2020) An estimated 40-60 million citizens of Wuhan and 15 other closed cities were exposed to community containment measures (Wu et al., 2020). South Korea took sustainable actions to screen the population for the virus, and separate any infected people. They also used wide contact tracing and used quarantine measures with electronic tracking on those who have contact with infected people. Knowledge from the SARS epidemic of 2003, the speedy and considerable measures taken by South Korea has been taken as an effective measure to control the epidemic (BBC, 2020, Normile, 2020). Similarly, countries like Taiwan, Hong Kong, and Singapore actively implemented travel limitations on passengers coming from the mainland even though the WHO stated at that time that travel bans were not necessary. Taiwan had entrenched a central command centre for epidemic after the 2003 SARS epidemic, the centre rapidly took measures such as border controls, the closing of schools and workplaces, public communication plans, and resource assessments of hospitals which helped to limit the spread of COVID 19 (Barron, 2020). These responses have played a significant role to prevent epidemics.

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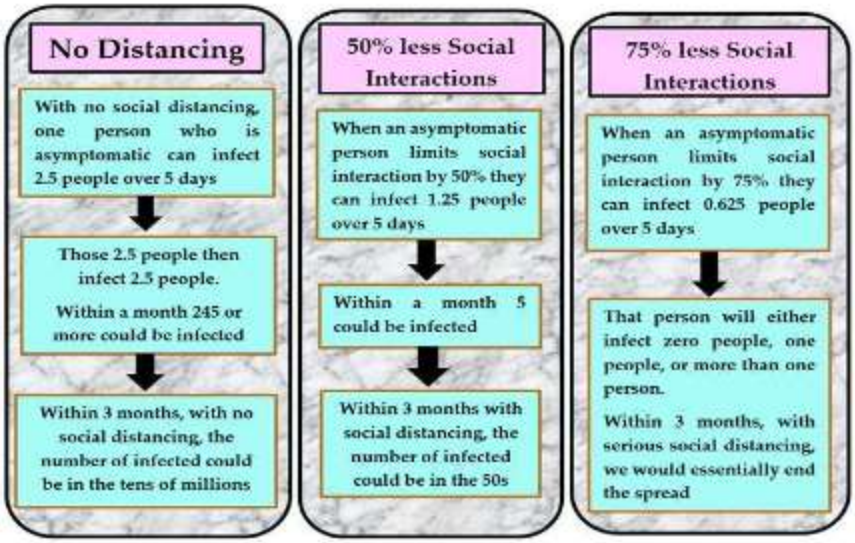

Figure 2: Significance of Social Distancing

Conclusion

Pandemics are unusual occurrences and anthropogenic changes in the natural ecosphere affect the threat of event. With a rising quantity of cases and mortality worldwide, the pandemic COVID-19 is a community fitness emergency. While ongoing studies and clinical trials for the prevention and treatment of COVID-19 have been undertaken, there is currently no appropriate medication or vaccine available for it. In fact, the origin of viral transmission is still unclear, as a result experts face barriers to control the virus. In the absence of any therapy for the prevention of viral infection, a significant approach to avert infections has been interventions such as social distancing and population containment that may help minimise the mixing of vulnerable and transmittable persons with healthier populations. In addition, research laboratory studies are required to clarify the SARS-CoV-2 virulence that will assist in the development of antiviral SARS-CoV-2 drugs. It is therefore urgently recommended and demanded that prevention action, management and quarantine should be strictly pursued by all individuals without any religious discrepancy, else the condition may be the worst. There is also an immediate need to educate our new

generation of science and technology to tackle any such tragedy in the future, if any. There is no reason to fear, and to fight this epidemic, careful prevention and control are necessary. In short, cooperative actions are required to combat against those diseases worldwide without any religious discrepancy in the future.

Conflicts Of Interest

The authors declare that they have no conflicts of interest.

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