



Pandemics of Influenza viruses and Coronaviruses; Past and Present

Muhammad Umar Nafees¹, Syed Arshad Ullah², Adeel Ahmed Khalil², Roohullah³, Anees Muhammad⁴

Department of Biosciences, Biochemistry and Molecular Biology, Comsats University, Islamabad, Pakistan

²Department of Cardiology, College of Medical Technology, Bacha Khan Medical College, Mardan, Pakistan

³Cardiology Technology (KMU), MBBS, Guizhou Medical University, Guiyang, Guizhu, China

⁴Department of MLT, College of Medical Technology, Bacha Khan Medical College, Mardan, Pakistan

Corresponding Author's Email: aneesafridi15295@yahoo.com

ABSTRACT

Respiratory viral infections remain a significant cause of human morbidity and mortality. Several outbreaks and pandemics caused by respiratory viral infections occurred throughout the world in human history. The emerging respiratory viral infections especially RNA viruses are more pathogenic than the DNA containing virus due to non-existence of herd immunity. The RNA containing viruses can adapt to the changes that occurred in the local and global environment due to the high rate of replication of polymerases enzymes in their genomes. Presently, coronavirus disease 2019 (COVID-19) pandemics occurred in Wuhan city of China and spread all over the world by traveling and trade. The COVID-19 was caused by Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), which is an RNA virus. In this study, we discussed emerging and re-emerging viral infections from influenza to COVID-19.

Keywords: Emerging, Re-emerging, Pandemics, Respiratory viral infection, COVID-19

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INTRODUCTION

The word "Pandemic" is a combination of two Greek words "Pan means All" and "demos means people". The term pandemics is mainly associated with the epidemic of various diseases, which spreads to entire regions, country, or world [1]. A pandemic can be defined as "Epidemic disease spreads to entire regions of the country or beyond the boundaries and affected a large number of the population" [2].

In human history, several pandemics occurred including acquired immunodeficiency syndrome, cholera, dengue, influenza, plague, smallpox, tuberculosis, West Nile disease, and severe acute respiratory syndrome (SARS). Each pandemic badly affects human life and economy [3].

ORIGIN OF THE PANDEMICS

The origin of pandemics varies the geographical regions, however, the reservoirs are almost the same for all infectious diseases. The common reservoirs of human infectious diseases are themselves humans or animals [4]. Approximately 60% and 75% of infectious pandemics occurred due to humans and animals respectively [5]. Many influenza strains, Hendra virus, Nipah virus, and Middle East Respiratory Syndrome (MERS) are associated with zoonotic origin based on genetic homology [6]. From the past two decades, it was shown that many arthropod-borne viruses such as chikungunya virus (CHIKV), dengue virus (DENV), West Nile virus (WNV), and Zika virus (ZIKV) emerged and re-emerged in various tropical and sub-tropical regions of the world [7,8].

PANDEMICS OF VARIOUS DISEASES

The history of pandemics is old and started before the common era (BCE). The golden age people of Greece suffered from Plague in 430 BCE, which was associated with typhoid fever [9]. The measles or smallpox affected the empire of Rome in the past (165-180 CE) [10]. The bubonic plague caused by a

bacterium *Yersinia pestis* reported in 540 CE and re-emerged in the 1300s and was continued to the 1800th Century [11]. The pandemic of Cholera was caused by *Vibrio Cholera* from 1816 to 1826 also reported in history. The Cholera was also reported in Bangladesh, Zimbabwe, and Africa in the past [12]. Other pandemics have been reported in the past of human history including measles, smallpox, tuberculosis, malaria, yellow fever, SARS-CoV, and MER-CoV. The recent pandemic of coronavirus determined various ideas regarding the disease, epidemiology, risk assessment of socioeconomic tendency, feedback of countries, and the importance of response against the deadly disease [13].

Table No.1:History of epidemics and pandemics of Influenza infectious diseases before the 20th century

Epidemic or Pandemic	Year of origin	Regions	Reference
Epidemic	412 BC	Greece and Roman	[14]
Epidemic	1200BC	Persians, Central, and Southern Asia	[15]
Pandemic	1510	Asia, North Africa, Europe	[16]
Epidemic	1634-1640	The United States and Canada	[17]
Epidemic	1729-1733	Worldwide	[18]
Pandemic	1781-1782	Worldwide	[18]
Pandemic	1830-1833	Worldwide	[18]
Pandemic	1889-1892	Worldwide	[18]

Table No.2: Respiratory viral infectious disease outbreaks of the 20th century

Disease	Year of origin	Regions	The strain of Influenza A	Death (estimate)	Reference
Spanish Flu	1918-1920	Worldwide	Subtype H1N1	17-100 million	[19]
Asian Flu	1957-1958	Worldwide	Subtype H2N2	1-4 million	[20]
Hong Kong Flu	1968-1970	Worldwide	Subtype H3N2	1-4 million	[21]
Russian Flu	1977	Russia	Subtype H1N1	250,000	[22]

Table No.3:Coronaviruspandemicsin the 21st century

Virus	Year of origin	Regions	Disease	Death(estimate)	Reference
SARS-CoV-1	2002-2004	Worldwide	SARS	774	[23]
MER-CoV	2012-present	Worldwide	MERS	862	[24]
COVID-19	2019-present	Worldwide	COVID-19	572,128	[25]

Spanish Flu Pandemic (1918)

Spanish influenza caused by subtype H1N1 of the influenza virus occurred in 1918 [26]. The pandemic spread to Africa, Asia, Brazil, Europe, North America, and South Pacific [27]. Approximately 40 million deaths occurred especially in the age of 20-40 years of people [28]. About 1/3 world population was infected and the fatality rate was 2.5% [29]. The mortality rate with the Spanish flu was diverse and varied from region to region throughout the world. The most affected countries were developing countries having a low income [30]. A report showed that almost half of deaths (21-25 million) occurred in the United States (US), Europe, and Asia [31].

Asian Flu Pandemic (1957)

After the Spanish flu, Asian flu originates from China and spread to the rest of the Asian countries in 1957. The Asian flu was caused by the H2N2 strain of influenza [32]. Approximately, 1-4 million deaths reported with deadly infectious Asian flu during the pandemic [32,33].

Hong Kong Flu Pandemic (1968)

After the Spanish flu and Asian flu, the pandemic of influenza virus caused by H3N2 in Hong Kong in 1968 [34]. The virus was spread to neighboring countries of Hong Kong within a few weeks and then extend to Europe, India, Japan, Northern Australia, Philippines, United Kingdom (UK), and the US. The estimated infected individuals were 1-4 million around the world [34,35].

Russian Flu Pandemic (1977)

The pandemic Russian flu was occurred in Bokara, Central Asian in 1977 and rapidly spread in Russia, Germany, and Western European countries [36]. The deaths were reported by about 0.25 million in Europe [37,38].

SARS Pandemic (2002-2003)

The SARS-CoV-1 was recently occurred in 2002-2003 and firstly reported from China. Almost 8,098 individuals were infected and about 774 deaths reported. The fatality rate was almost 10% in most countries [23].

MERS Pandemic (2012)

The pandemic of MERS-CoV first began from Saudi Arabia in 2012 and spreads to 26 countries of the globe. Throughout the pandemic, about 787 deaths were reported from various regions [24].

COVID-19

The COVID-19 outbreak was first reported from Wuhan city of China in the mid of December 2019. The COVID-19 was spread to almost all over the world and more than 15 million cases reported. Approximately, 0.63 million deaths were reported from the globe till to July 25th, 2020 [25].

Impact of Pandemic

The pandemic of various diseases is always spread beyond the boundaries of each country. Therefore, the regional stability and economy of the world badly affect the pandemics [39]. Besides the morbidity and mortality, pandemics also affects the society, political activities, educational system, transport, agriculture, animal life, the economy of country, and individuals [40,41]. Person, families, and communities' living standards are mostly affected by pandemics [42].

Pandemics effects may directly or indirectly on countries such as the funding amount should be increased for health (hospitals, staff, and medications) [43]. On the other side, businesses including agriculture, industrial, and local can badly affect pandemics [44]. The pandemic has serious effects on society such as closed of sports activities, schools, markets, and transport [45,46]. The shortage of foods for people is another issue link with pandemics [47].

MANAGEMENT OF INFECTIOUS PANDEMICS

The past and present pandemics give a piece of knowledge regarding the infections. The individuals, families, and countries should learn from the pandemics of viral infections. Drugs and medications should be used for specific infectious diseases. Moreover, good health practices and precautionary measurements can also play an essential role in the reduction of infections. The use of personnel protective equipment, hand washing, and masks can reduce infectious diseases particularly respiratory diseases. Better planning of management and awareness among people can reduce any infectious disease. Health care workers can play the main role during pandemics. Therefore, better educations, training, facilities, and practice should be provided for health care workers.

CONCLUSION

The emerging and reemerging infections are a continuing threat to human life. Human to human and animal interface, deforestations, changing environment, increasing population traveling trades, migration provoke pandemics of deadly diseases. It important to enhance awareness among people regarding the precautionary measurements that can overcome any future threat in the form of pandemics.

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