

Spread of Corona Virus Disease (COVID – 19) from an Outbreak to Pandemic in the Year 2020

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Abstract

Aims: The COVID-19 is the most recently discovered of the corona viruses which caused respiratory infections consisting of two large scale pandemics MERS & SARS and found to be zoonotic in origin. The disease started from Wuhan local seafood market in China and infected 2,761 people. The 2019-nCoV virus isolated from the bronchoalveolar lavage fluid of critically ill patients and have shown it 96% identical to bat coronavirus and bearing same cell entry receptor angiotensin converting enzyme II (ACE2). Corona means crown in Latin and it look like a crown under a microscope. Corona virus disease is an infectious disease where most infected people suffered from mild to moderate respiratory illness and recover without requiring special treatment however older people and those with underlying medical problems develop serious illness and can be prevented by washing the hands or using an alcohol based rub and not touching the face. Outbreak is small but unusual; the epidemic is outbreak over a larger geographic area while pandemic spreads to multiple countries.

Methodology: The duration of review for spread of COVID-19 was between 31st December 2019 to 11th March 2020. The 31st December 2019 was the reporting of first case of Corona Virus (COVID-19) by the China while 11th March was the declaration date of Pandemic by the World Health Organization (WHO). A total of 70 papers consisting of research article, review papers and news reports has been studied and evaluated.

Results: China on 31 December 2019 first informed about COVID-19 and WHO declared on 11 March 2020 that COVID-19 can be characterized as a pandemic. Scientists suspected that corona

virus originated in a bat and before passing to human hopped to another animal. Thailand, Japan, USA, France, Australia, Germany, Italy and Spain reported their first case on 13,16,19,24,25,27,31 and 31 January 2020. In February the cases reported by Belgium, Egypt, Iran, Brazil, Pakistan, Netherland, England and Ireland on 4,14,19,25,26,27,28,29 while in March cases seen in Saudi Arabia, South Africa, Peru and Turkey on 2,5,6 and 10 respectively. WHO on 11 March 2020 assessed the outbreak as a pandemic with 114 affected countries.

Conclusions: The spread of disease as a pandemic occurred due to movement of carriers outside China. Strict quarantine needed to prevent spread of disease. The code of ethics for social distancing should be defined and strictly implemented. Selling, buying and eating of wildlife animals should be internationally banned.

Key Words

Bat, Intermediate host, COVID-19, Outbreak, Quarantine, Pandemic

Introduction:

A COVID-19 is the most recently discovered of the corona viruses which caused respiratory infections such as MERS (Middle East respiratory syndrome) and SARS (Severe Acute Respiratory Syndrome)¹. The disease started from Wuhan local sea food market in China and infected 2,761 people in China with 80 deaths and infection of 33 people in 10 additional countries as on 26th January 2020. Full length genome sequences from five patients have shared 79.6% sequence identity to SARS-CoV. It was seen that 2019-nCoV is 96% identical at genome level to a bat corona virus. The virus isolated from the bronchoalveolar lavage fluid of a critically ill patient could be neutralized by sera from several patients². The Corona virus Study Group of the International Committee on Taxonomy of Viruses has proposed this virus as a sister to severe acute respiratory syndrome corona viruses (SARS-CoVs) and designates it as severe acute respiratory syndrome corona virus 2 (SARS-CoV-2)³. Corona means crown in Latin and it look like a crown under a microscope. At first it was 'novel corona virus' which means a new strain of corona virus. Once scientists figured out exactly was given the name as SARS-CoV-2. It has been identified in 2019 and for simplicity got the same name as COVID-19⁴. The two strains severe acute respiratory syndrome corona virus and Middle East respiratory syndrome corona

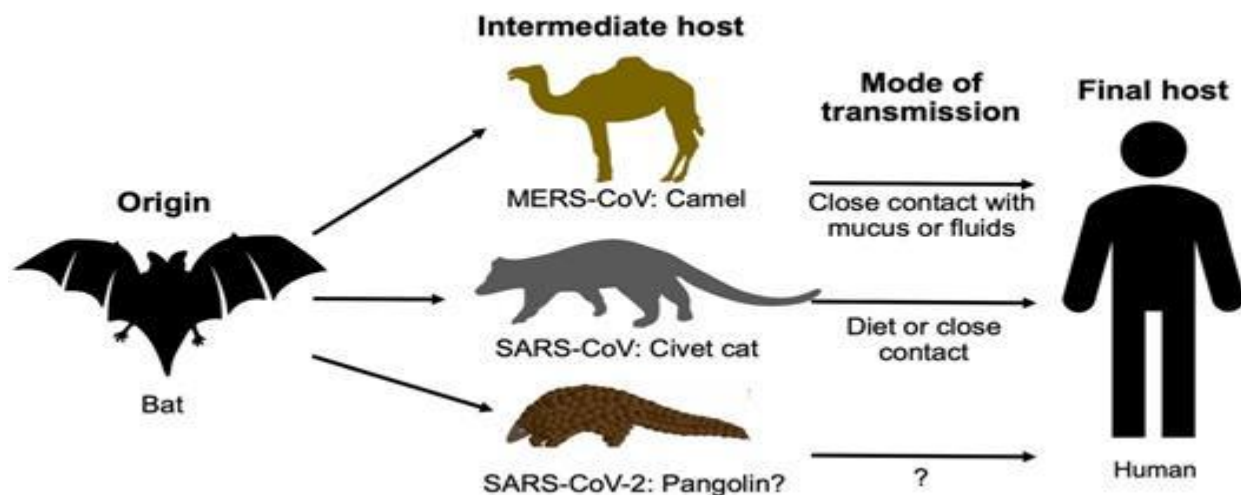
virus are also zoonotic in origin and linked for fatal illness where SARS-CoV was the causal agent of the severe acute respiratory syndrome outbreaks in 2002 and 2003 in Guangdong Province China and MERS-CoV was the pathogen responsible for severe respiratory disease outbreaks in 2012 in Middle East⁵. Corona virus disease (COVID-19) is an infectious disease where most infected people suffered from mild to moderate respiratory illness and recover without requiring special treatment however older people and those with underlying medical problems like cardiovascular disease, diabetes, chronic respiratory disease and cancer are more likely to develop serious illness. The COVID-19 virus spreads primarily through droplets of saliva or discharge from the nose when an infected person coughs or sneezes so it is important to follow the practice respiratory etiquette (e.g., coughing into a flexed elbow)⁶. An epidemic has been defined as an outbreak of a disease that occurs over a wide geographic area and affects an exceptionally high proportion of the population where as the pandemic relates to geographic spread and used to describe a disease that affects a whole country or the entire world⁷. Outbreak is small but unusual. The cluster of pneumonia cases that sprung up unexpectedly among market goers in Wuhan where China and public health authorities detected the outbreak spike of pneumonia cases. As an emergence of new disease the outbreaks got more noticeable since the anticipated numbers of illnesses caused by that disease was zero. As an epidemic the outbreak over a larger geographic area where people in places outside of Wuhan began testing positive for infection with SARS-CoV-2. It was an indication for epidemiologists that outbreak was spreading and was a likely sign that containment efforts were insufficient or came too late which were not unexpected as no treatment or vaccine was yet available. COVID-19 become pandemic when it became international and out of control and epidemic spreads to multiple countries or regions of the world⁸. Few of the biggest pandemics in history have been the Black Death, Spanish Flu, HIV/AIDS etc⁹. On 31 December 2019 WHO has been first informed about “pneumonia of unknown cause” by the China¹ and WHO on 11th March 2020 assessed the outbreak as pandemic.¹⁰

Origin and Transmission of Corona Virus to Human:

Scientists suspected that corona virus SARS-CoV-2 originated in a bat and then hopped to another animal which is possibly the pangolin and then passed to humans. The disease has then been spreading between people without any intermediate animal¹¹. Wet markets put people and live/dead animals e.g. dogs, chickens, pigs, snakes, civets and more where close contact of human and animal exist. That makes it easy for zoonotic diseases to jump from animals to humans. According to virologists the bats and birds are considered reservoir species for viruses with pandemic potential. Bats can pass along viruses in their poop and if they drop feces on to a piece of fruit that a civet then eats the civet can become carrier. Since these viruses have not been circulating in humans earlier therefore specific immunity to these viruses is absent in humans¹². According to one report bats has not been sold at Wuhan market where the virus is believed to have originated and it is likely another animal which was sold there got infected and transmitted the disease. In this instance it is assumed that bats infected an intermediary host that served as an immediate source for the human infection¹³ however according to other report of livemint bats, pangolins and dogs were sold in wet market¹⁴. Although initial speculation pointed to sea food, snakes etc however researchers from Hong Kong, China and Australia have found that genetic sequences of the novel corona virus in pangolins are 85.5% to 92.4% identical to the corona virus which is currently infecting hundreds of thousands people. That means before reaching to humans the virus likely passed from bats to the pangolin¹⁵ (Figure-1). According to one hypothesis the interaction between the receptor binding domain (RBD) of the corona virus spike protein and the host receptor angiotensin converting enzyme 2 (ACE2) controls disease transmission in SARS and COVID-19. The spike protein grabs hold of ACE2 on host cells to gain entry into cells where it replicates, bursts open the cell, and spreads to other cells. The ACE2 receptor proteins belonging to different species e.g. pigs, ferrets, cats, orangutans, monkeys, at least some species of bats, civets and humans which have shown similar levels of affinity for SARS-CoV-2 based on the structural similarity of their ACE2 receptors¹⁶. According to WHO ecological reservoirs for SARS-CoV-2 are bats and intermediate animal host could be a domestic food animal, a wild animal, or a domesticated wild animal which has not yet been identified. Corona viruses are very stable in a frozen state and shown survival for up to two years at -20°C. Since the virus is found to be stable at low and freezing temperatures for a certain period therefore food hygiene and good food safety practices can prevent their transmission

through food. Specifically corona viruses are thermo labile which means that they are susceptible to normal cooking temperatures (70°C). Therefore the consumption of raw milk, raw or undercooked animal products should be avoided¹⁷.The incubation period is the time from exposure to the causative agent until the first symptoms develop and is characteristic for each disease agent¹⁸.According to World Health Organization(WHO) the COVID-19 has incubation period between 2 and 10 days¹⁹ however China National Health Commission(NHC)has estimated an incubation period from 10 to 14 days whereas the United States CDC estimates the incubation period for COVID-19 to be between 2 and 14 days²⁰.Carrier is a person or animal that harbors a specific infectious agent without discernible clinical disease and serves as a potential source of infection. The carrier state may exist during incubation period, convalescence and post convalescence of an individual with a clinically recognizable disease (commonly known as an incubatory or convalescent carrier) which can be of short or long duration (temporary or transient carrier, or chronic carrier).Mostly it has been the carrier state where most of the spread of the disease occur resulting from an outbreak to pandemic²¹.

Figure-1



Global Pandemics:

The history of pandemics is not new and they date back to years and years resulting to affect huge population in all continents of the world and deaths of millions of people.

The Plague has a long history in the European continent where evidence of the disease date back to Stone Age. Plague epidemics in Europe during the first (sixth to eighth centuries) and second pandemics (fourteen to nineteenth centuries) including the Black Death (1346–1353) are infamous for their widespread mortality and lasting social and economic impact. The third plague pandemic originated in the Yunnan region of southwest China where plague caused multiple outbreaks since 1772. In the nineteenth century third pandemic spread globally and affected the Europe²².

In the whole of the 20th century it was believed that Black Death and all the plagues of Europe (1347–1670) were epidemics of bubonic plague. Black Death was named in 1823 because of the black blotches caused by subcutaneous hemorrhages which appeared on the skin of victims²³.

The Spanish influenza pandemic also labeled as mother of all pandemic and an estimated one third of the world's population (or =500 million persons) were infected during 1918–1919 influenza pandemic. The disease was exceptionally severe and case fatality rates were >2.5%, compared to <0.1% in other influenza pandemics. Total deaths were estimated at =50 million and were arguably as high as 100 million²⁴.

The bacterium *vibrio cholerae* is the causative agent of cholera which caused severe and potentially life threatening diarrheal disease which is of considerable public health concern because of its high morbidity and mortality. There have been seven cholera pandemics since 1817 and all continents except Antarctica have had significant or major incursions by one or more of them²⁵.

Many writers have dwelt on the shifting of the incidence and mortality of smallpox from childhood to adult life in the first half of the nineteenth century where the epidemic of 1837-41 being the last to show a preponderating proportion of deaths among infants and young children. It was generally found that the change in age incidence was due to a better enforcement of vaccination in early life. Those countries where vaccination was not compulsory the infantile

mortality from smallpox during the pandemic was much higher than in those in which vaccination was more or strictly enforced²⁶.

Since the beginning of epidemic 75 million people have been infected with the HIV virus and about 32 million people have died of HIV. Globally 37.9 million (32.7–44.0 million) people were living with HIV at the end of 2018. An estimated 0.8% (0.6-0.9%) of adults aged 15–49 years worldwide is living with HIV although burden of the epidemic continues to vary considerably between countries and regions. The WHO African region remains most severely affected with nearly 1 in every 25 adults (3.9%) living with HIV and accounting for more than two-thirds of the people living with HIV worldwide²⁷.

Methodology:

The review has been carried on the spread of Corona Virus Disease (COVID-19) from outbreak to pandemic where the disease was initiated in Wuhan China in the shape of an outbreak and afterward spread globally all over the world. The duration of review was between 31st December 2019 to 11th March 2020. The 31st December 2019 was the reporting of first case of Corona Virus (COVID-19) by the China while 11th March 2020 was the declaration date of Pandemic by the World Health Organization (WHO). The data for review has been collected from literature and reporting of the first case by the country. A total of 70 papers consisting of research article, review papers and news reports has been studied and analyzed and then evaluated.

Results:

The corona virus disease was reported by the China where it was found that Pneumonia cases were detected Wuhan city of China and the same disease spread globally resulted in declaration by WHO as a pandemic.

First Corona Virus Disease case (December - 2019) in Wuhan city by the China:

On 31st December 2019 WHO has been first informed by the Chinese authorities that “a pneumonia of unknown cause” had been detected in Wuhan which is the largest city in Hubei province in central China. The COVID-19 is the most recently discovered of the corona viruses which have caused respiratory infections such as MERS and SARS¹.

Spread of Corona Virus Disease (COVID-19) in January 2020:

On 13th January 2020 Thailand reported the first imported case of lab confirmed novel corona virus (2019-nCoV) from Wuhan Hubei Province China. The case was a 61 year old Chinese woman living in Wuhan City Hubei Province China. On 8th January 2020 she took a direct flight to Thailand from Wuhan city together with five family members and was reported to have history of visiting a local fresh market in Wuhan on regular basis prior to onset of illness²⁸.

Japan confirmed its first case of infection on 16th January 2020 from Wuhan pneumonia like virus and they isolated two visitors from the Chinese city as a preventive measure. It was found that Chinese national had been in close contact with a patient when he was in Wuhan however none of his family members who live with him in neither Japan nor the doctors who treated him have tested positive for the virus. The Wuhan outbreak coincides with the annual flu season in Japan and it was advised for people to wash their hands, gargle and wear masks to avoid falling sick²⁹.

The United States first case of 2019-nCoV infection was reported on 20th January 2020 where on 19th January 2020 a 35 years old man presented to an urgent care clinic in Snohomish County Washington with a 4 days history of cough and subjective fever. It was disclosed by him that he had returned to Washington State on January 15, 2020 after traveling to Wuhan China. The patient stated that he had seen a health alert from U.S. Centers for Disease Control and Prevention (CDC) about novel corona virus outbreak in China and because of his symptoms and recent travel decided to see a health care provider³⁰.

France has declared first confirmed cases of the deadly corona virus on 24th January 2020 where one case of the virus had been confirmed in Bordeaux while the second found near Paris marking the first confirmed cases of the novel virus in Europe. It was found that both of the initial cases had travel history to China³¹.

It has been on 25th January 2020 when Australia first case of novel corona virus (2019-nCoV) has been confirmed by Victoria Health Authorities. It was found that the patient was a man from Wuhan who flew to Melbourne from Guandong on 19 January 2020³².

The first human to human transmission of the Wuhan corona virus has been reported in Germany on 27th January 2020 where a man was infected by a colleague who had been in China and experts said that the Chinese woman who originally had the virus apparently had no symptoms when she transmitted it to her colleague. There have been warnings from inside China that people may be infectious before they start to feel ill. The 33 year old man who has been infected had not visited China but a Chinese colleague who visited Germany gave a training session on 21st January 2020 and the man who had attended the session tested positive for the virus. It was found that she have recently visited her parents in Wuhan³³.

On 31st January 2020 the Italian Government announced to suspend all flights between Italy and China with declaration of emergency in the country when doctors confirmed two Chinese tourists in Rome had tested positive for the coronavirus³⁴.

The corona virus pandemic was confirmed to have spread to Spain on 31st January 2020 when a German tourist tested positive for SARS-CoV-2 in La Gomera Canary Islands. The National Microbiology Center (CNM) reported a positive test from an individual in the Canary Islands. The patient was a German national treated at Nuestra Señora de Guadalupe Hospital in the town of San Sebastián where he has been placed in isolation³⁵.

Spread of Corona Virus Disease (COVID-19) in February 2020:

The Belgium reported first case of COVID-19 on 4th February 2020 when nine repatriated Belgians came from Wuhan and tested at the Military Hospital in the Brussels and one of them found to be infected with the novel corona virus³⁶.

Egypt announced and reported first confirmed COVID-19 case on 14th February 2020. It was found and reported that the patient was a foreigners³⁷.

The Iran has first reporting of the disease when two deaths occurred on 19th February 2020. It was suspected that the carrier of the virus may have been a merchant who travelled between Qom and Wuhan in China where COVID-19 have originated. It was also estimated that outbreak might have begun between three and six weeks ago which would mean that two died could have been sick and infecting others for weeks³⁸.

The Brazil confirmed their first case of a fast-spreading new corona virus disease on 25th February 2020 in Latin America when a 61 years old man in Sao Paulo returned recently from Italy. Brazil's first confirmed patient had traveled to Lombardy in the northern Italy from 9th February to 21st February 2020 and had symptoms compatible with the disease³⁹.

On 26th February 2020 a young man tested positive for the corona virus in Pakistan. The 22 years old male patient travelled to Iran where he probably acquired COVID-19. The patient travelled from Iran to Karachi by plane on 20th February 2020. The patient with his family has been placed in quarantine at the Aga Khan University Hospital Karachi⁴⁰.

The Netherland reported first case of corona virus disease (COVID - 19) on 27th February 2020 when a 56 years old Dutch person traveled to the Lombardy region of Italy and was tested at the Elisabeth-TweeSteden hospital in Tilburg. The said person was placed in quarantine by the authorities⁴¹.

The first patient was diagnosed with the corona virus in England on 28th February 2020 however it was unclear whether this was directly or indirectly from someone who recently returned from abroad. The man was a resident of Surrey who had not been abroad recently himself⁴².

On 29th February 2020 first case of the corona virus (COVID-19) in Ireland was confirmed in Dublin. It was found that the patient was a school student who had recently returned from Italy⁴³.

Spread of Corona Virus Disease (COVID-19) in March 2020:

Saudi Arabia reported first case of the new corona virus on 2nd March 2020 virus. According to report by that time the virus has reached in 66 countries of the world. The Saudi virus patient traveled from Iran via Bahrain over the King Fahad Causeway⁴⁴.

First case of Covid-19 Corona virus reported in South Africa has been found on 5th March 2020 where the National Institute for Communicable Diseases confirmed a suspected case of COVID-19 found positive. The patient was a 38 year old male who found to have travelled history to Italy with his wife⁴⁵.

Peru recorded first confirmed case of corona virus 6th March 2020 when 25 years old man who had traveled to Spain, France and the Czech Republic. The patient was found to be suffering with disease resulting in spread around South America⁴⁶.

Turkey reported first corona virus case on 10th March 2020 where it was found that the afflicted person was a Turkish male who had been immediately put in isolation and that the person was contracted the virus while traveling to Europe⁴⁷.

Declaration as Pandemic by the WHO:

According to WHO on 11th March 2020 the number of cases of COVID-19 outside China has increased 13-fold and the number of affected countries has tripled. Thousands more patients are fighting for their lives in hospitals. WHO has assessed the outbreak as alarming and that COVID-19 can be characterized as a pandemic. By that time there were more than 1,18,000 cases in 114 countries and 4,291 people have lost their lives¹⁰ (Figure -2).



Figure - 2

Core Cause for spread of COVID-19/Movement outside the affected Areas

The review has shown that spread of corona virus disease (COVID-19) occurred due to movement of nationals outside the affected area of Wuhan Hubei China. It has been seen that

first diagnosed case of COVID-19 in different countries were either found to have a recent travel history from Wuhan Hubei or the affected country which earlier got the disease due to travel of infected person from China. Afterward due to spread of disease from multiple countries the number of affected persons and counties have shown swift increase leading the incidence as being conversion from an outbreak to pandemic.

Global Lock Down:

The corona virus which started from Wuhan, Hubei China and spread globally in short span of time. On account of increase in number of reported cases and subsequent deaths an almost complete lock down was made globally in all continents of the world with suspension of all social, economical etc activities except vital provision of food and health required for life. (Figure-3)

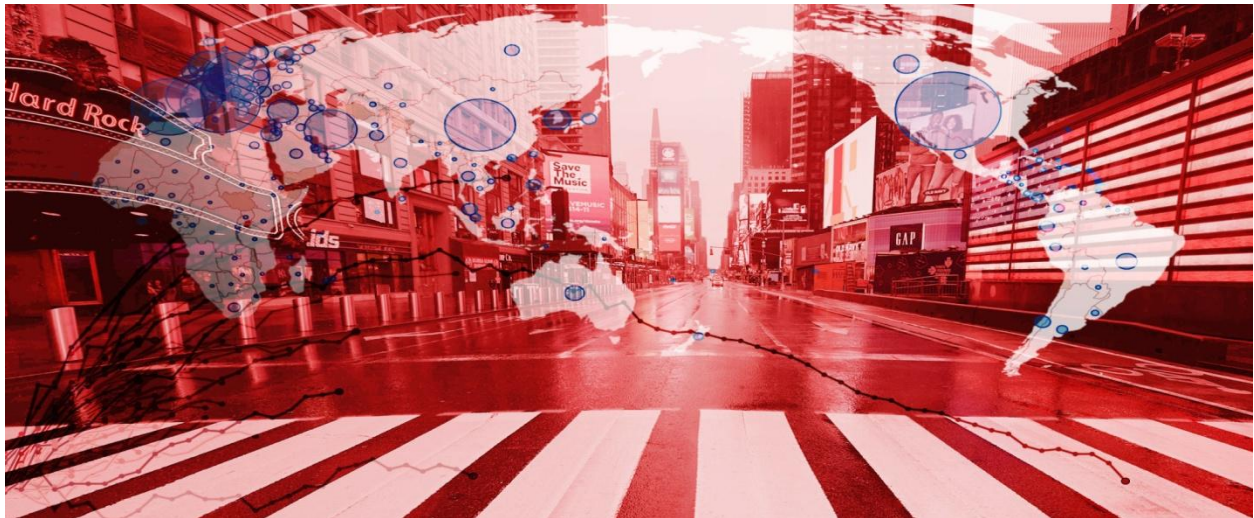


Figure - 3

Corona Virus (COVID-19) Pandemic 2020:

Like earlier pandemic since Stone Age the COVID-19 has shown to affect millions of people with result of thousands of deaths. The pandemic has widespread social and economic impact in almost all continent of the world. This was not first outbreak in 21st century where SARS(2002), Swine Flu(2009),MERS(2012),Ebola Virus(2014) etc happened. It has been seen that maximum mortalities has been seen in deceased at higher age group. Like earlier as seen in number of

outbreaks the disease started as zoonotic in origin bat and involved intermediate host drawn attention toward the wet markets.

The remedies consisting of strict quarantine, implementing immunization(after its preparation), reducing influx of unvaccinated refugees, reduction of ongoing global wars, control of political insurgency, security issues, adequate awareness of health care professionals regarding vaccination schedule, proper training , self vaccination of health care professionals, reduction of corruption etc would result in reduction of casualties all over world⁴⁸.

A global pandemic is all over but there are many unknowns and as earlier giving a message in almost all counties to work on the source and causes which have resulted in the shape of a bigger catastrophe in the world.

Treatment/Therapies for Corona Virus Disease (COVID-19):

According to WHO there is no vaccine for COVID-19 however it may take a number of years for a new vaccine to be developed for prevention of the disease⁴⁹.

The WHO has recommended avoiding close contact with people suffering from acute respiratory infections. It was advised to use mask,do frequent hand washing, especially after direct contact with ill people or their environment. For prevention of disease there should be avoiding of unprotected contact with farm or wild animals. People with symptoms of acute respiratory infection should practice cough etiquette (maintain distance, cover coughs and sneezes with disposable tissues or clothing, and wash hands). The healthcare facilities should enhance standard infection prevention and control practices in hospitals especially in emergency departments⁵⁰.There should be washing the hands or using an alcohol based rub frequently and not touching the face⁶.

Hydroxychloroquine and chloroquine have been used for prevention and hospitalized COVID-19 patients. It has also been fast-tracked through clinical trials to determine its efficacy in the treatment of COVID-19.The use of chloroquine as prevention/cure has been utilized to limit the spread of 2019-nCoV pandemic⁶⁹.

Discussion:

The Chinese authorities introduced unprecedented measures to contain the virus by stopping movement in and out of Wuhan and limiting more than 60 million people to the homes. Flights and trains were suspended and roads were blocked. The people in many Chinese cities were also told to stay at home and venture out only to get food or medical help. According to New York Times some 760 million people which is roughly half the country's population were confined to their homes⁵¹.

According to Chinese Authorities Wuhan the provincial capital and city hardest hit by virus was sealed off until 8th April 2020 which means after reporting of first case they have quarantined Wuhan city for more than three months⁵².

The new virus sweeping the world is believed to have started in a “wet market” in Wuhan China where like many other markets in Asia bats, snakes, civets and other animals are tied up or stacked in cages. Many are killed on-site to ensure freshness which is highly valued in Chinese culture and cuisine. According to health experts the markets are considered breeding grounds for new and dangerous infections because of close contact between humans and live exotic animals which makes it easier for viruses to jump between species. It is believed SARS originated from the same type of market and COVID-19 also spreads throughout China and widely crossed the borders⁵³.

In the past century five influenza pandemics had occurred (1918 "Spanish flu" , 1957 "Asian flu" , 1968 "Hong Kong flu" , 1977 "Russian flu" and 2009 H1N1 Pandemic) which accounted for hundreds of millions of people infected and tens of millions dead. The China was influenced by all the five pandemics, and three of them (1957 "Asian flu", 1968 "Hong Kong flu" and 1977 "Russian flu") were originated from China. The previous history of Pandemics due to viral disease indicate risk of infection of COVID-19 not only in the China but as well as in other countries of the world⁵⁴.

Siddharth Chandra said that the estimates about of deaths from the influenza pandemic of 1918–19 in Japan range from 257,000 to 481,000 with the resulting crude death rate range of 0.47%–0.88% is found as considerably lower than worldwide estimates of 1.66%–2.77%. In agreeing

with Siddharth about Japan for control of disease it looks that the Japan is maintaining similar approach for prevention where they have detected first case during screening as a preventive measure in the beginning period of pandemic⁵⁵.

Alexandra et.al in the editorial about Pandemic in the United States drawn toward role of both private citizens and uniformed personnel; for households, communities, work forces, volunteer organizations, and professional organizations; and for traditional governance structures at the local, state, and federal levels. In agreeing with Alexandra the vital role of all corner of community can't be ignored for control of disease⁵⁶.

The Local (fr) in the article Black Death to Spanish Flu stated diseases have shaped French history and since in the 21st century advances occurred in microbiology and virology as well as an understanding of how disease spreads expects that it would be extremely difficult for a plague to rage as widely and wildly as the Black Death or at least at the same level of lethality. In continuation of epidemic we agreeing partially about reduced level of lethality however in spite of sufficient advancement in microbiology and virology yet the Pandemic of COVID-19 have not only occurred but as well as spread globally which indicate the search of factors beyond microbiology and virology to control the occurrence of epidemic/pandemic disease⁵⁷.

The Health Department of Australia in their update about history of pandemics stated influenza pandemic of 1957-58 arose by genetic reassortment of a bird virus. Similarly studies showed that in 1968-70 pandemic or Hong Kong flu also occurred by genetic reassortment. In agreeing with the Health Department studies are needed to be carried out not only for control of the corona virus disease but as well as to detect genetic reassortment for control of disease⁵⁸.

German Lopez in the Vox stated about lessons on social distancing from 1918 Spanish flu pandemic and recommended that quick actions are needed to be taken and interventions should be sustained until the virus truly goes away. It also emphasized to sustain the social distancing practices which could required for months as it is necessarily required to save as many lives as possible. The role of leadership in control of epidemic/pandemic can be judged from lessons in 1918 where in Pennsylvania the mayors of Philadelphia and Pittsburgh were fighting with the

governor and the governor was fighting with the state health commissioner. In the same year there were some cities that had really good leaders and they had really good health commissioners who worked well with mayors and worked well with the superintendent of schools and police force and then there were others that were really bad. All this indicate that in addition to social distancing whole of the community including leadership should function as a single unit to compete the pandemic⁵⁹.

Guido Alfani stated in European Review of Economic History about Plague in seventeenth century Europe and decline of Italy where it was concluded that plague greatly contributed to relative economic decline of Italy and set an agenda for investigating fully the economic consequences of the epidemics. In agreeing to Alfani whereas Italy is one of the most affected countries in the world due to COVID-19 the economic consequences are needed to be investigated globally with appropriate remedies for the recovery of the survivors⁶⁰.

We agree with David et.al who in their study of Spanish flu (1918) gave an insight for the 21st century that the most difficult challenge would probably not be to increase medical knowledge about treatment and prevention but to increase medical capacity, resource availability (e.g., hospital beds, medical personnel, drugs, and supplies), public health and community crisis responses to an event in which 25–50% of the population could fall ill during a few weeks' time. Health care systems could be rapidly overwhelmed by the sheer volume of cases where ensuring production and delivery of sufficient quantities of antiviral, vaccines, antibiotics, widespread access to medications and medical care particularly to impoverished regions would be a sobering challenge since supply chain of necessary medications and equipment for medical care could easily be disrupted by global public health catastrophe⁶¹.

Azizi et.al in their study about History of Cholera Outbreaks in Iran during the 19th and 20th Centuries concluded that several Persian books were written on cholera by Iranian and European physicians in Iran during the 19th and 20th centuries. The oldest book was entitled 'Wabbayeh' (Cholera) written by an Iranian author named Mirza Mohammad Tabib Tehrani which dated back to 1858. Among European physicians Dr. Jacob Eduard Polak (1818-1891) from Austria who was the first medical teacher of Dar al-Fonun School (founded in 1851) wrote a treatise on cholera (Resaly-e Wabbayeh) which was published by Dar al-Fonun Press in 1852. The Pandemic of corona virus disease(COVID-19) after killing thousands of people globally would

be most probably over following which as earlier books and articles would have been written with numerous conclusions and failure to implement to implement the remedies of conclusion can't stop the happening of next pandemic in the world⁶².

Mazhar Hussain in their article stated about Pakistan's preparedness for corona virus pandemic. It was emphasized that Pakistan has unenviable task of ensuring its public health system which is already under resourced and overburdened where it should be urgently strengthened to tackle the rapidly expanding pandemic. In this regards three steps consisting of ensure adequate availability of diagnostics and effective screening, take adequate preventive measures and develop capacity for timely regulatory approvals and stockpiling for drugs/vaccines are urgently required to be taken in competing the risk COVID-19 pandemic in Pakistan⁶³.

Philips in their article said that the issue of repatriation of foreign nationals from China grabs the headlines in South Africa and elsewhere on the continent in the wake of the spread of Covid-19 about important lessons that needed to be drawn from events 102 years ago in 1918 when an earlier epidemic called Spanish flu arrived in the country. That was the most devastating pandemic of modern times killing more than 50 million people around the world (or 3% to 4% of the globe's population) in just more than a year. About 300000 South Africans died within six weeks which represented 6% of the entire population. Certainly the world is a very different place in 2020, not least in the speed of international travel compared to that in the steamship era of 1918 however the ways in which viruses behave and humans respond have not changed as much. Therefore still important lessons needed to be learnt from the catastrophe from 1918 to 2020⁶⁴.

According to Massimi Galli "Italy is a country of old people" and therefore the elderly with previous pathologies are notoriously at higher risk. The higher age with weaker immune system has been the probable reason for more serious cases of corona virus in the Italy⁶⁵.

It has been on 18th February 2020 where a fit 38 year old with no apparent links to China fell ill in Codogno. He saw his GP and visited his local hospital several times but his symptoms were not picked up as resulting from the corona virus. The patient was finally admitted to hospital where he was tested after a 36 hour delay which he spent outside isolation. It can be judged that

by that time he had infected a number of medical personnel and other contacts over a period of days⁶⁵.

According to Berna Arda et.al the pandemic is reported to spread in three waves, A moderate but fairly spreading occurrence in spring 1918 then an utterly severe and devastating attack in fall 1918 and finally a last attack in spring 1919. The last wave was more severe than the first wave but not as devastating as second phase. This indicate that after settlement of acute phase still there would be risk of disease and proper preventive measures should be continued to prevent relapse of the disease⁶⁶.

BCG vaccination has shown broad protection to respiratory infections. It is found that those countries without universal policies of BCG vaccination (Italy, Nederland, USA) have been more severely affected compared to countries with universal and long-standing BCG policies. It has been observed that countries where late starts of universal BCG policy (Iran-1984) was implemented they have high mortality indicating the idea that BCG protects the vaccinated elderly population. Since BCG vaccination also reduced the number of reported COVID-19 cases in a country therefore the reduced morbidity and mortality suggest BCG vaccination as a potential new tool in the fight against COVID-19⁶⁷.

The novel corona virus outbreak presents an immense challenge for global health. But it is also part of a larger pattern that viruses that circulate in animals keep jumping over to infect humans. The story of the novel corona virus is the story of HIV, of SARS, of Ebola, and even the measles. These are all diseases that have been introduced to humans with deadly effects via animals. And as humans encroach more and more into animal habitats it is believed that these spillover events may grow more common⁶⁸.

The countries introduced unprecedented measures to stem the spread of the new corona virus. One of the most alarming conclusions from infectious disease modelling is that there is no clear exit strategy. We can see from China and South Korea where a combination of community surveillance, testing and contact tracing, strong social distancing and rapid clinical care, reduced infections and deaths. But we don't know how long these measures should last or whether relaxing them will allow the virus to undergo resurgence⁷⁰.

Conclusion:

The spread of disease as a pandemic occurred due to movement of carriers outside China and ultimately became source of global spread. Strict quarantine measure should be maintained to avoid spread of infectious disease. Early and appropriate preventive measures should be opted after outbreak/epidemic to prevent spread of disease. The vital role of community as a whole is required to control the epidemic/pandemic disease. Beyond personal/political differences the leadership at every level should be committed to compete and manage the global crisis for the world. The code of ethics for social distancing should be defined and strictly implemented. Appropriate economic remedies should be made after survivors of pandemic globally. Selling, buying and eating of wildlife animals should be internationally banned. The genetic reassortment of COVID-19 should be worked to prevent any pandemic due to same virus in future. In order to manage global public health catastrophe the health authorities should make system in cold days which is reserved sufficiently for provision of chain about necessary medications and equipment to manage the crisis. The settlement of corona disease may take a longer time therefore preventive measures should be continued after settlement of acute of the disease.

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