



ISSN: 0975-833X

Available online at <http://www.journalcra.com>

International Journal of Current Research
Vol. 12, Issue, 04, pp.11014-11020, April, 2020

DOI: <https://doi.org/10.24941/ijcr.38444.04.2020>

**INTERNATIONAL JOURNAL
OF CURRENT RESEARCH**

RESEARCH ARTICLE

CORONAVIRUS (COVID-19): THE CHALLENGES OF PUBLIC HEALTH IN THE FACE OF A GLOBAL PANDEMIC

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ARTICLE INFO

Article History:

Received 14th January, 2020

Received in revised form

05th February, 2020

Accepted 18th March, 2020

Published online 30th April, 2020

Key Words:

COVID-19, Public Health,
Quarantine, Global Pandemic.

ABSTRACT

The COVID-19 is the most recently discovered of the corona virus which causes respiratory infections consisting of two large scale pandemics MERS & SARS and found to be zoonotic in origin. The disease started from Wuhan's 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 causes 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. It can be prevented by washing the hands or using an alcohol-based to rub them and avoid touching the face. Outbreak is small but unusual, the epidemic is outbreak over a larger geographic area while pandemic spreads to multiple countries. China on 31 December 2019 first informed the world 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. Japan, USA, France, Australia, Germany, Italy and Spain reported their first case on 16,19,24,25,27,31 and 31 January 2020 respectively. In February new cases were reported by Iran, Pakistan, England on 19,26,28 respectively while in March cases seen in South Africa, Turkey on 5 and 10 respectively. WHO on 11 March 2020 assessed the outbreak as a pandemic. 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.

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Citation: Eduardo Martinez Martinez, Alba Lúcia Lopes Valente and Wagno Alcantara de Santana. 2020. "Coronavirus (COVID-19): The challenges of public health in the face of a global pandemic", *International Journal of Current Research*, 12, (04), 11014-11020.

INTRODUCTION

A COVID-19 is the most recently discovered of the corona viruses which caused respiratory infections such as MERS and SARS¹. The Coronaviruses have caused two large scale pandemics in the past two decades, SARS and Middle East respiratory syndrome (MERS). The disease started from Wuhan local seafood market in China and infected 2,761 people in China with 80 deaths and infection of 33 people in 10 additional countries as of 26 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 the whole-genome level to a bat coronavirus. The 2019-nCoV virus isolated from the bronchoalveolar lavage fluid of a critically ill patient which could be neutralized by sera from several patients.

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It has been confirmed that 2019-nCoV uses the same cell entry receptor angiotensin converting enzyme II (ACE2)². The Coronavirus Study Group of the International Committee on Taxonomy of Viruses has proposed this virus as a sister to severe acute respiratory syndrome coronaviruses (SARS-CoVs) of the species severe acute respiratory syndrome-related coronavirus and designates it as severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2)³. Corona means crown in Latin and it look like a crown under a microscope. At first it was 'novel coronavirus', which means a new strain of coronavirus. 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 coronavirus (SARS-CoV) and Middle East respiratory syndrome coronavirus (MERS-CoV) are zoonotic in origin and have been linked to 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 the 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 best way to prevent and slow down transmission is the self protection and others from infection by washing the hands or using an alcohol-based rub frequently and not touching your face. 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 (for example, by 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 is 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 in 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 (which causes the disease known as COVID-19). 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 is 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 which killed a maximum estimate of 200 million people in the 14th Century, HIV/AIDS, which has so far killed up to 32 million people, the Black Death was known as the Great Plague and claimed millions of lives and the most deadly flu-like pandemic was the Spanish Flu which began in 1918 and at one point infected 40 per cent of the world's population⁹. On 31 December 2019 WHO has been first informed that "a pneumonia of unknown cause" had been detected in Wuhan, the largest city in Hubei province in central China¹. WHO assessed the outbreak round the clock about the alarming levels of spread and severity and on the basis their assessment declared on 11 March 2020 that COVID-19 can be characterized as a pandemic¹⁰.

The genesis of contamination 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 it on 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 in constant close contact. 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 sold at the Wuhan market where the virus is believed to have originated and it is likely another animal which sold their got infected and transmitted the disease. In this instance it is assumed that bats infected an intermediary host that served as the immediate source for the human infection¹³ however according to other report livemint bats, pangolins and dogs are sold in wet market¹⁴. Although initial speculation pointed to seafood, snakes etc however researchers from Hong Kong, China and Australia have found that genetic sequences of the novel coronavirus in pangolins are 85.5% to 92.4% identical to the coronavirus currently infecting hundreds of thousands people.

That means, before reaching humans, the virus was likely passed from bats to the pangolin¹⁵. According to one hypothesis the interaction between the receptor binding domain (RBD) of the coronavirus 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. Coronaviruses are very stable in a frozen state and shown survival for up to two years at -20°C. The coronaviruses appear to be stable at low and freezing temperatures for a certain period and food hygiene and good food safety practices can prevent their transmission through food. Specifically, coronaviruses are thermo labile which means that they are susceptible to normal cooking temperatures (70°C). Therefore, as a general rule, the consumption of raw or undercooked animal products should be avoided. Raw meat, raw milk or raw animal organs should be handled with care to avoid cross contamination with uncooked foods¹⁷.

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 initially 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. 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 in an individual with an infection that is inapparent throughout its course (commonly known as healthy or asymptomatic carrier), or during the incubation period, convalescence and postconvalescence of an individual with a clinically recognizable disease (commonly known as an incubatory or convalescent carrier). Under either circumstance the carrier state may 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.

Can sars-cov-2 infection be considered a pandemic?: On 31 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 SARS. ¹ Japan confirmed its first case of infection on 16 January 2020 from Wuhan pneumonia like virus and they isolated two visitors from the Chinese city as a preventive measure. It was found that the 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 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 sick²².

The United States first case of 2019-nCoV infection was reported on January 20, 2020 where on January 19, 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 after traveling to Wuhan, China. The patient stated that he had seen a health alert from the U.S. Centers for Disease Control and Prevention (CDC) about the novel coronavirus outbreak in China and because of his symptoms and recent travel decided to see a health care provider²³. France has declared first confirmed cases of the deadly corona virus on 24 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 China²⁴. It has been on 25 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 Guangdong on 19 January 2020²⁵. The first human to human transmission of the Wuhan corona virus in has been reported in Germany on 27 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 21 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 Wuhan²⁶.

On 31st January 2020 the Italian Government announced to suspend all flights between Italy and China with declaration of emergency in the country after doctors confirmed two Chinese tourists in Rome had tested positive for the coronavirus²⁷. The coronavirus pandemic was confirmed to have spread to Spain on 31 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 isolation²⁸. The Iran has first reporting of the disease when two deaths occurred in the on 19 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 the two died could have been sick and infecting others for weeks²⁹. On 26th February 2020 a young man had 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 20 February 2020. The patient with his family has been placed in quarantine at the Aga Khan University Hospital Karachi³⁰.

The first patient was diagnosed with the coronavirus in England on 28 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 himself³¹. First case of Covid-19 Corona virus reported in South Africa has been found on 5 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 wife³². Turkey reported first coronavirus case 10 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 Europe³³. According to WHO on 11 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 been assessed the outbreak as alarming and that COVID-19 can be characterized as a pandemic¹⁰?

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, roughly half the country's population were confined to their homes³⁴. According to Chinese Authorities Wuhan, the provincial capital and the city hardest hit by the virus was sealed off until 8th April 2020 which means after reporting of first case they have quarantined Wuhan city for more than three months³⁵. 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 the close contact between humans and live exotic animals 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 borders³⁶. 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 for replace infection of COVID-19 not only in the China but as well as in other countries of the world³⁷.

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 pandemic³⁸. 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 disease³⁹. 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 disease⁴⁰.

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 disease⁴¹. 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 in addition to social distancing the whole of the community including leadership should function as a single unit to compete the pandemic⁴². Guido Alfani stated in European Review of Economic History about Plague in seventeenth century Europe and the decline of Italy and concluded that plague greatly contributed to the 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 survivors⁴³.

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, and antibiotics, as well as providing 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 catastrophe⁴⁴.

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 1858.23 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 world⁴⁵.

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 regard, 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 compete the risk COVID-19 pandemic in Pakistan⁴⁶. 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 can 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 300 000 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 2020⁴⁷. 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 Italy⁴⁸. It has been on 18th February 2020 where a fit 38 years 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 36 hours 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 days⁴⁸. 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 disease⁴⁹.

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. Countries where late start of universal BCG policy (Iran, 1984) also had 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 makes BCG vaccination a potential new tool in the fight against COVID-19⁵⁰. The novel coronavirus 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 coronavirus 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 only grow more common⁵¹.

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 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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