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Review Article

Debunking Myths about COVID-19, Paranoiac Misconceptions, Recent Developments and its Current Stance

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ABSTRACT

As the COVID-19 is becoming an increasing health threat, it has urged the scientists all over the world to not only research about its transmission, prevalence and causes but also to spread its awareness in the maximum possible ways. Although the complete disease-causing mechanisms of COVID-19 remain to be fully elucidated, active research is being conducted continuously in the field to gather as much information about every aspect of this disease as possible. Also, a clear difference is prevalent in different regions of the world about the rate of deaths and survivals. Therefore, the current comprehensive review has been written in view of all these aspects so as to present a complete picture of where the world stands, how can the disease be coped, what myths have been developed along with this new pandemic, and what measures should be taken both at individual and states' levels to help fight against COVID-19.

WHAT IS COVID-19?

The dissection of the word COVID-19 helps to understand its origin is as follows: 'CO' stands for corona, 'VI' for virus, 'D' for disease and '19' for the year 2019 in which the first case of the disease was reported. Formerly, this disease was referred to as '2019 novel coronavirus' or '2019-nCoV', as it was reported in late December 2019 in Wuhan, China. COVID-19 is an infectious disease caused by a novel Coronavirus. Coronavirus is of 1-2nm size and belongs to group of enveloped virus family, containing a positive-sense single stranded RNA (Fehr and Perlman, 2015). According to the report of World Meter, this virus has subsequently affected 205 territories and countries till now. The COVID-19 is an acute disease and it can be deadly with 2% fatality rate (Xu *et al*., 2020).

WHY IS IT NAMED CORONA?

According to Center for Disease Control and Prevention, coronaviruses are named for their crown like appearance under the microscope. These viruses have crown or corona like spikes on their surface, these spikes are protein molecules which are used for the attachment purposes (Singhal, 2020).

ORIGIN AND EPIDEMIOLOGY

In December 2019, a series of pneumonia cases of unknown cause emerged in Wuhan (Province Hubei, China) with clinical symptoms resembling to viral pneumonia. Deep sequencing analysis from samples of lower respiratory tract showed a novel virus, named Coronavirus. Coronavirus is one of those pathogens that targets the human respiratory system. Severe acute respiratory syndrome (SARS)-CoV and the Middle East respiratory syndrome (MERS)-CoV are previous outbreaks caused by coronavirus. The analysis of genome sequence data of public from SARS-CoV-2 and related viruses found no evidence that the virus was made in a laboratory or otherwise engineered (Science Daily, 2020a; Andersen *et al*., 2020; Support the Guardian, 2020; NIH Director's Blog, 2020).

In December 2019, in Wuhan city of China, various

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patients were admitted suffering from pneumonia of an unknown etiology. These patients were linked epidemiologically to a seafood and wet animal wholesale market of Wuhan, Hubei Province, China (Rothan and Byrareddy, 2020).

MODES OF TRANSMISSION

Based on the initial cases of COVID-19 counting those who were exposed to wet animal market in Wuhan where live animals are sold, it is suggested that these animals are the zoonotic cause of COVID-19. To date there is no evidence of coronavirus having reservoir other than mammals and birds (Bassetti *et al*., 2020). Genomic analysis showed 88% similarity of COVID-19 with two bat derived SARS-like coronavirus, thus indicating that the link between human and coronavirus are mammals which probably served as their passive reservoirs as the disease has not been found in these animals (Lu *et al*., 2020; Rothan and Byrareddy, 2020).

There are several evidences of transmission of COVID-19 from human to human. These were strengthened by the reports of the infected people who did not visit wet market of Wuhan. Human to human transmission occurs via droplets which come out of an infected person's mouth after sneezing and coughing as well as direct contact to infected person (Guo *et al*., 2020; Yuen *et al*., 2020; Cai *et al*., 2020). Eyes are also route of virus entry in the body (Yu *et al*., 2020; Douglas and Douglas, 2020). However, in a study it was seen that infected pregnant ladies of third trimester had delivered the normal children. This study suggests that COVID-19 does not transfer from mother to child during pregnancy. But there is no evidence of the fact that this virus does not transfer during vaginal delivery because all the women delivered children via C-section (Chen *et al*., 2020a; Schwartz, 2020).

The COVID-19 infection is caused by the binding of virus to host cell followed by the fusion with cell membrane. Keeping in view the example of SARS-CoV, the epithelial cells of lungs are the primary target of the virus which binds to the angiotensin-converting enzyme 2 (ACE2) receptor through its receptor-binding domain of spikes on the cell (Wan *et al*., 2020; Jaimes *et al*., 2020). Similarity in the sequence of SARS-CoV-2 and SARS-CoV strongly suggests the entry of SARS-CoV-2 through ACE2 receptor to the host cell (Wan *et al*., 2020). ACE2 is not only expressed in lung cells, but also in esophagus upper, stratified epithelial cells, absorptive enterocytes of ileum and colon. So, digestive system could also be a potential route for COVID-19 infection (Zhang *et al*., 2020).

Unlike other viruses, Coronavirus-spread depends on environmental conditions. Temperature and humidity in environment are still under consideration but surface environment, clean air are important factors to consider, because droplets of infected people need environmental surfaces to spread. Therefore, to prevent the transmission of this virus, social distancing, strict adherence to environmental and personal hygiene are important (Fig. 1; Science Daily, 2020b).

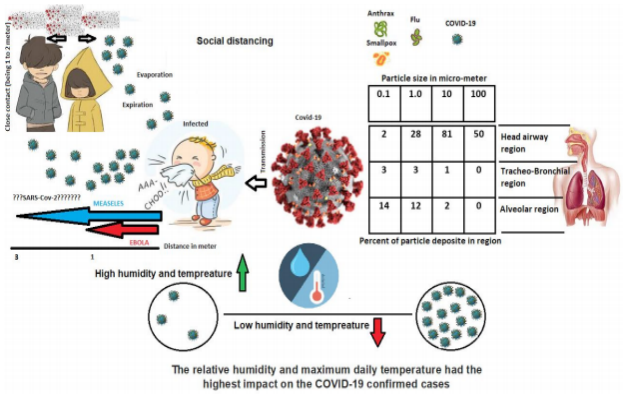

Fig. 1. The importance of social distancing, close contact, particle size, percent of virus particle deposit in various regions of upper airway, and the effect of humidity and temperature on the COVID-19 activity.
(taken from https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3563403).

SYMPTOMS OF THE DISEASE

The most common symptoms of the COVID-19 infection are fever, cough and fatigue (Fig. 2). Other severe symptoms include sputum production, headache, hemoptysis, diarrhea, dyspnea, and lymphopenia (Ren *et al*., 2020; Zhou *et al*., 2020b). The CT scan reports of patients show severe pneumonia along with acute respiratory syndrome and cardiac injury which can lead to death. Unique clinical features of COVID-19 which make it different from previous beta coronaviruses are fever, dry cough, sneezing and sore throat (Kolifarhood *et al*., 2020; Singhal, 2020; Zhou *et al*., 2020d). A recent study also suggests infected patients with lost sense of smell and taste (Gautier and Ravussin, 2020).

Symptoms of COVID-19 appears mean incubation period of 5.2 days (Edinburgh News, 2020). Duration between symptoms of COVID-19 illness to death is of 6 to 41 days with median of 14 days. This duration depends on the age of the patient and on patient's immune system. It was shorter in patients >70-years old compared to the people of the age of 70. Studies have indicated that mortality rate due to COVID-19 is significantly greater in old-aged patients than young or middle-aged patients (Liu

et al., 2020b; Guan *et al*., 2020; Liu *et al*., 2020a). The ACE2 is involved in protective mechanisms of lungs and work against severe injuries to lungs due to the coronavirus. The enzyme expression declines with the increase in age. However, the lower susceptibility in young age may not be consistent. Moreover, the young-aged people have more active and strong immune system and healthy respiratory tract which have not been much exposed to smoking and pollution (Lee *et al*., 2020).

The severity of COVID-19 is also linked to other pre-existing disorders. Patients of diseases such as cardiovascular disease, cancer, hypertension, diabetes at high risk of COVID-19 infection (Ganatra *et al*., 2020; Chen *et al*., 2020b; Zheng *et al*., 2020). The risk is even higher in elder people with pre-existing disease (Ganatra *et al*., 2020). Elderly patients specifically with comorbidities such as diabetes, hypertension is more likely to get COVID-19 infection (Zhou *et al*., 2020a; Guan *et al*., 2020).

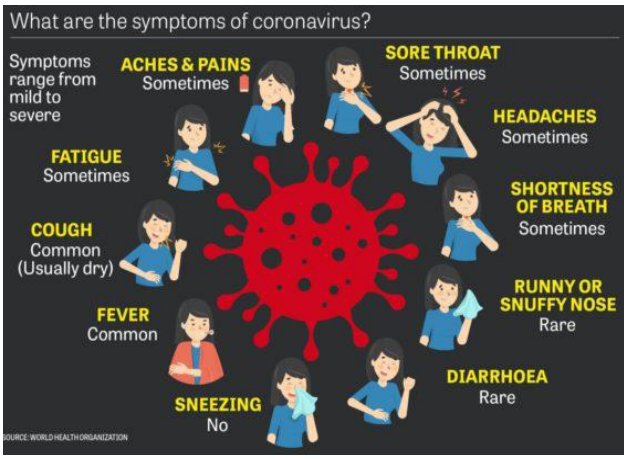

Fig. 2. Symptoms of crona virus infection.
Image courtesy: WHO (World Health Organization). (taken from https://www.edinburghnews.scotsman.com/health/how-long-does-coronavirus-last-how-many-days-covid-19-stays-your-system-and-when-symptoms-will-go-away-2520312)

SURVIVAL IN HOST

COVID-19 spreads from person to person through droplets of sneezing, cough, and flu as it cannot fly in air. It always needs a surface to travel and human beings are the major carriers through which it travels. For instance, by touching a contaminated surface, it comes in contact with a person's hands and if the same person touches his/her mouth prior to washing hands, the virus enters inside the body through nose or mouth (Chemistry Views, 2020).

After entering in the body through nose or mouth and it enters in the mucous membrane of the respiratory tract and symptoms start to appear such as sore throat and inflammation in nasal cavity. After moving into the lungs, more severe symptoms begin to show such as high fever and difficulty in breathing (Fig. 3).

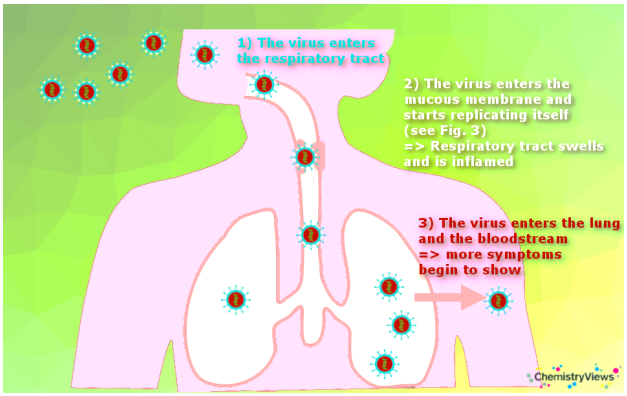

Fig. 3. Entry of coronavirus inside the host.
(taken from Chemistry Views. Coronavirus entering and replicating in a host cell. March 03, 2020).

According to current study, host of the coronavirus are human and bird species only. If virus enters in human body, it can replicate and eventually stays for longer time (Miłek and Blicharz-Domańska, 2018).

Coronaviruses contain RNA genome surrounded by nucleocapsid having helical symmetry. After entering in respiratory tract, virus enters in lungs and penetrate in airways via specific receptors (ACE2). The ACE2 receptors are present in ciliated epithelial cells in upper and lower airways and type II pneumocytes in alveoli in lower airways. These type II pneumocytes produce lung lubricating proteins, which are important for lung function.

The spike, 3CLpro, PLpro and RdRp are four essential proteins for coronavirus. Scientists are trying to find the treatment for SARS-CoV-2 by using one of these four proteins. Spike of SARS-CoV-2 is different from SARS-CoV spike in terms of binding to ACE2 receptors. That is why antibiotics made for SARS-CoV spike cannot be used for SARS-CoV-2 (Fig. 4).

SURVIVAL OF THE VIRUS OUTSIDE THE HOST

It has been claimed by studies that COVID-19 cannot survive at temperatures above 26°C, but it can survive for approximately 5-10 minutes on skin, six to 12 h on plastic materials, and 12 h on metal (Fig. 5) (SSRN, 2020).

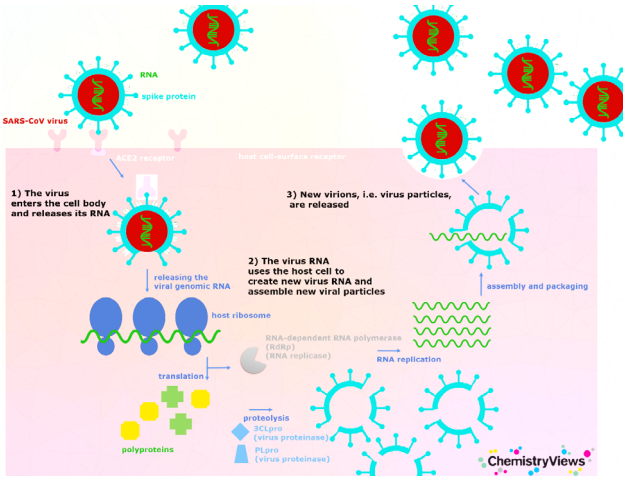

Fig. 4. Replication of COVID-19 inside the host. (taken from Chemistry Views. Coronavirus entering and replicating in a host cell. March 03, 2020).

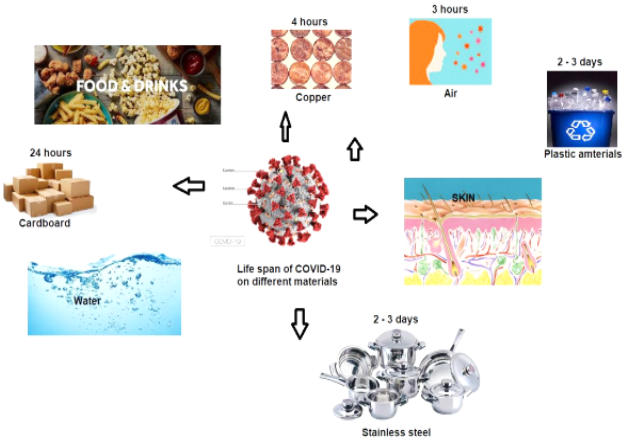

Fig. 5. Virus resilience on various surfaces and materials. (taken from https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3563403).

Exact span of survival of corona outside the living body is not clear yet. But studies on other coronaviruses such as SARS and MERS show that their life span on surfaces is of approximately 9 to 28 days (varies from surface to surface) unless these surfaces are properly disinfected (SSRN, 2020).

Scientists are poorly aware of the survival of coronavirus in the environment and exact factors of the transmission. However, limited studies in this field suggest that these viruses are more resistant to environmental factors unlike other coated viruses (Fehr and Perlman, 2015).

MYTHS ABOUT COVID-19 AND THEIR REALITY

Deaths

The data of June 02, 2020 depicted a total 6,366,197 confirmed cases of COVID-19 worldwide on the date with 377,437 deaths. This infection has affected about 215 regions and countries of the world (https://www.worldometers.info/coronavirus/). Although, few countries have fought extremely well with the viral outbreak, but such spread of pandemic disease made the general population frightened and compelled to think that if someone got infected with COVID-19, this would definitely lead them to death.

However, the above data has shown that the deaths are only less than 12%. About 2,903,605 patients have recovered. When comparing with related viral diseases, the SARS−CoV caused infection in 8098 people and killed 9.6% patients globally in 30 regions and countries from November 2002 to July 2003 (WHO, 2003). While it is also much lower than that of 34.38% of MERS-CoV, that killed 866 patients out of 2519 infected people from 2012 to 31 January 2020 (WHO, 2020b). Taken together, above mentioned facts revealed that the current mortality is although lower than SARS-CoV and MERS-CoV, but 2019-nCoV seems very contagious and public should be careful about the spread and expansion of the disease.

Affects only elder people

There has been a perception that COVID-19 disease infects only elder people. Studies have pointed and supported more deaths among elderly people than youngsters. Studies also support the fact that the first deaths commonly occurred among individuals with old ages (Wang *et al*., 2020a). The investigation also showed that the median days were from first symptom to death time were lesser in seventy years or older ages. Similarly, the China's CDC center reported the highest fatality rate in patients with ≥80 years old age (Epidemiology Group of the New Coronavirus Pneumonia Emergency Response Mechanism of the Chinese Center for Disease Control and Prevention, 2020). In another study, the researchers have observed the median age from 425 patients of coronavirus infection is 59 years and more than half of the patients' ages were 60 years or older (Li *et al*., 2020).

Nevertheless, COVID-19 cannot be associated with old age only. Another study has reported the association of COVID-19 patients with age range of 21-82 years where 10% were ≤39 years old while 22%, 30%, 22%, 15% patients were 40–49, 50–59, 60–69, ≥70 years old respectively (Chen *et al*., 2020b). A Report of China CDC center states that till February 11 (2020) death percentages

in 10–19, 20–29, 30–39, 40–49, 50–59, 60–69, 70–79 and ≥80 age ranges were 0.1, 0.7, 1.8, 3.7, 12.7, 30.2, 30.5 and 20.3%, respectively (Epidemiology Group of the New Coronavirus Pneumonia Emergency Response Mechanism of the Chinese Center for Disease Control and Prevention, 2020). Also, it has been identified that nine infants having ages from 1 months and 26 days to 9 months have been infected with novel coronavirus (Wei *et al*., 2020). And so, although some studies have supported the more chance of deaths in aged people, but young people also have fair chances to get infected and ultimately deceased.

Only Chinese are susceptible

In the beginning of the COVID-19 outbreak, there was a myth that only Chinese people are susceptible to its infection. However, now this viral infection has spread and causing deaths to almost all the continents with 215 countries or regions.

Wearing mask will protect you

As COVID-19 spreads through aerosolized droplets discharged during coughing or sneezing of infected person, an initial question for protection against the virus was whether wearing mask will protect from getting infected or not (Ng *et al*., 2020). According to study, the use of N95 mask protected the health workers dealing with COVID-19 patients from getting the infection (Wang *et al*., 2020b).

Most of general population uses surgical masks instead of N95 masks, so the next logical question was whether surgical masks would also be equally effective or not. A recent case study suggested that both N95 as well as surgical masks are equally effective for protection against COVID-19 (Ng *et al*., 2020). Nonetheless, the definitive role of each type of mask in the prevention of acquiring the disease is yet to be determined. Moreover, improper usage of N95 or other surgical masks would not be helpful for protection. Therefore, these should be worn tightly and properly so that there is no space of aerosols to infiltrate them (Wang and Yu, 2020).

Bat soup virus?

As early cases of COVID-19 were linked to Huanan market of Wuhan (China), there arose a general perception of coronavirus origin from an animal source, supported by few investigators (Wu *et al*., 2019; Zhou *et al*., 2020c). Also, a large number of SARS-related coronaviruses have been discovered from bat source (Li *et al*., 2005; Ge *et al*., 2013; Yang *et al*., 2013; Hu *et al*., 2017) and studies have shown that these viruses have the ability to infect humans (Menachery *et al*., 2015; 2016; Wang *et al*., 2018). A recent study has reported an investigation and have shown that the genome sequence of new coronavirus (2019-nCoV) is much like bat coronavirus so that bat might be a probable origin of 2019-nCoV (Zhou *et al*., 2020b). Likewise, another group has reported similar views based on genomic characterization (Lu *et al*., 2020). Thus, based on above-mentioned reports, it seems that the new coronavirus was transferred to humans from bats.

Pets can transfer virus or not?

Can pets get coronavirus and or be a medium of their transfer to humans is a question of active debate these days? A study of coronavirus infection to animals suggested that it replicates poorly in pigs, dogs, ducks, and chickens, but efficiently in ferrets and cats. The virus transmitted to cats by respiratory droplets (Shi *et al*., 2020). But other scientists commented that this study does not apply in real life scenarios as these experiments were conducted in specific laboratory conditions with higher coronavirus doses. No direct evidence has proven that infected cats may transfer virus to humans (Nature, 2020a, 2020b). Similarly, another report says that there is no concrete evidence that cats or dogs can be sickened due to coronavirus or transmit it to humans (Almendros, 2020).

Getting sick from packages sent from China

Some people think that they might get COVID-19 infection from touching packages sent/imported from China. However, it is possible only if those packages are contaminated with COVID-19 on their surfaces. Although this is not main source of virus transmission, but chances are still here (CDC, 2020). A research group has reported that the SARS-CoV-2 was detectable on copper surfaces for up to four hours, on cardboard up to 24 h while on the plastic and stainless-steel surfaces the duration was two to three days. Consequently, COVID-19 may be acquired after touching the contaminated objects (van Doremalen *et al*., 2020). Thus, it is highly recommended that such surfaces or suspected objects should be cleaned and sterilized properly before handling. However, it has been suggested by WHO that the chances of a person getting infected from any commercial package is very low as the package has been traveled for a long time and through different temperatures and conditions thus making it less likely for the virus to survive (WHO, 2020a).

The most dangerous virus

Due to pandemic conditions of COVID-19, it is being considered the most dangerous and lethal virus by public. However, by looking at the spread of infectious COVID-19 till June 02 (2020) the death rate has come out to be less than 12% (https://www.worldometers.info/coronavirus/). An investigation calculated its mortality rate as 3.6%

in Chinese patients and 1.5% outside the China during early March 2020 (Cai *et al*., 2020). The comparison of this with other pandemics indicates that this rate is quite lower and thus COVID-19 is not as deadly as has been generally perceived. For example, during 1918 pandemic of influenza (H1N1 virus), about one third population (500 million population) got infected with at least 50 million deaths (CDC, 2019), accounting for 10% death rate. By the same token, hepatitis has stemmed total 1.34 million deaths in 2015 worldwide. Moreover, the death rate due to this viral disease has been increased by 22% since 2000 (WHO, 2017). Also, in the case of MERS-CoV, the death rate is 34.4% worldwide with 2494 laboratory cases along with 858 deaths till November 2019 (WHO, 2019, 2020b) and for Ebola virus it has over than 66% fatality rate in Democratic Republic of the Congo (WHO, 2020c). Hence, coronavirus is not the most dangerous virus known to humans, many other viruses have more death rates. However, its quick spread is an alarming situation and proper precautionary measures are mandatory to stop its transmission and protection against it.

Will closing borders save others?

In the context of coronavirus spread, many countries have closed borders and banned traveling of foreigners to their land. Since February 2020, many airlines have suspended or limited the flight operations from greatly infected countries like China, US, Australia, Italy, Russia (Channel News Asia, 2020; The New York Times, 2020). A detailed study indicated that travel restriction to stop COVID-19 spread was very beneficial (Chinazzi *et al*., 2020). Despite that, violation of this restriction has been done several times that helped the transmission of coronavirus.

Same as SARS?

In China, severe acute respiratory syndrome coronavirus (SARS-CoV) originated during November 2002 and created a global outbreak by spreading in 26 countries with 8,000 cases till July 2003. While in December 2019, SARS-CoV-2 originated from Wuhan city of China causing an infectious outbreak subsequently named as COVID-19. Whether these two viruses are same or different is a general confusion. Although they are not identical but high degrees of similarity has been found in origin as well as route of transmission. For instance, both are considered to be originated from animal source and transmit through respiratory droplets (Wilder-Smith *et al*., 2020). Correspondingly, a group of scientists has also reported much similarities in genomic sequences of both viruses. However, many clear differences are also emerging in transmissibility as well as severity pyramids (Zhou *et al*., 2020b) as COVID-19 presents greater transmissibility, higher number of cases and symptoms than that of SARS (Wilder-Smith *et al*., 2020).

Deliberate creation/released

Some rumors are also in the air about the generation of COVID-19 *via* biotechnological techniques as a bioweapon. But a study has stated that from the genome sequence of SARS-CoV-2 no evidence has been found for its deliberate creation in laboratory. Rather the comparison of genome with other related virus firmly suggested that its origin was through a natural process (Andersen *et al*., 2020). Moreover, the coronavirus got its pathogenic state through natural selection in non-human host and then transmitted to human. The other possibility was that the virus was transmitted from animal host to human in non-pathogenic state and then evolved to pathogenic state in human body.

What could be the role of antibiotics and antivirals?

It is a common myth that different kinds of antibiotics are effective against COVID-19. But World Health Organization (WHO, 2020a) has declared that antibiotics cannot work for coronavirus as they kill bacteria not virus. On the other hand, new discoveries may take months or even years. However, existing antiviral drugs for treating different infections caused by hepatitis B virus, HIV, and influenza are in trials to find any effect against COVID-19 based on previous experiences that have been successful with other coronaviruses – SARS and MERS (Li and De Clercq, 2020).

Several studies have achieved the promising results by using drugs such as chloroquine, hydroxy chloroquine, remdesivir, arbidol and favipiravir to assess their efficacy to treat the COVID-19. However, no final drug verified for COVID-19 is present yet. More preclinical and clinical trials are still needed to evaluate the safety and efficacy of these drugs (Dong *et al*., 2020).

Some studies have been conducted to assess the effectiveness of convalescent plasma for the treatment of severe COVID-19 cases. The outcome of this therapy was satisfying which resulted in the significant decline of viremia and improved clinical status of patients. However, the optimization of time and dose as well as clinical benefits are further required to be investigated in larger controlled clinical trials (Shen *et al*., 2020; Duan *et al*., 2020).

RECOMMENDED PRACTICES TO MINIMIZE GETTING THE VIRUS

Apart from myths, there are many facts that may minimize the chances of getting COVID-19 although

many researches are still in progress. According to WHO, hands should be washed regularly with soap and water or alcohol-based hand rub will kill the virus on the hands (WHO, 2020d). Also, social distancing is the key to contain the virus and minimize its spread. A distance of at least 1 meter (3 feet) should be maintained. Nose and mouth should be avoided to touch by hands as these can increase chances of getting infected and while sneezing or coughing the mouth and nose should be covered properly to avoid the dispersal of droplets. Therefore, a good respiratory hygiene and maintaining distance would be beneficial to avoid COVID-19 spread. Moreover, masks should be used if you are suffering from COVID-19 it should be disposed off properly too (UNICEF, 2020).

CONCLUSION

Soon after the origin of CoVID-19 in Wuhan, China, it became threat for humans worldwide and subsequently was declared global pandemic by WHO. COVID-19 symptoms were characterized by mild to severe symptoms such as fever, cough, fatigue, sputum production, headache, hemoptysis, diarrhea, dyspnea, and lymphopenia. This disease spreads through the respiratory droplets of infected person or by contaminated surface, so proper precautionary measures in the case of proper distancing, washing hands and avoiding physical touch may prevent its transmission.

With COVID-19 outbreak, several myths are also circulating related to current pandemic condition which are needed to debunk. The disease is being spread all over the world, but the death rate is quite lower than SARS-CoV and MERS-CoV and other pandemic diseases suggesting that it's not the most dangerous virus the humanity ever faced. Elder aged persons are getting more infected, but all ages are susceptible. Proper use of masks is effective to deal with COVID-19 infected persons. Like other SARS-related viruses, SARS-CoV-2 also reported to originate from bats, so bat soup in China maybe a probable source of new coronavirus. No concrete evidence has supported the role of pets in the transmission of COVID-19. This virus may stay on surface for enough time, but commercial packages being transported from China are less likely to bring the virus with them as recommended by WHO. However, proper disinfection of the surface is mandatory to cancel out any chance of infection. Moreover, closing borders between different nations have been found an effective measurement taken by governments to avoid the dispersal worldwide but unfortunately its violation has made a big loss. There are fair differences of SARS-CoV-2 with previous SARS-CoV at genetic level as well as in symptoms and deliberation of current virus in laboratory has not been proved scientifically, rather it is a result of natural processes. No effective cure of COVID-19 has been discovered yet, but the work is in progress and trails are being conducted on the application of available antiviral drugs to treat the current virus. However, use of any antibiotic would not be effective as antibiotics kills only bacteria not viruses. Hence rather than believing rumors, effective precautionary measurements are required to be adopted from reliable resources. Respiratory hygiene and maintaining distance would be beneficial to avoid COVID-19 spread.

Statement of conflict of interest

All authors have declared no conflict of interest.

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