A Review on COVID - 19

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Abstract

Globally the incidence of COVID-19 is severely affecting the humans with serious health issues. The COVID-19 is viewed as one of the significant emerging infectious diseases and the entire world is facing vulnerable conditions with social distancing, individual isolation, proper lockdown, shortage of food and poverty, unemployment, industries and factories remain closed, indefinite closing of educational institutions, inaccessibility of transport facilities and other serious social issues including psychological stress and depression. The Wuhan city is the first place known to the COVID-19, during 2019. Globally 1,50,84,874 cases were infected in which 6,18,493 were deceased due to COVID-19 since 2019 as on 23rd July, 2020. The COVID-19 is considered as a member of the family of SARS and MERS. The disease can transmit from person to person through aerosol and droplets within 2-10m distance by speaking, coughing, sneezing and breathing. They have greater surface viability in the aerosol and droplets with several hours. The longevity of the virus is 72 hours in plastic, 48 hours in stainless steel, 4 hours in copper and 24 hours in cardboard. The major signs of the diseases including fever, dry cough, dyspnea, and diarrhea but asymptomatic individual such as ARD Pneumonia etc., also showed positive results with the virus.. Maximum incubation period of the virus is 1-41days and it has varied significantly in relation to geographical location and immunity of the individual. The COVID-19 is infecting from one month baby to 75 year old individuals. The virus is also affecting pregnant women. Various drugs are used for the treatment of the disease but the recovery rate is not satisfactory. Nevertheless preventive and control measures should be taken towards the microbes causing Emerging Infectious Diseases for better management of human wellbeing.

Key words: clinical sign, COVID-19, disease management, epidemiology, social impact

INTRODUCTION

COVID-19

The corona virus belongs to any of a group of RNA animal virus consisting of enveloped particles 80–120 nm long, with helical nucleocapsids. The corona virus contains the largest known viral RNA genomes (27–31 kb) and cause devastating epizootics (of respiratory or enteric disease) in livestock and poultry. Human coronaviruses cause upper respiratory tract infections and severe acute respiratory syndrome (SARS) (www.oxfordreference.com). Nonetheless the emerging COVID-19 infectious disease is threatening human life and the world is facing a severe panic situation, since it is killing lakhs of human being globally. In the beginning the virus is so called 2019- nCoV (Novel Corona Virus), however the WHO renamed the virus as COVID-19 by 11th February, 2020. Subsequently a group of the International Committee on Taxonomy of Viruses (ICTV) proposed the name SARS-CoV-2, but this name remains to be officially approved (Gorbalenya, *et al.* 2020). Nonetheless various other coronaviruses can infect humans such as HCoV-229E, HCoV-NL63, HCoV-HKU1 and HCoV-OC43 but these types of corona viruses cause mild respiratory disease when compared to the COVID-19. The prevalence of COVID-19 was first identified from Wuhan, China, during December, 2019.

Earlier the Corona family members, such as SARS (Vincent *et al.*, 2017) and MERS have been identified from China and Saudi Arabia, in 2002 and 2012, respectively. But the mortality was very low compared to other pandemic diseases which have occurred over the years. However, COVID-19 is a very pandemic and


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sensitive pathogen since it is spreading from humans to humans through aerosols and droplets. The Corona Virus (CoV) is considered as the seventh member of the family Coronaviridae which is known to infect human. Due to overwhelming numbers of cases are confirmed, the WHO declared as a Public Health Emergency of International Concern (PHEIC) on 30th January, 2020. Nearly 5,38,179 people have perished and 11,630,935 tested positive as on 10th June, 2020 (Worldmeters-COVID-19). Nevertheless, COVID-19 is appearing like a first of pandemic diseases and is killing severely compared to previous episodes. The entire world has been put in a lockdown as regular work, social and economic activities, healthcare, etc., have been affected (Dezecache *et al.* 2020).

Indeed the first case of COVID-19 infected person was 55 years old individual from Hubei province of China, it was confirmed by the Government of China, during Nov. 17, 2019 (South China Morning Post-2019). However, the novel coronavirus (2019-nCoV) infected pneumonia (NCIP) cases increased during the month of December 2019, in Wuhan. The Wuhan is one of the large cities with 11 million people of Central China. Subsequently four cases have been reported on 29th December, 2019, and these patients have closely linked to Seafood Wholesale Market, Huanan, Southern China and these four cases were identified by the local hospitals in China by monitoring a protocol applied for using "pneumonia of unknown etiology". Indeed that protocol was used during 2003 for the severe acute respiratory syndrome (SARS), but which is timely facilitated for the identification of novel pathogens i.e. COVID-19 (Qun Li *et al.,* 2020). Subsequently the people with ≥37°C body temperature, have been restricted from china to move other regions since it is viewed as one of the reliable symptoms of the COVID-19. Nonetheless the first COVID-19 reported outside china was from Thailand during 13th January, 2020 (Qun Li *et al.,* 2020, WHO timeline). Currently the COVID-19 is spreading globally with serious outbreaks and is alarming the world with panic conditions with massive mortality rate.

DIAGNOSIS OF COVID-19

The diagnosis of COVID-19 depends on several criteria including case history, clinical symptoms, serology, molecular diagnosis, and computed tomography (CT) imaging. The samples are collected from the suspected or COVID-19 infected patients include nasopharyngeal and oropharyngeal swab or wash in ambulatory patients, sputum (if produced) and/or endotracheal aspirate or bronchoalveolar lavage in patients with more severe respiratory disease. However, the blood and stool are also collected for the detection of COVID-19, as for the coronaviruses responsible for SARS and MERS (Ding *et al.,* 2004, Shi *et al.,* 2005, Zhou *et al.,* 2017, XU Kaijin *et al.,* 2020, Yong Zhang *et al.,* 2020). The duration and frequency of COVID-19 virus in stool and potentially in urine is unknown. In case of patients who are deceased, the autopsy material including lung tissue is also taken into account for testing. In surviving patients, paired serum (acute and convalescent) can be useful to retrospectively define cases, as serological assays become available.

In spite of clinical and serological examination, the samples are analysed through NAAT (Nucleic Acid Amplification Test) by using rRT-PCR (real-time Reverse Transcription Polymerase Chain Reaction) with reference to the detection of unique sequences of virus RNA (COVID-19). The viral genes targeted so far include the N, E, S and RdRP genes. The results are obtained from the rRT-PCR as cycle threshold value (Ct-value) i.e. less than 37 were defined as a positive test, and a Ct-value of 40 or more was defined as a negative test. A medium load, defined as a Ct-value of 37 to less than 40, required confirmation by retesting (Qun Li *et al.,* 2020). In addition to that the Rapid Kit for COVID-19, N-Protein IgM and IgG antibodies in human serum, whole blood, or finger prick samples was also used for the diagnosis of COVID-19 but the RT-PCR is universally accepted as standard protocol for the diagnosis of COVID-19. Besides, a rapid kit was also used for the assessment of the corona virus from the common people to ascertain the virus as a quantitative method.

EPIDEMIOLOGY OF COVID-19

The occurrence of the COVID-19 was considered at the initial phase as person to person transmission by close contact with infected patients (Li *et al.,* 2020). Subsequently the second phase started on 13th January, 2020, with the virus spreading from Wuhan to other regions of China. In fact the virus rapidly spread within the hospital with the nosocomial infection through close contact transmission as family transmission, which was considered as on the panic situation in China (Li *et al.,* 2020, Wang *et al.,* 2020, Chan *et al.,* 2020, Yang *et al.,* 2020, Kang *et al.,* 2020, Lie *et al.,* 2020, Chang *et al.,* 2020). However, by 23rd January, 2020, 846 confirmed cases at 29 provinces in China including six foreign countries, which was considered as 20 fold increases when compared to the first phase of the incidence. During 25th January 2020, the number of confirmed cases had risen to 2062, including 2,016 in China, Thailand, Hong Kong, Macau, Australia, Malaysia, Singapore, France, Japan, South Korea, Taiwan, the US, Vietnam, Nepal, and Sweden (WHO, March 2020). Meanwhile the third phase started by 26th January, 2020, which was regarded as cluster cases of COVID-19 *i.e.* 50-80% of

confirmed cases in Beijing, Shangai, Jangsu and Shandong (Li *et al.*2020). Suddenly by 30th January, 2020 the cases have been increased with 240 fold *i.e.* reaching 9826 confirmed cases. Due to the serious health issues and rapid spread of the COVID-19, the WHO declared the situation as PHEIC and on 11th March, 2020, the WHO declared Europe to be the new center of the pandemic due to the massive increase of confirmed cases (WHO,12 March 2020). Subsequently after one week, 30th March, 2020, the timeline of global map for COVID-19 has been changed with significant alarming situations occurred, for example, 122,653 infected cases with 2112 deaths at USA, which was the highest number than the other countries and followed by Italy (97,689 cases;10,781 deaths), China (82,447 cases; 3310 deaths), Spain (78,797 cases; 6528 deaths), Germany (57,298 the USA) and 67,594 deaths (most of the deaths, 15,889, were in Italy). One week later (13 April 2020), the number of confirmed cases of SARS-CoV-2 increased 1.7 times (up to 524,514 confirmed cases), and the number of deaths increased 2.5 times (up to 20,444 deaths) in the USA alone (Yosara Helmy et al.2020). During the month of April, 2020, globally the number of cases has been increased into 3,266,132, and for the month of May 6,129572 and for the month of July 23rd 2020 the cases was 1,50,84,874 (Worldmeters-Covid-19) (Fig.1). The active cases, recovered cases and number deaths have been increased with many folds among the total cases confirmed for the COVID-19 (Fig.1). However the trend is still increasing with massive mortality rate.

CLINICAL SIGNS OF COVID-19

Globally the clinical sign of the COVID-19 ranged from mild to severe and lead to death. Starting of death ranged from 6 to 41 days with a median of 14 days from the onset of COVID-19 symptoms, but it will be influenced by the age and immune status of the patients i.e. it was shorter among patients>70-years old than under the age of 70 (Wang *et al.*, 2020). The projected incubation period of the COVID-19 is ranges from 2 to 14 days but some cases showed beyond the duration for example upto 27 days (Bai *et al.*, 2020). Beyond doubt, the COVID-19 is showing variety of typical signs including fever, cough, muscular soreness, and dyspnea and atypical symptoms, such as diarrhea and vomiting (Wang *et al.*, 2020, Yang *et al.*, 2020, Chen *et al.*, 2020, Pongpirul *et al.*, 2020, Bastola *et al.*, 2020, Holshue *et al.*, 2020) (Fig. 2). Studies also mentioned that the COVID-19 disease is characterized by fever, dry cough, dyspnea, and diarrhea in 20–25% of patients who do not exhibit upper respiratory signs such as sneezing or sore throat Haung et al. 2020 and Chan *et al.*, 2020). However for the severe cases of COVID-19, the following characteristics features were noticed such as pneumonia, metabolic acidosis, septic shock, and bleeding (Li *et al.*, 2020 WHO 17th March, 2020). In fact severe complications can also occur due to the infection of COVID-19, which is leading to severe infections including pneumonia, kidney failure, RNAaemia, acute respiratory distress syndrome, acute cardiac injury, and incidence of grand-glass opacities that led to death (Li *et al.*, 2020 and Haung *et al.*, 2020). Besides asymptomatic cases were also reported with positive results in Germany by using their throat samples tested by RT-PCR (Wei *et al.*, 2020). Nevertheless the COVID-19 not showing any age and gender discrimination of infections because it is infected even 1 month old infant (Guan *et al.*, 2020 and Wei *et al.*, 2020) and upto 69 years of old man (NCPERET, 2020). Nonetheless the corona virus infected the pregnant women in India and hundreds of babies were delivered by corona virus infected mothers at Mumbai during May, 2020 (BBC news: https://www.bbc.com/news/world-asia-india-52693987). However, COVID-19 is more infectious than SARS-CoV or MERS-CoV (Anderson *et al.*, 2004 and Chowell *et al.*, 2015, Li *et al.*, 2020).

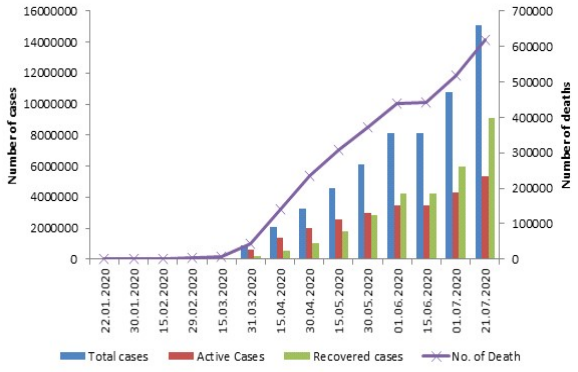

Fig. 1. Details of COVID-19 total, active, recovered and number of deaths occurred as on 21st July, 2020 (source WHO.21.07.2020)

ORIGIN AND EVOLUTION OF COVID-19

The sources of the COVID-19 and its intermediate host are yet to be identified and which is very much fuss to the scientific community since it is mystifying their evolutionary characteristics (Li *et al.*, 2019). However, studies stated that the 96.2% of COVID-19 gene is similar to the Bat coronavirus RaTG13 [(GenBank No. MN996532.1), nucleotide homology] (Zhou *et al.*, 2020, Jiang and Shi 2020). Indeed studies also mentioned that the pangolin, mink, snake, turtle could be a reliable intermediate hosts for the COVID-19 but it is not confirmed (Guo *et al.*, 2020, Ji *et al.*, 2020, Jiang *et al.*, 2020). In fact, globally the COVID-19 is threatening and spreading rapidly with significant mortality rate and due to the panic situation towards

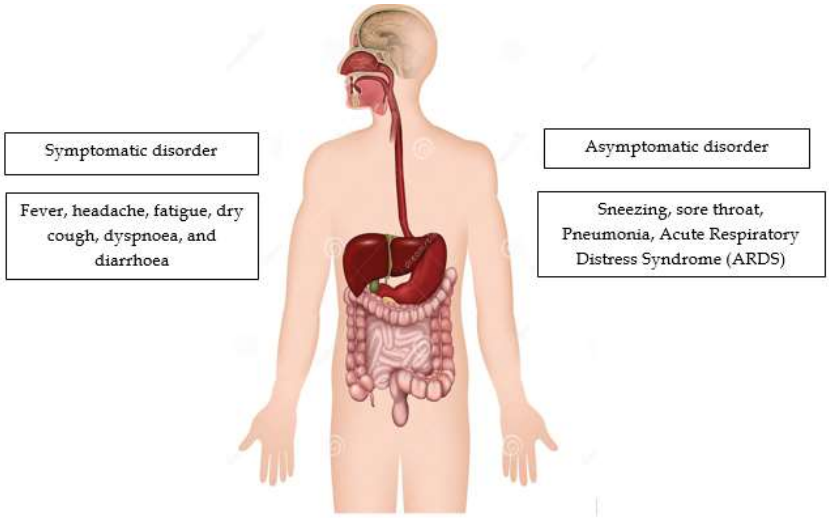

Fig.2. The symptomatic and asymptomatic disorders in human beings due to COVID-19.

the COVID-19, lot of epidemiological sagas have been under consideration, for example studies revealed that the COVID-19 is a member of the genus Beta-coronavirus, sub geneus Sarbecovirus (Lu *et al.,* 2020 and Wu *et al*., 2020). Besides, the WHO has also reported that the COVID-19 is a β CoV of group 2B (Hui *et al.,* 2020). A study revealed that 99.98% showed sequence identify which was collected from nine COVID-19 infected patients (Lu *et al.,* 2020). Studies also mentioned that the genetic sequences of COVID-19 showed 80% SARS CoV and 50% MERS CoV which was originate in Bats (Cui *et al.,* 2020) (Fig.3). Therefore the evidences through phylogenetic analysis showed that the COVID-19 belongs to the genus βCoV, which includes SARS CoV (Zhu et al.2020).In addition to that a study has been carried out by the South China Agricultural University and the study reported that 99% sequence similarity of a virus isolate from the pangolin with the current infected human strain COVID-19 (SCAU, 2020), and the study claimed that the pangolins could be one of the intermediate hosts for COVID-19 but subsequently they were discomfited and they said it was miscommunication of data reported (Xio *et al.,* 2020). But still people are working on it to identify the intermediate hosts of COVID-19 to ascertain their evolutionary characteristics for proper control of their transmission. Indeed the viability of the COVID-19 aerosol and surface stability is 72 hours in plastic, 48 hours in stainless steel, 4 hours in copper and 24 hours in cardboard (Amandine Gamble, *et al*., 2020).

TRANSMISSION OF COVID-19

Studies stated that the aerosols and droplets are facilitating the transmission of viruses during speech between persons *i.e.,* if a person is speaking, the oral fluid will be generated with varying size of the fluid/ droplet in which the infectious viruses could be passed from the speaking person to another person (Duguid, 1946). Nonetheless the large droplets or fluid could rapidly settle to the ground but the small droplets or the fluid will be dehydrated and stay as "droplet nuclei" in the air and which is facilitating the aerosol for transmission of the infectious particle spatially (Marr *et al.,* 2019). A recent study mentioned that the transmission of COVID-19 is predominantly through droplets and aerosols between persons by speech, coughing and sneezing etc., (Matthew Meselson, 2020). Indeed the distance and longevity of the aerosols or droplets among persons is also very much essential to prevent the transmission of the disease. A study described that the micro-organisms could diffuse from a person to another person through the droplets at a maximum distance of 2m (Leonardo Setti *et al.,* 2020). Another study imposed that the smaller particle of viral content could travel up to 10m in an indoor environment (van Doremalen 2020). The same results found in another study that the COVID-19 can be transmitted through air beyond the close distance (Paules *et al.,* 2020). However in relation to the longevity studies reported that the COVID-19 has greater aerosol and surface stability when compared to the SARS-COV-1, *i.e.* the COVID-19 virus could remain viable in aerosol for hours (Van Doremalen *et al.,* 2020). Therefore the transmission of the COVID-19 is applicable upto 10 m and more care should be followed for the better prevention of COVID-19 through aerosol and droplets spatially.

DRUGS FOR COVID-19

Nevertheless there is no absolute drugs against the COVID-19, but globally various laboratories and scientists are working and trying their level best to find out a novel drug to control the COVID-19 disease

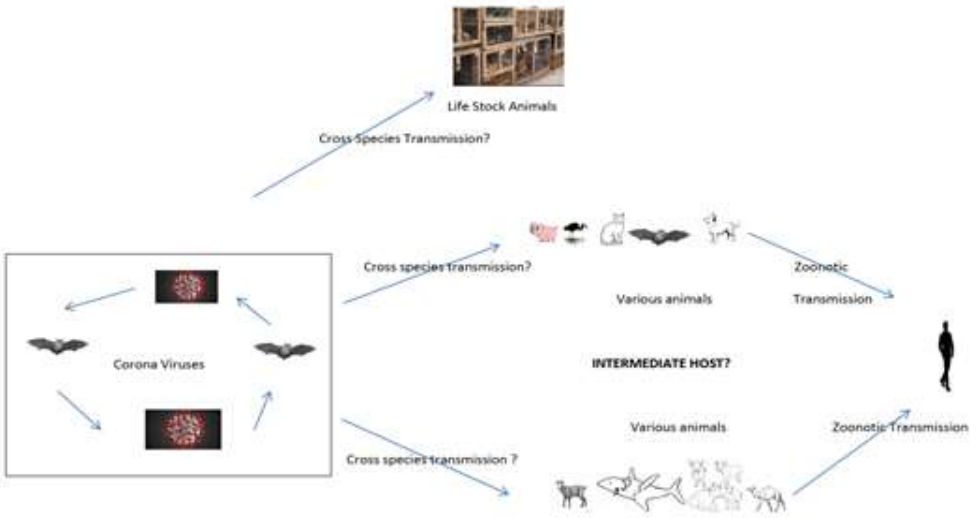

Fig. 3. Hypothesized origin of the COVID – 19 and their generalised route of transmission of the epidemic zoonotic corona virus

with vigorous workload by 24x7. However the hydroxychloroquine is considered to be a medicine for the COVID-19 infected patients and the same has been treated for the COVID-19 patients. The hydroxychloroquine is highly used in USA but it is not recommended by the WHO to treat against COVID-19. However the USA ordered to import the medicine from India as larger scale for the treatment of COVID-19. In fact the hydroxychloroquine is thought to have more effective drug is having greater *in vitro* mechanism against COVID-19 (Vincent *et al.,* 2020 and Liu *et al.,* 2020). But studies reported that the hydroxychloroquine has side effects and it has been trailed with 414 infected patients, in which 40.1% (n=414) reported side effects such as nausea, loose stools, and abdominal discomfort but such kind of side effects were comparatively less in Placebo used patients (16.8%; N=407) (Boulware *et al.,* 2020). Another study also stated that the result did not support the hydroxychlorouine (Joshua Geleris *et al.,* 2020). On the other hand a study reported that the Hydroxychloroquine and azithromycin are more effective medicines for the treatment of the COVID-19 disease with good results but intensive study should be carried out for better understanding of the drugs to control the COVID-19 (Philippe Gautret *et al.,* 2020). The another drug is Remdesivir, which is also treated for COVID-19 patients with speedy recovery about 11 days than the other medicines already treated but it has also have some serious adverse effects reported when using the Remdesivir (Beigel *et al.,* 2020). Besides the health, the Economic Times published an article in which they stated that there are 35 drugs in race to control the COVID-19. Nevertheless the world is looking forward a novel and effective drug to fight against the COVID-19 disease for proper relief from the stressful life.

SOCIAL IMPACT

The COVID-19 is not only threatening the human health and social life but also affected various developmental sectors. The major social impact includes social distancing, mobility restrictions, physical distancing, hygienic measures, socio-economic restrictions, communication and international support mechanisms towards the COVID-19. Indeed the WHO was declaring the COVID-19 outbreak as one of the global emergency on January, 30, 2020 (Sohrabi *et al.,* 2020). Due to consistency of corona virus infections, the Governments have imposed border shutdowns, travel restrictions and quarantine. Due to the COVID-19, the following sectors are facing very serious problems viz., agriculture, Petroleum and Oil, Manufacturing industry (production of various goods from small scale to large scale industries), Education (delayed declaration of results or all pass for students due to social distancing) both school and Universities, Academic activities such as seminar, conferences, hands on workshops and other scientific meetings, financial industries, Health care, Pharmaceutical industry, Hospitality, Tourism, Aviation, Real estate and housing sectors, Sports industry, Information technology, media, research and development, Food sectors, Family dynamics: domestic violence and home video-gaming (Maria Nicola *et al.,* 2020). In addition to that the Covoid-19 is also affecting most seriously the day today life style of the human such as Marriage functions, Condolences, Temple worships and festivals, religious prayers in Churches and Mosque and other holy places, Transports including, ships, train, buses, train, metro train, hiring

of vehicles, entertainment including mall, cinema, swimming pool, walking in the beach, public gathering, public stage music and drama etc., Online trading and courier services and other social wellbeing of human life styles. However, during the COVID-19, the online meetings through various apps has been enhanced for the conduct of online class, quiz, meeting, seminar, conferences, discussion, administrative gathering and various online communications regarding the COVID-19 and other emergency services. The COVID-19 is also influencing the Research and Development sectors not only in the drug industries but also in the publications of research articles in Journals in relation to time and volumes. Nevertheless, due to the reflections of corona virus infections, political meetings, parliament, assembly, senate and other political meetings also remain closed till then.

FUTURE TREND AND SUGGESTIVE RECOMMENDATIONS

The COVID-19 and its future is fuss to the world. However, globally people are working for the development of proper drug and for the fine development of vaccine against COVID-19, but still it is a challenging task. Subsequently a novel and significant measures should be introduced to minimize the transmission of COVID-19 from human to human for the control of COVID-19. Already a study suggested significant guidelines for the medical staff, healthcare providers, and, public health individuals and researchers for doing services against the COVID-19 (Jin *et al.,* 2020). The prevalence of COVID-19 in children, elderly people and front line workers especially health care individuals should be monitored and given priorities for speedy recovery from the disease. Studies stated that the high mortality has been occurred in elderly people due to rapid transmission of the disease since their immune system is very weak (Wang *et al.,* 2020 and Li *et al.,* 2020). Several countries are implementing the travel screening to stop further spread of corona virus in which they are taking serious steps towards the entry of people from one country into other country which will also extend the global spread of virus. However we need to have several initiatives towards the prevention and control of the corona virus. In addition to that the preventive measures including masks, sanitizer, soaps and other washing chemicals should be given priorities under subsidies especially for rural and downtrodden people through consumer shops and mobile systems for the better prevention of transmission of the virus. Screening for COVID-19 should be enriched with several folds *i.e.,* 10000/Lakh of people/day to ensure their infection status either positive or negative. In addition to that the social economic status of patients particularly patients with positive results can be collected for further analysis which will facilitate to track the transmission of the virus. Apart from the droplets or aerosol, the other sources such as blood, urine, fecal matters, cloths, matters of patients used in their environment, smoking, spitting of saliva, sweat, etc., can be considered for the proper sources of virus and its transmission. The ecological factors including temperature, humidity, rainfall, atmospheric pressure, photoperiod, water characteristics, soil characteristics, should also be taken into account for the transmission of the COVID-19, to correlate the probability and influence of the factors for the transmission of the corona virus. Education and awareness should be given to public regarding the transmission of COVID-19 and its impact on human health and social life through media such as social networks, newspaper, magazine, TV and other platforms with regional languages for better understanding of the disease from illiterate to literate sectors. Globally strong guidelines should be framed and implemented with serious follow up protocols for the use of animals as edible items especially under wildlife schedule categories of species to prevent the infections of microbes from animal to human since it is regarded as one of the major intermediate host of several diseases not only the COVID-19 but also various other diseases proven over the periods. Finally the science should have the timely development of drugs and vaccines to prevent and control the emerging infectious diseases for the wellbeing of human beings sooner than later for better management of the emerging diseases.

CONCLUSION

In conclusion, COVID-19 is threatening the social life of human and its impacts are very serious health issues and huge loss in world economic. Over the periods several out breakings of diseases have occurred and killed millions of people over the centuries. For example the Antonin (Gilliam 1961), the plague of Justinian or the Bubonic plague (Sarris 2002), Black Death (Cohn, 2008), Second Pandemic Death (Dixon, 1994), The third Cholera pandemic (Wincenty, 1980), the Flu Pandemic, (Langmuir,1961), the Spanish flu, Yoshikura, 2014), the Asian flu, (JPHA, 1917), HIV/AIDS, (Amborzia and Levy, 1998 and Mphonline, 2020), Small Box (Moore et al.2006), Ebola (Holmes *et al.,* 2016). In addition, bird flu, swine flu, Nipah and Hindra (paramyxoviruses) have raised serious concerns and potential pandemic situations in recent years. Already, Corona family members, such as SARS (Vincent *et al.,* 2007) and MERS have been identified from China and Saudi Arabia, in 2002 and 2012, respectively. But their mortality was very low compared to other pandemic diseases which have occurred over the years. However, COVID-19 is very pandemic and sensitive disease since it is spreading

from humans to humans through aerosol and droplets with greater viability. Due to the out breaking of the COVID-19, the entire world is in a lockdown and regular work, social and economic activities, healthcare, etc., have been affected (Dezecache *et al*., 2020). The occurrence of various emerging infectious diseases in the world is due to climate change, destruction of forest and anthropogenic pressure. Forests carry deadly microbes and their destruction is threating human life seriously. Climate change is also contributing to the crisis significantly. On the other hand the wild animals are getting infectious disease from humans for example tuberculosis (TB), which is referred to as reverse zoonosis (Zachariah *et al*., 2017), which is another serious issue in wildlife due to microbes. Therefore we need to have proper surveillance and management of emerging infectious disease like COVID-19 to save the world with standard drugs and vaccines, which is the need of the hour.

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