

## SARS-CoV-2 (COVID-19) Outbreak a Global Pandemic Challenge

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### Abstract

The 2019 novel coronavirus (previously 2019-nCoV) or coronavirus infectious disease 2019 (COVID-19) outbreak has been summarized as on June 05, 2020. COVID-19 is a highly transmittable and pathogenic viral infection caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). The disease was first seen during an outbreak in Wuhan, China and continuous spreading from human to human around the sphere. The disease is uncontrolled and increasing the death toll through the globe. The world is facing a global challenge to protect human lives caused by coronavirus outbreak. World health organization (WHO) has declared global public health emergency on January 30, 2020. The disease has been spread around 216 countries with total confirmed cases 6,535,354 and death cases 387,155 as on June 05, 2020. The confirmation of the transmission of virus are possible by the droplet, human saliva and fomite formation (things that can become contaminated with infectious). This may increase the risk of virus transmission through public transportation. The goal of this review to update about the epidemic and suggestions for analysis of the COVID-19. The discussion of the various therapeutic algorithms, risk, transportation, prevention and control based on the latest reports has been provided.

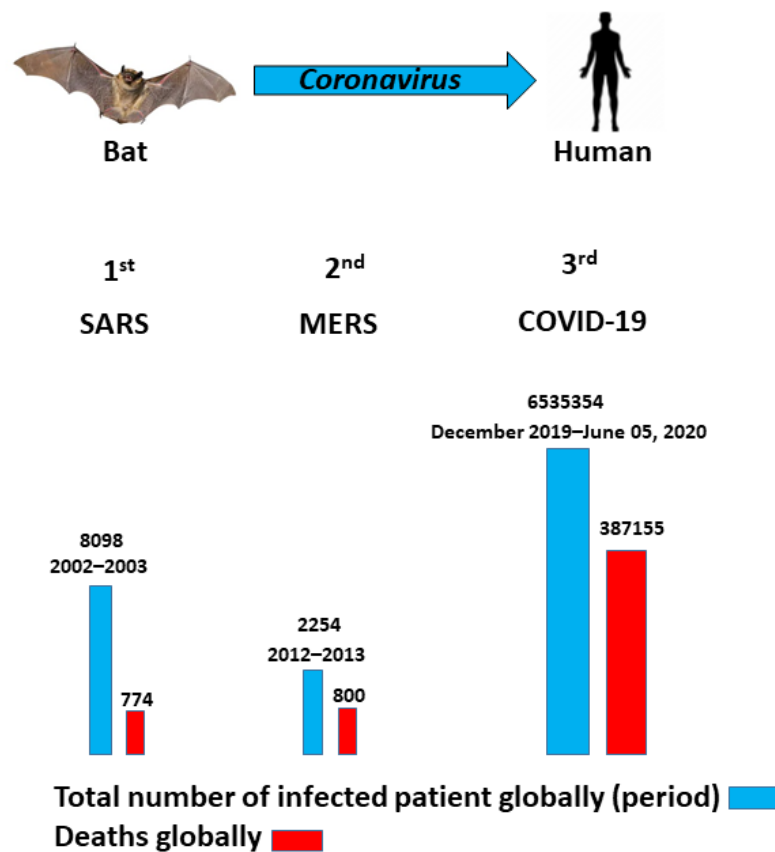
**Keywords:** COVID-19; Global pandemic; Global health emergency; SARS-CoV-2.

## 1. Introduction

The World Health Organization (WHO) has declared COVID-19 to be a Public Health Emergency of International Concern (PHEIC) on January 30, 2020 due to the high risk on human health system. A few cases of pneumonia of unknown aetiology were recognized in Hubei province in China, Wuhan City, (Wuhan's Seafood Wholesale Market) on December 31, 2019 [1]. Most probably, the virus has originated via animal species viz. bats or pangolin. The human-animal interface activities, large genetic diversity, wide distribution of coronavirus, frequent recombination of their genomes made the disease a global pandemic. On January 7, 2020, the Chinese Centre for Disease Control and Prevention (CCDC) has announced confirmation of Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) via human throat swab samples [1, 2]. COVID-19 has spread to most of the countries and continue to spread through the globe. The WHO has named 2019 novel coronavirus (2019-nCoV) or COVID-19 on February 11, 2020. COVID-19 as a global pandemic has affected 216 countries and territories with total cases of 6,535,354 as of June 05, 2020. The first sign of the COVID-19 is typical flu-like symptoms. The most common are fever with respiratory symptoms such as cough, dyspnea (shortness of breath) and chest pain. 387,155 people have lost their lives from this global pandemic. An increment in the mortality rate of about 5.9% (it was 2% up to February 2020) was estimated as of June 05, 2020.

Coronaviruses (CoVs), a large family of single-stranded RNA or ssRNA (as a nucleic material, length size ranging from 26 to 32kbs) viruses can infect human. The genome of COVID-19 is a 29,903 bp ss-RNA CoVs. The virus causing COVID-19 is a SARS-like CoVs. The diameter of CoVs are ranging from 65 to 125 nm. Genomic analysis shows that COVID-19 is phylogenetically related bat virus and hence bats could be the possible primary host. On January 17, 2020, a genome report of SARS-CoV-2 (COVID-19) from

Wuhan, China was submitted in the National Center for Biotechnology (NCBI) database with an ID NC\_045512 [3]. The rapid transfer of disease from human to human has been confirmed. No availability of clinically approved vaccine for COVID-19 is found till the date. However, the clinical trials are sustained to few antiviral drugs development. CoVs is divided into four classes: alpha-coronavirus, beta-coronavirus, gamma-coronavirus and delta-coronavirus [4]. Six human coronaviruses (HCoVs) have been noted, including the alpha-CoVs HCoVs-NL63 (*Alphacoronavirus* lineage 1b member) and HCoVs-229E (genus *Alphacoronavirus*) and the beta-CoVs HCoVs-OC43 (*Betacoronavirus* lineage 2a member), HCoVs-HKU1 (*Betacoronavirus* lineage 2a member), SARS-CoV (*Betacoronavirus* lineage 2b member), and Middle East respiratory syndrome-CoV (MERS-CoV) (*Betacoronavirus* lineage 2c). COVID-19 is the seventh new human coronavirus (HCoVs) and transmission is increasing periodically in humans. It may also affect the gastrointestinal system including heart, liver, kidney, and central nervous system prominent to multiple organ failure [5, 6]. Baig et al. have revealed tissue distribution, host-virus interaction and neurotropic mechanism for COVID-19 [7]. They have shown that similar to SARS-CoV, COVID-19 virus exploits the angiotensin-converting enzyme 2 (ACE2) receptor to gain entry inside the cells. The spike protein of COVID-19 comprises a 3D structure in the receptor-binding domain (RBD) region to maintain the van der Waals forces [8]. The life cycle of COVID-19 in host cells can be realized when S protein binds to the cellular receptor ACE2 and initiates life cycle [9]. Figure 1 shows the animal (probably form bat) to human transmission of coronaviruses. Total number of infected patient and deaths globally (SARS, MERS and COVID-19) as on June 05, 2020.



**Fig. 1:** Animal (probably form bat) to human transmission of coronaviruses. Total number of infected patient and deaths globally (SARS, MERS and COVID-19) as on June 05, 2020.

## 2. (a). Objective of the review

Due to declaration of public health emergency of international concern (PHEIC) by WHO as on January 30, 2020 for 2019-nCoV or COVID-19 officially named severe acute respiratory syndrome coronavirus 2 (SARC-CoV-2), the present review summarizes, recent update and discuss the clinical aspects, current condition, transportation of the disease, risk, challenges and preventions. An urgent update is required to study the effect of COVID-19 as a global pandemic on human health system. Detailed emphasize has been considered for outbreak of COVID-19 in India.

## (b). Method

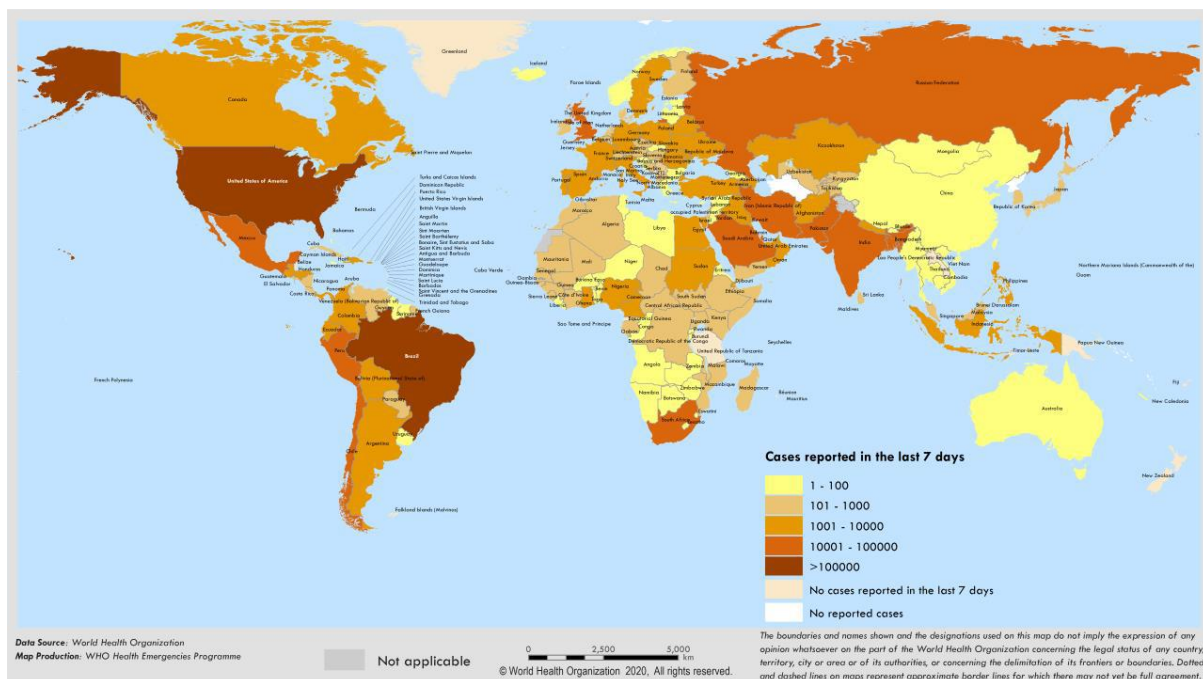
Most recent literatures were reviewed for COVID-19 a global pandemic at the time of writing (June 05, 2020). A literature search was carried out via web of science, PubMed and other sources available from the internet. Search word comprises “COVID-19” or Coronavirus or "2019-nCoV" or “Severe Acute Respiratory Syndrome (SARS-CoV)” or “Middle East Respiratory Syndrome (MERS-CoV)”. The nature of this review is based on literature search and hence no ethical approval was required.

### **3. WHO global health emergency**

WHO declared coronavirus infectious disease 2019 (COVID-19) outbreak as a pandemic on March 11, 2020. The directions for all the countries have been reiterated to take immediate actions and save people’s lives via reducing transmission, fast treatment and social distancing. From the past few months (December 2019 to June 2020), WHO has implemented effective strategy for controlling the spread of virus. The WHO is foremost and managing the global effort, supporting countries to prevent, identify, and respond to the global outbreak. WHO has launched a US\$675 million preparedness and response plan for the states of weaker health systems for a period of February to April 2020 [10]. On March 25, 2020, the United Nations (UN) has launched a US\$2 billion coordinated global humanitarian response plan to fight COVID-19, the fund is for the world’s most vulnerable countries in a bid to protect millions of people and stop the spread of virus from circling back around the globe [11]. The WHO risk assessment on the global level is very high.

#### 4. Global response caused by COVID-19

The spread of COVID-19 as a global pandemic has been seen over the many countries (number of countries around 216). Graphic of the topographical spread of confirmed COVID-19 disease has been given in the Figure 2. In order to help countries to stop the spread, interruption of transmission, detection, and manage the COVID-19 disease, the United Nations Foundation (NRF) and the Swiss Philanthropy Foundation (SPF) have generated the solidarity fund to sustenance WHO and partners in a substantial asset [12]. The fund will be used by the WHO and partners to support countries rendering to the COVID-19 strategic awareness and response plan. A large number of studies as a solidarity trail in many countries has been started to compare different treatments.



**Fig. 2.** Graphic of the topographical spread of confirmed COVID-19 disease. Info accurate as of June 05, 2020 (WHO situation report-137, 2020) [13].

The COVID-19 is the sixth PHEIC as per WHO announcement. Before the outbreak of COVID-19, H1N1 (2009), Ebola in West Africa (2014), polio (2014), Zika (2016) and Ebola in the Democratic Republic of Congo (2019) was declared PHEIC. Therefore, in order to stop this epidemic, health workers, scientist, government of the countries and the public are need to unite altogether [14]. Spread of disease can be divided into various stages of pandemic COVID-19 transmission (Table 1). Stage 1 is slow imported cases, stage 2 is local transmission and the stage 3 is critical due to the community transmission. Also, the other stages (4-5) are worst and required proper attention from the government. United States of America (1837803), Brazil (584016), Russia (449834), Spain (240660), United Kingdom (281665), India (230014) and Italy (234013) (all have crossed the confirmed cases above than 200000) have very critical condition due to disease with no clear end point. Moreover, mortality rate is variable and changes with the time. The variation in the mortality rate is about 2-14% for different countries. The infected human can possibly spread the COVID-19 even before they become symptomatic [15].

**Table 1:** Stages of pandemic COVID-19 transmission.

<b>Stage 1</b>	These are the imported cases, patient has travelled to pandemic COVID-19 affected foreign continent to other continent in the world.
<b>Stage 2</b>	These are the local transmission. The cases has come to contact with the patients through local transmission, who have a travel history. The person most probable got infected and passed to others. Contact tracing can be used to stop the spread of disease via breaking of chain of transmission. Travel ban is an immediate need. All type of public transport vehicles such as motor car, train, auto rickshaw, airlines, cruise ships, etc. should be restricted.
<b>Stage 3</b>	These are the community transmission. In this stage, a large areas get affected and hence uncontrolled mass level transmission is possible. There may be



	starting of a chain reaction and huge number of patients infected with COVID-19 is started. In this situation a complete travel ban is suggested.
<b>Stage 4</b>	These are the epidemic. This stage of the disease is worst. Rapid burst of the disease with no clear end point.
<b>Stage 5</b>	The entire area is under quarantine. An urgent need to stop the spread of pandemic as much as possible is required. Most of the businesses viz. restaurants, shopping centers, transportation ban and all kind of shops are closed. The instructions of the government strictly used to follow by the persons till the situation is under control.

## 5. COVID-19 pandemic effect in India

The population of India is around 1.3 billion. India is the second largest populated country in the world after China. The discussion about India is very important due to the large population and supposed to be substantially affected by the COVID-19 pandemic. The situation of India was 'total lockdown' in an attempt to slow the spread of the COVID-19 up to May 31, 2020. This decision has been taken by Indian government as on March 25, 2020, when the active COVID-19 cases touched 469 and death case was 10. The government of India is fully aware about the outbreak as a pandemic and COVID-19 being declared a notified disaster. A total number of 230014 confirmed cases have been reported including 6642 death cases as on June 05, 2020. The total affected state/union territories is 35 as on June 05, 2020. Isolation of all the confirmed cases, screening, tracing, home quarantine, people's curfew and rapid response teams for management of COVID-19 is enduring by the government. Table 2 shows the India data of COVID-19 outbreak as a pandemic reported by Ministry of Health and Family Welfare (MoHFW), data accurate as on June 05, 2020.

**Table 2:** Indian COVID-19 data reported by Ministry of Health and Family Welfare (MoHFW), data accurate as on June 05, 2020 [16].

Number of active cases	Cured/discharged cases	Death cases	Migrated COVID-19 Patient
115942	114072	6642	1

On the basis of the Indian national data the mortality rate for outbreak of COVID-19 is 2.8% as on June 05, 2020. The outbreak of COVID-19 in India has been reported by WHO via transmission of classification as clusters of cases. All the efforts have been considering by the government of India to stop the chain of transmission of the disease. WHO (published Indian Situation Report-8, Coronavirus Disease (COVID-19) as on March 22, 2020) announce that WHO Country Office (WCO) of India has been working closely with MoHFW on preparedness and response measures for COVID-19, including disease surveillance, laboratory and research protocols, risk communications, training on infection prevention and control (IPC) and cluster containment plan, surveillance and tracking of travelers [17].

## 6. Transmission and mortality

In 2002, SARS was the first pandemic initiated by a coronavirus (CoVs). The mortality rate of SARS is about 9.5% and origin of the disease is Guangdong Province of China. COVID-19 outbreak has higher transmission as compared to SERS or MERS with a mortality rate of about 5.9% (globally calculated from December 2019 to June 05, 2020). The MERS outbreak has a mortality rate of 35% and the origin is Arabian Peninsula (September 2012). Table 3 shows the comparison of SARS, MERS and COVID-19 disease. The collected

data are accurate as of June 05, 2020. From the Table 3, it is conquered that the order of transmission rate is COVID-19 > SARS > MERS and the order of mortality rate is MERS > SARS > COVID-19. COVID-19 cultivate intestinal symptoms like diarrhea and low percentage of MERS/SARS patients had diarrhea [18]. Recent information specifies that COVID-19 is more transmissible than SARS [19]. A report shows the stability of COVID-19 in the aerosols, plastic, stainless steel, copper, and cardboard are 3, 72, 48, 4 and 24 hours, respectively at 40% relative humidity and 21-23°C temperature [20]. A detailed study person-to-person transmission of COVID-19 occurred between two people with prolonged, unprotected exposure was reported in USA [21]. Human to human transmission is possible through droplets or direct contact. Mortality rate depends on study and population and hence altered in various reports. COVID-19 can extant asymptomatic carrier state, acute respiratory disease (ARD) and pneumonia [22].

**Table 3.** Comparison of SARS, MERS and COVID-19 virus. The collected data are accurate as of June 05, 2020 [9, 23].

<b>Features</b>	<b>SARS</b>	<b>MERS</b>	<b>COVID-19</b>
Clinical symptoms	Severe acute respiratory syndrome	Severe acute respiratory syndrome	Severe acute respiratory syndrome

Possible natural reservoir	Bat, palm civets and Raccoon dogs	Bat	Bat or pangolin
Period of Incubation in human (days)	2-7	2-5	2-14
Total number of infected patient globally (period)	8098 (2002–2003)	2254 (2012–2013)	6535354 (December 2019 to June 05, 2020)
Deaths globally	774	800	387155
Mortality	9.5%	35%	5.9%
Origin	Guangdong Province of China	Arabian Peninsula	Wuhan City, Hubei province in China

### 7. (a) Risk, prevention and control

COVID-19 is a recently (December 2019) emerged virus that may have originated from animals (bat and pangolin) and transmitted to human. To identify its source further clinical, and epidemiological research is needed. The way to stop the infection of the COVID-19 is possible via interruption of spread, early detection, fast treatment of patient, isolation and quarantine. Precautions to be taken by the peoples to control the spread of virus by using face mask, hand hygiene, social distancing, avoid coughing and sneezing in public. This stage of pandemic suggests to keep aware about the start the use of outbreak control activity, adequate care of the patients and risk of bacterial superinfection, prevent transmission and empirical antibiotic analysis. Furthermore, the spread of virus leads to find out the intermediate masses, pathogenicity, transmission courses and infection and susceptible

populations. A larger number of infections are mild and can be recover, some cases are pneumonia and some are critical with respiratory failure. Some significant factors about COVID-19 is uncertain such as specifically age, incubation time period, respective clinical features and optimal treatment. Infection in children is mild or clinically absent and risk of death increases for older persons [24].

China is trying first vaccine trial after sharing of genetic sequence of the virus. Recently, the first human trial of a vaccine to defend against COVID-19 pandemic has underway in the US [25]. Many clinical trials have been led in China to examine the ability and safety of Chloroquine and hydroxychloroquine to treat the infected patients from the COVID-19 [26]. Worldwide race is going on for the development of vaccine. The treatment of COVID-19 infection is symptomatic and inhaled interferon-alpha (antiviral drug) and oral lopinavir or ritonavir has been suggested as antiviral treatment by the National Health Committee of the People's Republic of China [24]. It was observed that Chloroquine itself and combination with antiretroviral agents can be effective for human immunodeficiency virus (HIV). Recent report based on in-vitro study shows, that remdesivir and chloroquine were very effective in the control of COVID-19 [27, 28]. Moreover, there are some other potential drug such as nucleoside analogues remdesivir, umifenovir (Arbidol<sup>®</sup>), chloroquine, neuraminidase inhibitors, DNA synthesis inhibitors (tenofovir disoproxil and lamivudine), and Chinese traditional medicines (ShuFeng JieDu or Lianhua Qingwen capsules), have been proposed by the researchers [27, 29]. The COVID-19 can be detected in the gastrointestinal tract, urine and saliva [30]. Therefore, the mode of transmission should be reset to prevent the spread of disease. In COVID-19, the absence of fever is more recurrent than in SARS (about 1%) and MERS infection (about 2%) [31]. There may be possible of the patients to be lost if the investigation case definition concentrated on fever exposure. Bioinformatics study has been carried out to design of a synthetic vaccine and a preventative peptidomimetic antagonist

against COVID-19 [32]. CoVs-related biologic includes therapeutic antibodies, cytokines, and nucleic acid-based therapies targeting virus gene expression as well as various types of vaccines have been discussed by Liu et al. [33]. Teicoplanin as a potential treatment for patients with this virus has been suggested [34]. A recent report tells that inflammatory cytokine storm was very common in patients with severe COVID-19 in China [35]. Travel history rather than chest radiography is of vital importance for initial detection, quarantine and isolation of COVID-19 infected patients is important [36]. The CoVs can live for three days on the plastic and steel enabling increment in the infection through surface contacts. The viability of virus in the air is an additional threat [20]. People should avoid close contact with people suffering from acute respiratory infections. Moreover, people should cover cough and sneeze in public traffic, wash hand frequently, follow healthcare facilities, virus infection prevention strategy as per the government rules and control practices are recommended in hospital [37].

### **(b) Transportation of the disease**

The spread of COVID-19 through the globe has become possible by the transportation. Public transport services can act as a distribution of the virus. From the origin country of the virus (Wuhan, China) to other countries, dispersion of COVID-19 is through movement of human activity. The confirmation of the transmission of virus are possible by the droplet, human saliva and fomite formation (things that can become contaminated with infectious). This may increase the risk of virus transmission through public transportation. The first case can be local transmission by the movement of virus nearer to infected patients. In the cities, the patients come closer to other person using vehicles (motor car, train and auto rickshaw, etc.) and touching or sneezing over the environment. Imposing the travel ban raises the issue of economic crises. Gathering the person closer to the infected patient may increase the infection more rapidly. The existence capacity of virus on the different surfaces make it

more dangerous. Many country have got the infection by imported transmission, this may be resulted due to the human based activity movement of airlines, cruise ships, etc. The airlines has worked as communicable for virus transmission between the countries in a very fast way. People are avoiding public transport services and exhausting travel fearing risks of COVID-19 infection. Public transport services is still necessary to provide the basic services such as health care facility, food item delivery and office personnel continuing. In this situation a management approach consisting of reducing demand and supply is essential.

### **(c) Challenge and safety as global health management**

The COVID-19 outbreak has not been well controlled and needs close care. Risk arises by the COVID-19 can be minimize via stopping the spread of virus. Every infected country should test every suspected case of patients. If the symptoms of the COVID-19 has seen, they should be isolated. WHO has also advised that all confirmed cases, even mild cases, should be isolated in health facilities to prevent the disease transmission. After China, the number of confirmed infected peoples in Italy is at the height of its epidemic. Further cases are now being testified every day throughout the globe. Millions of people's are in isolations or quarantines. Now, it is the major challenge to worldwide health systems and a very big concerns on the global economy if the spread of the COVID-19 is not well controlled [38]. Presently, controlling the infection to stop the spread of COVID-19 is prime intervention being used via many countries. For the diagnosis of highly pathogenic COVID-19, the real-time quantitative polymerase chain reaction (RT-qPCR) and CT scans (multiple patchy ground glass opacities in bilateral subpleural areas can be seen) are significant [39, 40]. Chen et al., 2020 reported that nasopharyngeal and oropharyngeal swabs test of COVID-19 should be performed to decrease the incorrect negative rate that depends the viral load of the specimen [40]. Bronchoalveolar lavage fluid (BALF) specimen test is measured more true but has higher exposure risk. RT-qPCR assay to be used form the blood or stool swab and patients sputum.

The accomplishment in the overthrow of the current COVID-19 as a pandemic will depend much on conformist public health measures, quick clinical case identification, strict infection mechanism in healthcare, isolation, public education and community quarantine [41]. The spread of COVID-19 is lasting to cause global fears, economic losses, psychological distress, and negative impacts on various human activities [42]. The demand of laboratory test kit is high as compared to the infected person, this may delay to stop the spread of virus. The patients after discharge from the hospital should take home quarantine for at least 14 days. Nevertheless, public health authorities (international and national) are keeping observation at the situation carefully, as the more we can acquire about this COVID-19 as a pandemic, the well we can react.



## 8. Conclusions and perspective

387155 people have lost their lives from the COVID-19 as a global pandemic and 6535354 people have got infected as on June 05, 2020. There is an increment in the overall mortality rate and reaches up to 5.9%. The number of infection cases is rising day by day through the globe. Special care is necessary to stop the eradicator virus via breaking the chain of transmission. There is lack of effective drugs, the action of infection control interferences and movement control package to effectively limit virus infected droplet and fomite transmission. The increment in the number of infected patient is due to the transportation of the disease. The pandemic has spiral most of the country due to traveling and movement of the patient across the countries. The government of the countries should ensure all the way to stop the spread of the COVID-19. COVID-19 is highly terminal compare to SARS and MERS. The combat is for humanity against the virus that made the current situation very critical. An immediate search of effective vaccine is required to stop the spread of threat. Countries are lockdown and peoples are in quarantine, which may raise an issue of strong human health concern.

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