



SARS COV 2: Complete Review on Global Pandemic (Covid 19)

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Authors' contributions

This work was carried out in collaboration among all authors. Author BSR designed the study, wrote the protocol. Authors KB, AS and CS wrote the first draft of the manuscript. All authors managed the analyses of the study and managed the literature searches. All authors read and approved the final manuscript.

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ABSTRACT

SARS COV 2 (severe acute respiratory syndrome corona virus 2) has created a global health emergency worldwide due to public health crisis and life-threatening situation. According to a recent study it has been reported that the virus was found originated in animal and transmitted to humans through a food chain. First case was reported in Wuhan-china on December 2019, In this review we have enlightened on different aspects of novel coronavirus 2019 and measure to combat the battle against the novel corona virus 2019.

Keywords: SARS COV 2; global pandemic; food chain; transmitted.

1. INTRODUCTION

Coronaviruses represents a group/family of related viruses that cause diseases in mammals and birds [1]. It is a most deadly pathogen, that

causes acute and mild respiratory infection in human [2,3]. The history of first human corona virus (HCoV) outbreak was found in the year 1965, followed by two more pandemic outbreaks of global and economic health emergencies [3]:

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Severe acute respiratory syndrome corona virus (SARS-CoV) in 2003 and Middle East respiratory syndrome corona virus (MERS-CoV) in 2012. Therefore COVID-19/2019-nCoV/SARS-CoV-2 is a newly discovered coronavirus in the year 2019 [3,4] which belongs to the family of Coronaviridae and comprises crown-shape single strand RNA virus with 80-160 nM in size and 27-32 kb positive polarity [4,5-7]. The first case of Novel COVID-19 was detected in Wuhan, which is the large city of 10.76 million inhabitants and the capital of Hubei province. It is Located in the heartland of China, also known as the major transportation hub. During December 2019, a case of pneumonia was reported at Seafood Market in Wuhan, followed by series of pneumonia cases with the unknown cause, then by the first week of Jan 2020, the Chinese centre for disease control and prevention (CDC) identified the novel coronavirus from the throat swab sample of these patients, and named it as 2019 novel coronavirus (2019-nCoV) [8]. Initially the number of cases were less and the rate of propagation was slow, but sooner the number of cases started increasing exponentially which

indicated the fact of human-to-human transmission also known as local transmission. These cases were not only detected in the other regions of China, but it's also found predominantly in other countries who have recently travelled to China leading to the community transmission and the epidemic conditions [9]. Due this pandemic situation the World health organisation (WHO) declared the outbreak as Public Health Emergency of International Concern on 30 January 2020. And on 11 February 2020, WHO announced it as the new coronavirus disease: COVID-19 [10]. Though the mechanism of spread is uncertain, the transmission of this disease is occurring during the asymptomatic incubation period of about 12-14 days [11].

2. EPIDEMIOLOGY

Globally as of 21st April 2020, there are about 213 Countries, areas or territories which are affected, with 2,397,216 confirmed cases including 162,956 deaths [12]. The topmost affected countries are as listed in Table 1.

Table 1. Highest cases by country, territory, or area as of 1st May 2020 as per WHO report

Country, territory, or area	Confirmed cases	Recovered cases	Deaths rate	Mortality rate
United States of America	1096268	132544	63766	5.8%
Spain	215216	114678	24824	11.5%
Italy	205463	75945	27967	13.6%
Germany	163009	117734	6623	4.0%
United Kingdom	171253	-	26771	15.6%
France	129581	49476	3174	2.4%
Turkey	120204	48886	3174	2.6%
China	82874	77642	4633	5.5%
Iran	94640	75103	6028	6.3%
Russian Federation	114431	13220	1169	1.0%
Belgium	49032	11892	7703	15.7%
Brazil	87187	35935	6006	6.8%
India	35365	9065	1152	3.2%

Table 2. Statistics of current scenario of covid-19 as of 1st May 2020 as per WHO report

States	Total infected cases	Death rate	Mortality rate
Maharashtra	10498	459	4.3%
Gujarat	4395	214	4.8%
Delhi	3515	59	1.6%
Madhya Pradesh	2719	137	5.0%
Rajasthan	2584	58	2.2%
Tamil nadu	2323	27	1.1%
Uttar Pradesh	2281	41	1.7%
Telangana	1039	26	2.5%
Andhra Pradesh	1463	33	2.2%

Whereas in India there are about 35365 confirmed cases , among which 9065 recovered and 1152 causality , Table 2 gives the statistics of current COVID 19 cases in most affected states of India [13].

3. EVOLUTION

Coronaviruses belong to the family Coronaviridae in the order Nidovirales and are classified into four genera: Alphacoronavirus, Betacoronavirus, Gammacoronavirus, and Deltacoronavirus. It's discovered that there are various wildlife-borne CoVs in different regions of the world, however, it has also been indicated that bats are the main and original natural reservoirs of Alphacoronavirus and Betacoronavirus because of its special metabolic and immune systems which helps them to tolerate diverse viruses [14]. Although 17 years have passed without a recurrence of the SARS outbreak, recently in the year 2019, Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), was found to be responsible for the infection of 2,397,216 patients in 213 countries/regions across the globe, which is having a CoV of Rhinolophus bat origin with 98.7% nucleotide similarity, to the partial RNA-dependent RNA polymerase (RdRp) gene of the bat coronavirus strain BtCoV/4991 (GenBank KP876546, 370 bp sequence of RdRp) and 87.9% nucleotide similarity to bat coronavirus strain bat-SL-CoVZC45 and bat-SL-CoVZXC21 [15]. Based on the genomic evidence and the presence of some bats and live animals in the seafood market in Wuhan, it's suspected that SARS-CoV-2 would have originated from bats or bat droppings associated with contaminated materials in the market or surrounding region. Therefore, from the evolutionary studies it has been identified that the SARS-CoV-2 is a novel coronavirus which was introduced independently from animals to humans.

4. MODES OF TRANSMISSION OF DISEASE

COVID-19 is caused by a corona virus called SARS-COV-2. Corona viruses are a large family of viruses that are common in people and many different species of animals, including camels, cattle, cats and bats. Rarely, animal coronaviruses can infect people and then spread between people. This occurred with MERS-COV and SARS-COV, and now with the virus that causes COVID-19 [16].

Studies suggest that the virus is mainly transmitted through contact with respiratory droplets rather than through the air. People catch the virus from others who have the virus. The disease can spread through small droplets from the nose or mouth from person to person when a person with COVID-19 coughs or exhales. These droplets land on objects and surfaces, other people then catch the virus by touching these objects or surfaces, later touching their eyes, nose or mouth. People can also catch COVID-19 if they breathe in droplets from a person with COVID-19 who coughs out or exhales droplets [17].

The risk of catching COVID-19 from the feces of an infected person is low. While the initial investigations suggest that the virus may be present in feces in some cases. Spread through this route is not a main feature of the outbreak. WHO is assessing ongoing research on ways the COVID-19 is spread [17].

People may acquire the corona virus through air and also after touching the contaminated objects. Recent research has suggested the COVID-19 virus can survive for a long time on various types of surface. Research has shown viable virus detected on hands, fabric, metal surface, cardboard, copper, aerosols, plastic and stainless steel. From many studies it is concluded that this virus can survive from some hour to some days and it also depends on atmosphere humidity and temperature as well.

Table 3. Life span of virus on specific surfaces [18,19]

Surfaces	Lifespan of virus
Hands	10 minutes
Fabric	9 Hours
Metal Surface	12 Hours
Cardboard	24 Hours
Copper	4 Hours
Aerosols	3 Hours
Plastic & Stainless Steels	72 Days

5. MANIFESTATION OF INFECTION

Incubation period means the time between catching the virus and beginning to have symptoms of the disease. The estimate of the incubation period for COVID-19 ranges from 1-14 days. Most commonly around 5-6 days [20].

All coronaviruses contain specific genes in ORF1 downstream regions that encode proteins for

viral replication, nucleocapsid and spikes formation [21]. The glycoprotein spikes on the outer surface of coronavirus are responsible for the attachment and entry of the virus to host cells. The receptor-binding domain (RBD) is loosely attached to the virus, therefore, the virus may infect multiple hosts [22,23]. Other coronavirus mostly recognize amino peptidases or carbohydrates as a key receptor for entry to human cells while SARS-CoV and MERS-CoV recognize exopeptidase [23]. The entry mechanism of a coronavirus depends upon cellular proteases which include, human airway trypsin-like protease (HAT), cathepsins and transmembrane protease serine 2 (TMPRSS2) that split the spike protein and establish further penetration changes. MERS-coronavirus employs dipeptidyl peptidase 4 (DPP4), while HCoV-NL63 and SARS-coronavirus require angiotensin-converting enzyme 2 (ACE2) as a key receptor [24].

SARS-CoV-2 possesses the typical coronavirus structure with spike protein and also expressed other polyproteins, nucleoproteins, and membrane proteins, such as RNA polymerase, 3-chymotrypsin-like protease, papain-like protease, helicase, glycoprotein, and accessory proteins [25-27]. The spike protein of SARS-CoV-2 contains a 3-D structure in the

RBD region to maintain the van der Waals forces [28]. The 394 glutamine residue in the RBD region of SARS-CoV-2 is recognized by the critical lysine 31 residue on the human ACE2 receptor [29,30].

6. DIAGNOSIS

The symptoms of the SARS-CoV-2 infection at early stages of disease are non-specific and hence cannot be used for diagnosis. The COVID-19 patients found to have symptoms such as fever, sore throat, cough, fatigue, sputum production and shortness of breath; most of these could be associated with other respiratory infections [31]. At present, the most common methods used by the global healthcare system for diagnosis of COVID-19 are nucleic acid testing, and antibody testing. Medical imaging can be used in severe cases.

6.1 Nucleic Acid Testing

This diagnostic approach involves specific molecular techniques where the nucleic acid is isolated from the biological respiratory samples (throat swab/ nasopharyngeal swab/ sputum/ endotracheal aspirates and bronchoalveolar lavage) [32]. Currently across the world they are using PCR COVID-19 diagnostic kit as the golden

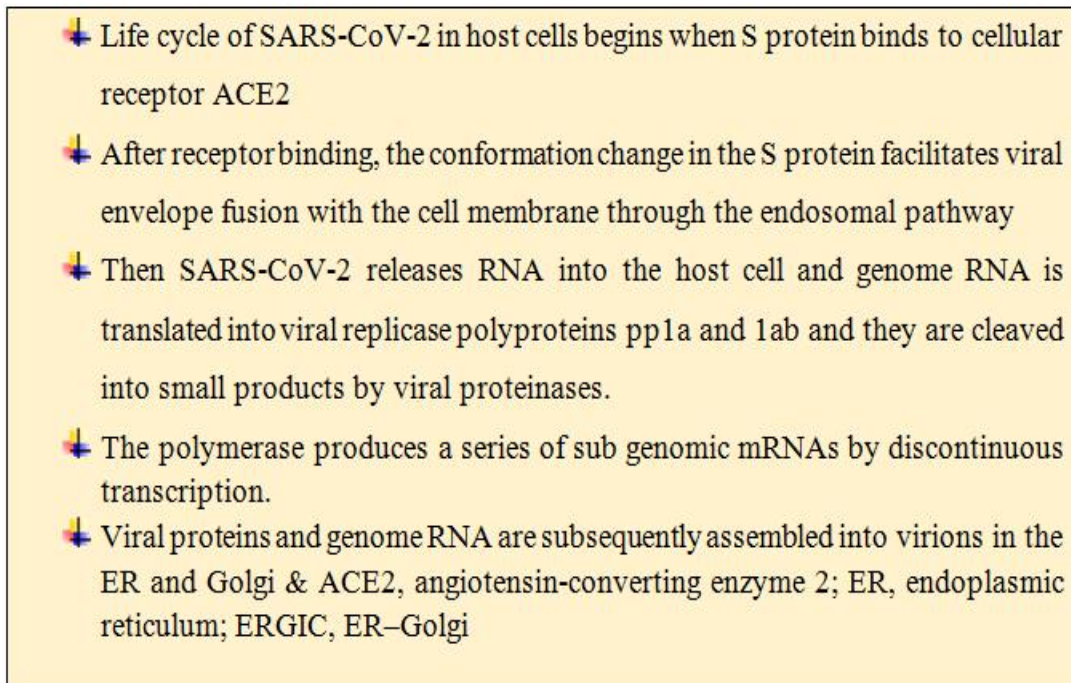


Fig. 1. Flow of manifestation of infection by SARS COV 2 in human host

standard due to its high specificity in testing suspected population. Most of the PCR COVID 19 diagnostic kits which are available in market target presence RdRp gene of virus in oral swabs collected from suspected population.

As this technique can identify specific targets hence this method is considered as golden standard compared to other techniques. But one of the major milestones in this procedure collecting and handling samples during direct sample collection from suspected crowd & carrying out diagnostic protocol have high risk of spread of infection if not handled with proper guidelines. One drawback of this test is chances of False negatives results can be obtained due to cross contamination and improper handling of samples.

6.2 Serological Testing

Serological test involves identifying antibodies produced by the host as immune response to specific infection and act as biomarker in diagnosis of COVID -19. CDC has developed a new laboratory test to inspect the percentage of population exposed to SARS-CoV-2. The serology test indicates the presence of antibodies in body fluid as immune response in host body. The presence of antibodies by this test indicate that a person had an immune response to SARS-CoV-2. Antibody test results are important in detecting infections with few or no symptoms. But this method is not suitable to find out who has infected because the antibodies are generated after a week or two, hence in initial stage of infection there are chances of obtaining false negative results which may lead to spread of infection from non-symptomatic patients to the neighbourhood [33].

6.3 Computed Tomography

In severe cases chest CT scans are used as alternate clinical diagnosis for COVID19 In this method cross-sectional images are produced by taking many X-ray measurements at different angles across the patient's chest. The images are analyzed by radiologists to find out abnormal features. The method is non-invasive.

The chest X-ray (CXR) usually shows bilateral infiltrates which may be normal in early disease. The CT is more sensitive and specific. It is also abnormal in asymptomatic patients [34]. In fact, abnormal CT scans have been used to diagnose

(SARS-CoV-2)in suspect cases with negative molecular diagnosis; many of these patients had positive molecular tests on repeat testing [35].

7. TREATMENT

Currently there is no specific antiviral treatment is approved for COVID-19. And also, there is no vaccine available for SARS-CoV-2. Infected patients should receive supportive care to relieve symptoms. In severe cases vital organ function should be supported. Adequate isolation is preliminary requisite to prevent transmission of disease in case of COVID. Maintaining hydration and nutrition and controlling fever and cough also essential. Provision of oxygen through nasal prongs and non-invasive ventilation is recommended for hypoxic patients [36].

Based on the experience with SARS and MERS; antiviral drugs such as ribavirin, lopinavir ritonavir have been used. But the studies are still going on this regard [37]. Lopinavir/ritonavir, a protease inhibitor broadly available for treating HIV infection has been recommended by the Chinese authorities to treat COVID-19. A recent randomized trial of 14 days of lopinavir/ritonavir therapy among severely ill patients hospitalized with COVID-19 showed no clinical improvement and no reduction in SARS-CoV-2 viral load beyond standard care. Despite these negative results, lopinavir/ritonavir is still commonly used to treat COVID often concomitantly with hydroxychloroquine or chloroquine [38].

After several clinical trials Hydroxychloroquine and chloroquine have considered as potential therapeutic agents against COVID-19. While there is a growing body of scientific data, there is also concern for harm, particularly for cardiac arrhythmias [39]. These drugs considered to be worthy for clinical trials as they have minimal risk upon use, a long experience of use in other diseases, cost effectiveness and easy availability across India. A significant mortality has been shown in a subgroup with COVID-19 and Diabetes. Since HCQ has approved for treatment of diabetes in India it can be employed in case of diabetes and COVID-19.

Experimental studies have suggested chloroquine as a promising anti-malarial drug and has the capability of inhibiting the replication of several intracellular micro-organisms including SARS-CoV-2 [40].

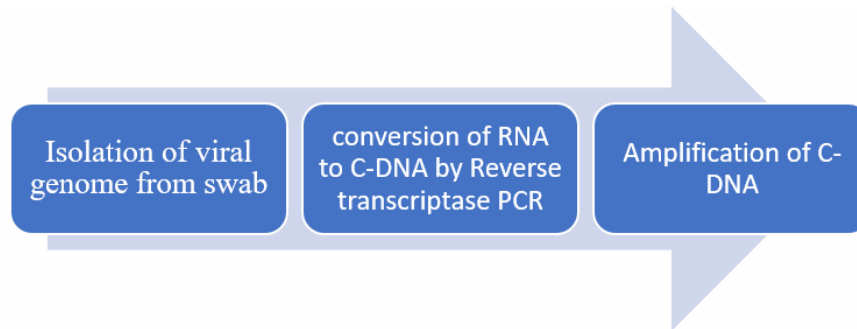


Fig. 2. Flow chart of PCR procedure

From recent surveys most of physicians considered that hydroxychloroquine (HCQ) and azithromycin are the two most effective drugs against COVID-19.

8. PREVENTION

Since there is no approved drug for Covid-19 prevention is crucial. namely, non-specific features of the disease, the chances of infection even before onset of symptoms in the incubation period, transmission from asymptomatic people, long incubation period, prolonged duration of the illness are some of the factors which made the disease more dangerous. Isolation of confirmed or suspected patients are recommended. Health care workers should be provided with suitable safety devices to avoid transmission as they are in high risk [40].

At the community level, people should maintain social distancing in crowded areas and avoid non-essential travel to places with ongoing transmission.

Cleaning hands often, covering nose and mouth with mask while coughing and sneezing, seeking immediate medical attention if unwell lastly but not the least following health authority guidelines are important preventive measures of COVID-19 [41].

9. CONCLUSION

The rate of spreading of SARS COV 2 is found to be drastically increasing day by day leading to death of elderly people & immune compromised individuals. Even though some treatment protocol has bought positive impact in recovering the patient it is better to stay safe by taking need full precautionary measure.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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