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A Review on Corona virus Disease 2019

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ABSTRACT

The novel coronavirus (SARS-CoV-2) has been identified as the cause of an outbreak of respiratory illness in Wuhan, Hubei Province, China beginning in December 2019. This epidemic had spread to 200 countries/territories with 2,471,930 confirmed cases, including 170,129 deaths, as of April 21, 2020. The World Health Organization declared it as a Public Health Emergency of International Concern. This study analyzed and discussed the epidemiology, transmission, symptoms, treatment and prevention of knowledge surrounding COVID-19 based on the current published evidence for a better understanding of the control of this virus. The reported symptoms include fever, cough, fatigue, pneumonia, headache, diarrhoea, haemoptysis, and dyspnea. Preventive measures such as masks, hand hygiene practices, avoidance of public contact, case detection, contact tracing, and quarantines are being recommended for reducing the transmission. To date, no specific antiviral treatment is proven effective; hence, infected people primarily rely on symptomatic treatment and supportive care. This review in the hope of helping the public effectively recognize and deal with the 2019 novel coronavirus (SARS-CoV-2), and providing a reference for future studies.

Keywords: COVID-19, epidemiology, treatment and prevention.

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INTRODUCTION

On 31st December 2019, a case of unidentified pneumonia was reported in Wuhan, Hubei Province, People's Republic of China (PRC). Its clinical characteristics are very similar to those of viral pneumonia. After analysis on respiratory samples, PRC Centers for Disease Control (CDC) experts declared that the pneumonia, later known as novel coronavirus pneumonia (NCP), was caused by novel coronavirus [1]. The World Health Organization (WHO) China Country Office was informed of cases of pneumonia of unknown etiology (unknown cause) detected in Wuhan City, Hubei Province of China. On 7th January 2020, Chinese authorities identified a new strain of Coronavirus as the causative agent for the disease. The virus has been renamed by WHO as SARS-CoV-2 and the disease caused by it as COVID-19. This virus belongs to β – coronavirus, a large class of viruses prevalent in nature. Similar to other viruses, SARS-CoV-2 has many potential natural hosts, intermediate hosts and final hosts. This poses great challenges to prevention and treatment of virus infection. Compared with SARS and MERS, this virus has high transmissibility and infectivity, despite of low mortality rate [2]. On 12 April 2020, data published by MoHFW showed that, since 31 January 2020 when the first case was reported, 8447 COVID-19 cases were confirmed to be infected in 31 states/union territories which include 765 who have been cured, discharged or migrated and 273 deaths [3]. The disease since its first detection in China has now spread to over 200 countries/territories, As per WHO (as of 15th April, 2020), there has been a total of 1914916 confirmed cases and 123010 deaths due to COVID-19 worldwide. In India, as on 21stApril, 2020, 18,985 confirmed cases (including 76 foreign nationals) of which 3,260 have recovered/migrated and 603 deaths reported from 32 States/UTs (Figure 1). Large number of cases has been reported from Maharashtra, Delhi, Rajasthan, Tamil Nadu and Madhya Pradesh.

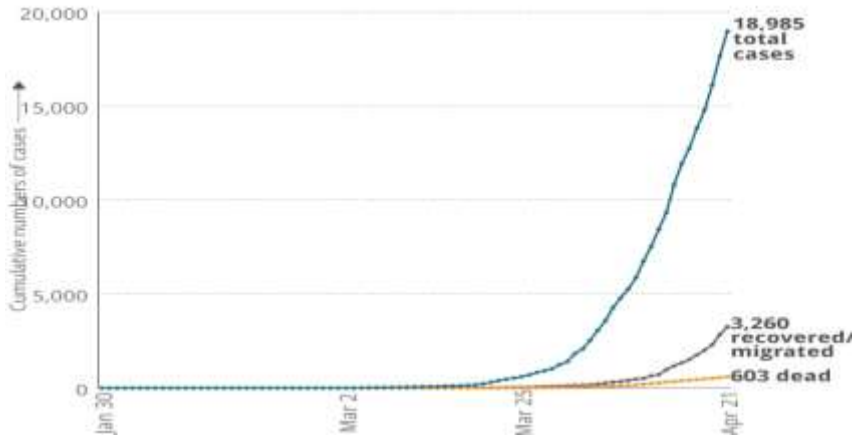

Figure 1: Numbers of Cases, Recovered and dead in India as of April 21

Epidemiology

Coronaviruses belong to a large family of viruses, some causing illness in people and others that circulate among animals, including camels, cats, bats, etc. Rarely, animal corona viruses

may evolve and jump species to infect people and then spread between people as witnessed during the outbreak of Severe Acute Respiratory Syndrome (SARS, 2003) and Middle East Respiratory Syndrome(MERS, 2014).The etiologic agent responsible for current outbreak of SARS-CoV-2 is a novel coronavirus closely related to SARS-Coronavirus [4]. The first case of the 2019–20 coronavirus pandemic in India was reported on 30 January 2020, originating from China. The infection rate of COVID-19 in India is reported to be 1.7, significantly lower than in the worst affected countries. This article gives a perspective view about this new virus [5]. In humans, the transmission of SARS-CoV-2 can occur via respiratory secretions (directly through droplets from coughing or sneezing, or indirectly through contaminated objects or surfaces as well as close contacts). Nosocomial transmission has been described as an important driver in the epidemiology of SARS and MERS and has also been documented in COVID-19. Current estimates of the incubation period of COVID range from 2-14 days, and these estimates will be refined as more data become available. As per analysis of the biggest cohort reported by Chinese CDC, about 81% of the cases are mild, 14% require hospitalization and 5% require ventilator and critical care management. The deaths reported are mainly among elderly population particularly those with co-morbidities [4]. At the time of writing this document, many of the crucial epidemiological information particularly source of infection, mode of transmission, period of infectivity, etc. are still under investigation.

Mode of Transmission

Peoples can get the infection through close contact with a person who has symptoms from the virus which includes cough and sneezing. Generally corona virus was spread via air- borne zoonotic droplets. Virus was replicated in ciliated epithelium that caused cellular damage and infection at infection site. According to a study published in 2019, Angiotensin converting enzyme 2 (ACE.2), a membrane exopeptidase in the receptor used by corona virus in entry to human cells (Figure 2) [6]. Typically, like most respiratory viruses, it is considered to be the most contagious when people are most symptomatic. However, cases, who were infected from an asymptomatic person in the prodrome period of COVID-19, were also reported. Sufficient data are not available on infectiousness of the disease and research is ongoing [7].

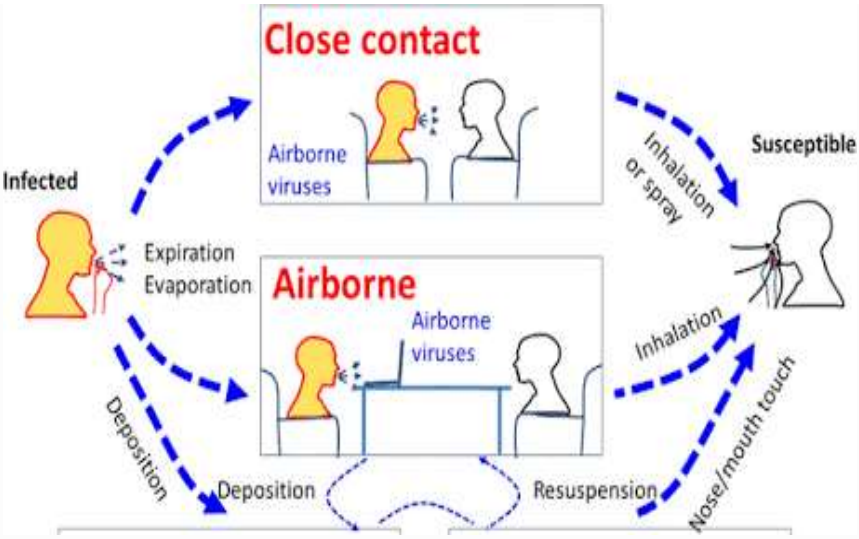

Figure 2: Transmission of corona virus via airborne droplets

Symptoms of Covid – 19

The most common symptoms of Covid-19 are mild to high fever, tiredness and a dry cough. Some patients may also have a runny nose, sore throat, aches and pains or diarrhea. Some people report losing their sense of taste or smell. About 80% of people who get Covid-19 experience a mild case about as serious as a regular cold and recover without needing any special treatment. The WHO says, the elderly and people with underlying medical problems such as high blood pressure, heart problems or diabetes, or chronic respiratory conditions, are at a greater risk of serious illness from Covid-19. Recovery depends on the strength of the immune system.

Treatment

The current best approach of treatment for patients with COVID-19 is purely supportive. Clinicians and intensive care specialists are applying much of what they have learned during the SARS epidemic to guide current therapy of COVID-19. Recommendations for admission to critical care units, guidelines for infection control, and procedures to minimize nosocomial transmission are being established [8]. However, there are several fronts that are being studied to develop targeted treatments. The most efficient approach to the treatment of COVID-19 is to test whether existing antiviral drugs are effective. In previous betacoronavirus epidemics, several antiviral drugs, such as ribavirin, interferon, lopinavir-ritonavir, and darunavir/cobicistat (prezcobix) were tested, with some showing promising in vitro results [9]. Remdesivir, an adenosine analog used against RNA viruses (including SARS and MERS-CoV), was a candidate Ebola treatment with promising in vitro results but disappointing in vivo effects against Ebola [10 ,11]. There is currently in vitro evidence that remdesivir may be effective in controlling SARS-CoV-2 infection [12]. In fact, compassionate use of remdesivir was employed in the treatment of the first COVID-19 case in the United States, during a period

of rapid clinical deterioration, and within one day there was dramatic improvement of the clinical condition [13]. Randomized double-blinded, placebo-controlled clinical trials are currently underway in China and USA to evaluate the efficacy of remdesivir and initial results are expected by the end of April 2020 [14,15].

Other existing drug candidates include chloroquine and Camostat mesylate. Chloroquine is a widely used anti-malarial drug that is known to block virus-cell fusion and has been shown to interfere with the glycosylation of SARS-CoV and ACE-2 cellular receptors, rendering the ACE-2-SARS-CoV interaction less efficient [16]. There is also in vitro evidence that chloroquine may be effective in preventing SARS-CoV-2 cellular entry [12]. Camostat mesylate, also known as FOY 305 [17], was initially developed and currently approved for the treatment of chronic pancreatitis in Japan[18, 19]. Camostat mesylate targets the TMPRSS2 protease, theoretically preventing viral entry. Researchers in Germany showed that camostat mesylate reduced the amount of SARS-CoV-2 viral replication [20]. A simple but very effective treatment modality is the use of convalescent plasma, or serum from patients who have recovered from the virus, to treat patients. Patients with resolved viral infection will have developed a specific antibody response which may be helpful in neutralizing viruses in newly infected individuals. This modality was successfully employed during the 2014–2015 Ebola outbreak [21, 22]. However, the use of convalescent sera is of limited benefit in an outbreak situation since the exponential growth of infected patients exceeds the ability of previous patients to provide donor plasma. The recent finding that SARS-CoV-2 binds to the same ACE-2 receptors targeted by the 2002 SARS-CoV [23] opens up the possibility of using the previous research on the 2002 SARS epidemic and applying it to COVID-19. The first strategy would be to employ either a small receptor-binding domain (RBD) or a neutralizing antibody targeting the ACE-2 receptor, thus blocking the binding of S protein and preventing virus entry into cells. Initial in vitro results have shown promising results [24,25] and specific monoclonal antibodies are being contemplated as candidates for treatment [26 ,27]. The main limitation of using RBDs or antibodies is that the treatment must be given within a specific time window, before the initiation of viral replication [28]. In addition, the side effects of ACE-2 blockade, especially since ACE-2 is also present in non-pulmonary tissue, must be understood and minimized before implementation. In addition, finally, the turnover of ACE-2 receptors would influence how often the therapeutic RBD or antibody would have to be administered. A second strategy is to create an ACE-2-like molecule that would bind to the S protein of the coronavirus itself. Again, research into the 2002 SARS virus demonstrated that soluble ACE-2 proteins blocked the SARS virus from infecting cells in vitro [25 , 29]. The additional benefit to using this strategy lies in the possible prevention of S protein-mediated ACE-2 shedding that has

been shown to induce the pulmonary edema characteristic of SARS [30, 31]. A phase II clinical trial of recombinant ACE-2 in ARDS reported significant modulation of inflammatory proteins, but no significant differences in respiratory parameters [32]. Further research is necessary to assess if the animal studies will translate to clinical benefit. There are currently more than 80 clinical trials to test a variety of potential SARS-CoV-2 treatments [33].

Vaccine Development

The long-term goal of SARS-CoV-2 research is developing an effective vaccine to yield neutralizing antibodies. The National Institutes of Health in the US, and Baylor University in Waco, Texas, are working on a vaccine based on what they know about the coronavirus in general, using information from the SARS outbreak. In addition, the recent mapping of the SARS-CoV-2 spike protein may pave the way for more rapid development of a specific vaccine [34]. Of interest is the use of a relatively new vaccine technology, RNA vaccines that have the ability to elicit potent immune responses against infectious diseases and certain cancers [35,36]. Traditional vaccines stimulate the production of antibodies via challenges with purified proteins from the pathogens, or by using whole cells (live or attenuated vaccines), while effective creation of new vaccines can take many years. Alternatively, RNA-based vaccines use mRNA that upon entering cells, are translated to antigenic molecules that in turn, stimulate the immune system. This process has been used effectively against some cancers [37, 38], and clinical trials are underway for several other cancers [39]. In addition, the production of RNA-based vaccines is more rapid and less expensive than traditional vaccines, which can be a major advantage in pandemic situations. Clinical trials for an mRNA-based SARS-CoV-2 vaccine are currently underway [40]. Study subjects will receive the mRNA vaccine in two doses, 28 days apart and the safety and immunogenicity will be assessed.

Prevention

There is nothing to provide complete guidance to prevent from corona virus but some guidelines was presented by WHO and ECDC. According to WHO, some general guidelines were published such as separate the infected patient from other family member to single room, implementation of contact and droplet precaution, airborne precaution etc. European Centre for Disease Prevention and Control (ECDC) also published the information leaflet to peoples i.e. Avoid contact with sick people, in particular those with a cough. Avoid visiting markets and places where live or dead animals are handled, Wash your hands with soap and water or use an alcohol based disinfectant solution before eating, after using the toilet and after any contact with animals, Avoid contact with animals, their excretions or droppings[41–42]. Isolation of confirmed or suspected cases with mild illness at home is recommended. The ventilation at home should be good with sunlight to allow for destruction of virus. Patients

should wear a simple surgical mask and practice cough hygiene. Caregivers should wear a surgical mask and use hand hygiene every 15–20 min [43].

CONCLUSION

Corona virus is spreading human to human by transmission through close contact via airborne droplets generating by coughing, sneezing, kissing and touching. So avoid these activities with infected partners and family members. As per WHO and ECDC guideline avoid the contact with sick person and also avoid the market or public place as per possible. There are no anti corona virus vaccine to prevent or treatment but some supporting therapy work. Future research needed to fight with corona virus. Social distancing is a non-pharmaceutical infection prevention and control intervention implemented to avoid/decrease contact between those who are infected with a disease causing pathogen and those who are not, so as to stop or slow down the rate and extent of disease transmission in a community. This eventually leads to decrease in spread, morbidity and mortality due to the disease.

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