Recent Trends and Treatment Approach in COVID-19—A Short Review

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How to cite this paper: Nistara S. Chawla, Satish Kumar Anumula. (2020) Recent Trends and Treatment Approach in COVID-19—A Short Review. *International Journal of Clinical and Experimental Medicine Research*, 4(4), 157-161.
DOI: 10.26855/ijcemr.2020.10.006

Received: August 1, 2020

Accepted: August 23, 2020

Published: August 27, 2020

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Abstract

COVID-19 has emerged as a pandemic in the month of March 2020. It was first discovered in China, with a geographical focus in the city of Wuhan. Since then, it has spread to various parts of the world. Initially, the virus was called as 2019-nCoV, but the International Committee of Taxonomy of Viruses later termed it as the SARS CoV2 virus, given its similarity to the SARS CoV virus of 2003. According to WHO, more than 8 million confirmed cases have been reported so far and the numbers keep on rising every day. In India, there have been 380,532 confirmed COVID positive cases 12,573 deaths according to the report released by WHO as on the 19th of June 2020. The disease outbreak is unprecedented and has managed to wreak havoc in the healthcare systems globally. COVID-19 has been declared as a public health emergency and lot of research is currently targeted in the understanding of the novel virus so as to accelerate the diagnosis and the treatment approaches for the novel virus. We bring forth an overview of the currently available data and resources in understanding about the SARS CoV2 virus, trends of transmission, the pathogenesis of the disease, clinical features, epidemiological transition of the disease in India, various tools for the diagnosis and the available treatment approaches that are currently under trail but have resulted in clinical recovery of the patients.

Keywords

COVID-19, coronavirus, SARS CoV2, pandemic, MERS, 2019-nCoV, SARS

1. Introduction

The novel coronavirus belongs to Family Coronaviridae, one amongst the large group of positive-sense RNA viruses. They are believed to be highly pathogenic in humans, given that epidemics like yellow fever, encephalitis, dengue fever, common cold and other respiratory tract infections that range from being mild to fatal are attributed to this very group of viruses [1]. The name Coronaviridae is derived from the Latin word “corona” meaning “crown”, because of the outlook of the virus as that of an encapsulated virion surrounded by spikes. As of now, the genera Coronaviruses and Tonoviruses are the two identified genus of viruses that belong to this family of which the coronaviruses are known to have the largest genome-27-32 kb in size [1].

Seven different forms of coronaviruses are known to affect humans till date, four of which cause mild diseases-229E, NL63, OC43, HKU1. However, three very deadly forms of coronaviruses have been seen over the last two decades. This involves the SARS-CoV responsible for the Severe Acute Respiratory Syndrome in 2003, the MERS Cov responsible for the Middle Eastern Respiratory Syndrome, identified in 2012 and the SARS CoV2 or the novel

coronavirus responsible for COVID-19 identified in December 2019. COVID-19 is a contagious disease caused by the SARS CoV2 virus. In March 2020, it was declared as pandemic by the WHO. The outbreak, which initially began as pneumonia of unknown cause detected in Wuhan, China, has metastasized to many countries around the globe, with the number of confirmed cases reported to be around 4 million as of 17th May, 2020 and increasing every day getting the healthcare system of various countries to go hay-wire [3] [4]. The geographical spread of the pandemic still continues.

2. Methodology:

Eighteen articles were selected from the years 2019-2020. The articles were searched from the search engines like Google scholar, Pubmed and Science Direct using the key words like “covid-19”, “coronavirus”, “pandemic”, “SARS-CoV2”. Along with that, recent resources provided by the CDC and the WHO on the coronavirus were also included. The articles with information about coronavirus, pathogenesis, clinical features, epidemiology, transmission, diagnosis, treatment and physiotherapy aspect were included in this review.

3. Discussion:

The SARS CoV2 virus is phylogenetically related to SARS-CoV identified in 2003. Recent research work on the virus has shown that it originated from bats, because of the similar genetic sequence. According to Habibzadeh P. et al, it first replicates in epithelial cells of the respiratory and enteric cells, which leads to cytopathic changes [3]. Weiss SR. and Navas-Martin S suggested a hypothesis for the pathogenesis of the disease in which they state that the spike proteins in the envelope of the coronavirus binds to the target receptors on the host cell and eventually lead to the release of viral RNA into it. Various enzymatic reactions are then followed that cause the replication of the genome and transcription of the viral RNA and hence disrupting the normal host cell metabolism. Viral proteins, which cause the derangement of the host immune system, are also translated from the host cell mRNAs. Spike mediated cell to cell fusion is thought to be the reason behind the viral spread, as observed in other viruses [7]. Another study by Ling Lin et al. suggested that although the exact pathogenesis of SARS CoV2 remains uncertain, it has been hypothesised that the immunosuppression leading to the development of pneumonia and the impending respiratory failure could be foreseen by the haematological changes like lymphocytopenia and thrombocytopenia associated with the elevated levels of C-reactive proteins as observed in the peripheral blood smear [8].

As Qun Li et al. reported, early Transmission Dynamics in Wuhan, China, of Novel Coronavirus-Infected Pneumonia, the incubation period of the virus has been estimated to be around 5 days [5]. According to Huang C. et al., clinical features of patients infected with 2019 novel coronavirus in Wuhan, China, the infection may cause mild to severe respiratory disease and preliminary symptoms often include fever, cough, dyspnoea, myalgia and fatigue. However, other symptoms which are not so common, but have also been reported to be the presenting symptoms of COVID-19 include sputum production, haemoptysis, diarrhoea and headache. Although majority of the cases reported cause only a clinically mild infection, severe cases may even lead to complications like ARDS, acute cardiac injury, secondary infection and septic shock [6].

According to Qun Li et al., the contagiousness or the rate of transmission of any infectious agent is represented by the basic reproductive number that is R_0 . For the SARS CoV2 virus, the R_0 is estimated to range between 2 and 2.5. This means that one COVID positive person is likely to spread the infection to 2 or more people over the time. This basically means that the SARS CoV2 virus is highly infectious and compared to an average epidemic with an R_0 of 1, the SARS CoV2, as had been observed in the initial studies, is likely to spread at an enormous level [9]. The CDC states that the disease is more likely to be spread to a certain group of people classified as high risk group. This includes people of the age group 80 and above, people with comorbidities like chronic lung disease, serious heart conditions, diabetes, chronic kidney disease, liver disease, severely obese individuals and those considered to be immune-compromised, for example, persons undergoing cancer treatment, smokers, or those taking corticosteroids [10]. According to WHO, pregnant females have not been classified as high risk individuals. There is no concrete evidence of the intra-uterine spread of COVID or via breast feeding.

The initial cases were reported in Wuhan, China as pneumonia of unknown cause. The outbreak spread at a rapid rate with the recorded effective reproductive number as 2.2 to 3.58, which is much higher than that of SARS 2003 [19]. Li Q, Guan X, Wu P et al. in their study early transmission dynamics in Wuhan, China, of novel coronavirus-infected pneumonia, presented with evidence that the mode of transmission of the disease was human to human. It was thus formulated that COVID-19 could effectively spread via droplets or close human contact [19]. Xia J, Tong J et al. reported the presence of the virus in tears [20]. The mean incubation period of the infection is around 5 days and ranges from 1-14 days. This data is suggestive of the 14 day period of isolation or medical observation

that is being practiced. However, an asymptomatic carrier was reported to be contagious for a period of 19 days. Rajiv Gupta et al. conducted a study on the epidemiological transition of the disease in India. It concluded that a very wide variation has been seen in trends of the spread of COVID-19 in India. Initially, it was more prevalent in the states with high HDI [11].

According to Palash Ghosh et al., the states of Maharashtra, Delhi, Madhya Pradesh, Rajasthan, Gujarat, Uttar Pradesh, and West Bengal were proposed as high risk states at the end of the month of April [12]. However, it was eventually seen to be following the classical pattern of epidemiological transition, spreading from the urban areas very rapidly to the states with middle and low HDI and attacking the latter even more severely [11]. According to Shi Y et al., the rapid screening algorithm for COVID-19 involves checking for fever and/or respiratory symptoms like cough, runny nose, breathlessness, etc. Regardless of the fever, if the patient even has one of the above mentioned respiratory symptoms, he/she is enquired about their epidemiological history. Those with epidemiological history but no symptoms are advised to be home quarantined for a minimum of 14 days and those who are symptomatic are then further evaluated for COVID-19 [13].

In the study by Guan et al., it was reported that the RT-PCR test is considered to be the gold standard test for diagnosing COVID-19. An oropharyngeal or nasopharyngeal swab is taken and the sample is processed in the thermal cycler to amplify the viral rna using reverse transcriptase enzyme [14]. Initially, radiological imaging was also considered to be a sensitive tool for the diagnosis. Characteristic “ground glass opacities” which represent alveoli filled with fluid was considered to be the confirmatory finding on the Chest-CT in the initial stages of the infection [14] [15]. The progression of the disease presents with “solid white consolidations” in the lung fields and as the fibrosis worsens; it leads to “crazy paving pattern”, Ground Glass Opacities with interlobular and intralobular septal thickening [14] [15]. There is no specific treatment or vaccine available for COVID-19 as of now. According to Cascella M et al., in mild cases, self-isolation, fluid replenishment and rest are recommended. The on-going treatment is on the lines to provide symptomatic relief to the patient. WHO recommends Acetaminophen for fever and pain. Oxygen therapy, non-invasive ventilation, mechanical ventilation or ECMO are recommended for patients with respiratory involvement based on the severity of the disease [16].

Although there is no concrete evidence for the use of antivirals in treatment of COVID-19, various on-going trials have shown positive results with the use of Lopinavir/Ritonavir, Chloroquine and Hydroxychloroquine and HCQ in combination with Azithromycin. Alpha-interferon is also being used [16]. Another study Dong El et al. suggested that intravenous infusion of Ribavirin and oral intake of Arbidol has also been advocated in one of the studies [17]. Nonetheless, numerous clinical trials are required to come up with a concrete and consensual treatment approach for the disease. According to Liying Dong et al., INF α is known to act as a broad spectrum anti-viral drug and studies have reported its efficacy in inhibiting the in vitro transmission of COVID-19. Favipiravir is another drug which is an RNA dependant RNA polymerase inhibitor. Currently, certain clinical trials are going on to check its efficacy in the treatment of COVID-19 [18].

According to Raef Fadel et al., a trial conducted in Michigan reported that short term course of corticosteroids is beneficial in improving the symptoms and could provide an inexpensive and effective medicine to be used in moderate to severe cases of COVID-19 [21]. COVID-19 mainly presents with dry cough or pneumonitis rather than exudative consolidation. Hence, the requirement of chest physiotherapy is not there in these cases unless the suspected or confirmed COVID patients develop mucous hyper secretion with difficulty in clearing out the secretions by themselves due to severe respiratory disease. Thus, the main role of physiotherapist in COVID-19 patients is targeted on interventions for rehabilitation and mobilization of the patients who have acquired weakness post the stay in ICU.

According to the current guidelines issued by WCPT, physiotherapeutic interventions for airway clearance are only required in the following cases:

- mild symptoms and/or pneumonia are accompanied by co-existing respiratory or neuromuscular comorbidity;;
- mild symptoms and/or pneumonia with evidence of exudative consolidation with difficulty or inability to clear secretions independently;
- Severe symptoms suggestive of pneumonia or LRTI;
- Any patient at risk of developing or with apparent significant functional limitations.

The interventions vary from case to case depending upon the need, the ability of the patient to participate and the feasibility for the physiotherapist to administer the planned interventions taking into consideration the health and safety of both. The standard set of interventions expected in such settings include passive, active assisted, active, or

resisted joint range of motion exercises to maintain or improve joint integrity and range of motion and muscle strength, mobilisation and rehabilitation of the patient. It must be taken into account that all the procedures and interventions which involve the therapists exposure to the aerosols or secretions of the patient must be done with full precautions, wearing PPE whenever necessary. Close contact with a COVID patient be avoided and as far as possible, educating the patient about the interventions should be the first priority. Only the professionals trained in cardiopulmonary physiotherapy and with experience in the ICU practice should be deployed for these patients [21].

4. Conclusion:

COVID-19 has emerged as a pandemic and is spreading all across the globe at a very rapid rate. The exact pathogenesis of the disease is still not known but the current researches suggest that the virus particularly targets the respiratory and enteric epithelium, causes cytopathic changes and leads to derangements in the immune system. The disease spreads from human to human via droplets and individuals with comorbidities such as hypertension, diabetes and those who are immune-compromised are particularly at a higher risk of enquiring the infection. The presenting symptoms of the disease often include fever, cough, dyspnoea, myalgia and fatigue and the disease may even take a severe route leading to ARDS and septic shock. The disease has shown characteristic epidemiological transition from area of high HDI to the areas of low HDI. Currently, no specific treatment or vaccine is available. However, certain existing anti-viral drugs are under trail for the treatment of COVID-19. Physiotherapy interventions may also be indicated in some cases. As more researches are carried on the virus, more details about the pathogenesis and treatment shall be brought into light soon.

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