

A Review on the Updated Diagnostic and Management Criteria of COVID-19

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ABSTRACT

This review has brought forward the updated guidelines of diagnosis and management strategies of the newly emerged disease COVID-19 whose number of cases has escalated to the situation of a pandemic. The review has successfully presented the timeline of COVID-19 and its background. The various diagnostic criteria have been discussed from different aspects. The updated guidelines on prevention have been well presented. The management options have been thoroughly reviewed for efficient patient care. This review also had presented the epidemiology of the COVID-19. It has been found that 44% of the patients have a fever during admission and 88% of the patients had a fever post-admission. Also, 70% of the patients had a dry cough. Again in Europe, 88% of the patients have developed hyposmia, anosmia and loss of taste. Anorexia is also the most frequent feature of COVID-19, while 30% of the patients develop dyspnea and myalgia. The preventive and management strategies that have been reviewed are clinically the most significant and can be easily followed by the clinicians and organizations along with by each individual.

Key-words: Betacoronavirus, COVID-19, Coronavirus, Pneumonia, World Health Organization

INTRODUCTION

At the end of the year 2019, an outbreak of pneumonia occurred in the city of Wuhan, China. As per the reports, the early cases were traced back to the seafood market and were believed to spread from there. The investigation on this new outbreak revealed betacoronavirus from the patient's upper respiratory tract ^[1]. Electron microscopy of the virus revealed that the diameter of betacoronavirus ranged from 60-140 nm and possessed spike proteins of 9-12 nm ^[2]. Subsequently, the International Committee on Taxonomy of Viruses called it SARS-CoV2 in 2020 Feb

and in March, World Health Organization (WHO) declared a pandemic and called the disease COVID-19 ^[3] (Table 1).

COVID-19 disease is also known as a coronavirus disease, which is derived from the Latin word "*corona*" which means crown. The name refers to corona due to its unique appearance under the electron microscope. Its resemblance is described as almost similar to the solar corona having round particles with the rim of projecting particles. The virus is found to be enveloped with a single-stranded RNA and that is first isolated in the year 1965 from humans. The coronavirus is derived from the family "*coronaviridae*" that produces usually mild symptoms of respiratory disease in humans ^[4].

The novel coronavirus named by the world health organization as COVID-19 was in the current outbreak producing pneumonia since December 2019. In the first 6 weeks of 2020, the coronavirus also known as COVID-19 has been spread to 20 other countries from Wuhan, PRC. It is widely spread in china along with other

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countries with serious complications like pneumonia [5]. The disease spread occurred primarily from bats and was later found to have a person to person transmission. Although the transmission route of the disease had some confusion, it was later confirmed that droplet transmission directly and indirect via fomites played a significant role. Even the presence of virus both in symptomatic and convalescing patients' stool suggested the chance of faeco-oral transmission, but the confirmation of this route is yet to be verified [6-8]. The coronavirus is a pathogenic virus. From the results obtained from the phylogenetic analysis of full genome sequences, it is confirmed that the bats are reservoirs of the virus, but the intermediate hosts of the virus have not been identified to date [9].

The coronavirus spreads through dust or fomites by unsafe or close contact with the infected individual. Though the airborne spread of the virus is not known to be a significant transmission way, it can be considered as a method of transmission in a hospital setting. The spread of the virus through fecal matter is seen in some patients and some reports state that the active virus is seen in clinical studies [10-12].

The coronavirus pandemic is caused by SARS-CoV-2 coronavirus which has many distinct features from other epidemics related to coronavirus. This epidemic has resulted in thousands of deaths in the whole world for more than two years but no drugs or vaccines are found to be effective in eliminating the disease from the people infected by the virus. Social measures like social distancing, wearing a face mask, washing the hands with soap, or using a sanitiser have been practised to reduce the spread of the virus [13]. It is mandatory to isolate the patients and perform quarantine as there is no preventive or palliative treatment, but these measures have brought a huge change in the daily routine of the people. Recently remdesivir (Veklury) has been used in treating critical patients. The coronavirus disease can be asymptomatic, but when it is symptomatic it shows problems of respiratory disease and also flu or cold-like symptoms, these symptoms are diagnosed with a CT scan of the chest and are confirmed with an RT-PCR test [14].

Epidemiology and Transmission- The very first case of coronavirus was recorded in Wuhan, the capital of Hubei province, china. Most of the coronavirus cases were epidemiologically linked to the wholesale market of

Huanan where live animals and aquatic animals were sold. An unknown beta variant of coronavirus has been discovered from the samples of the lower respiratory tract of the patients. The virus is isolated using the human epithelial cells of the respiratory tract. When observed under an electron microscope the virus appears to have a diameter of 60 to 140 nanometers with 9 to 12 nanometres spikes that are similar to the coronaviridae family [1,2]. It was estimated that (R_0) Basic Reproduction Number indicates the risk of the spread of the epidemic and readily reflect the status of the current pandemic. It was estimated that R_0 for COVID-19 was between 2.0 and 3.0, which is a reflection of the number of secondary cases in a risky population [15].

The time since the first case was reported in China, the spread of the disease was rapid and the number of cases was increased exponentially. The first case that was reported outside China in Thailand was on 11th January 2020 and has been spread to other countries except for Antarctica [5,15]. The analysis of the COVID-19 transmission dynamic revealed that the basic reproductive number (R_0) of the causing virus should be between 1.4 and 3.9. R_0 of MERS-CoV was between 0.50 and 0.92 which was much lesser than the current pandemic causing virus due to which it was controlled easily by isolation [16,17]. There are 75,995 confirmed cases in China as of February 20, 2020, including the death rate, and outside china 1200 confirmed cases including 8 death rates were reported [16].

In India, the first case was reported on 30 January 2020, which has been increased to 3 by 3 February 2020 and there were no reports of cases in February, but by mid of march there has been a rapid increase in the number of cases. The first death due to COVID 19 in India was reported on 12 March 2020. The disease has been spread to all parts of India except Sikkim by the end of April [18]. Table 1 below presents a timeline of the rise of COVID-19.

Table 1: The timeline of risk of the COVID-19 pandemic [3]

Date	Events
30 th Dec 2020	The report of the first outbreak in Wuhan, China
7 th Jan 2021	The isolation of the coronavirus was completed
12 th Jan2021	The genetic constitution of the coronavirus was shared

30 th Jan 2021	The first case was reported in India
11 th Mar 2021	WHO declared COVID-19 pandemic
19 th Apr 2021	The number of active cases of COVID-19 reached 15000 and death crossed 500 in India

DIAGNOSIS

Clinical features- The coronavirus disease appears to be asymptomatic or it can be critical including the death of the infected individual. According to the report given by the centre for disease control in china by referring 72314 cases, 81% of the cases were mild with mild or no pneumonia, 14% of the cases were severe with symptoms of dyspnea, oxygen saturation of blood less than 93%, respiratory cycle less than 30 per minute, lung infiltration greater than 50% within 24-48 hours, and 5% of the cases are critical with the symptoms of septic shock, respiratory failure, multiorgan failure [19].

The most common symptom of coronavirus disease is fever. According to a study in China, 44% of the patients have a fever at the time of admission while 88% of the patients develop a fever after admission. Almost 70% of the patients develop a dry cough. Almost 88% of the patients from Europe have developed hyposmia, anosmia, and also loss of taste. Anorexia is also the most frequent symptom of COVID-19. 30% of the patients develop dyspnea and myalgia [20,21].

Laboratory findings- The routine tests required for investigating COVID-19 include the investigation of fibrinolysis and coagulation of the blood, complete blood picture, parameters that are related to inflammation. Investigating the biochemical factors is important as the virus can impair vital organs like the liver, heart, and kidneys; it helps in investigating the functional activities of the organs [22].

The decreased levels of lymphocytes which are accompanied by thrombocytopenia are the most common finding observed in patients with COVID-19. The elevation of the levels of D-dimers is an important finding in patients with the progression of coronavirus disease [23]. The inflammatory parameters like the erythrocyte sedimentation rate and the C-reactive protein are elevated in the serum of the COVID-19 infected individuals. An increase in the levels of aspartate aminotransferase, lactate dehydrogenase, alanine aminotransferase, and the total bilirubin is

identified in the individuals infected with the coronavirus. Albumin levels are found to be decreased. An increase in the levels of creatine kinase and creatinine was also demonstrated in the patients with COVID-19. The COVID-19 mostly affects the lower respiratory tract of the patients as LDH is the most important enzyme present in the lungs, its increase in levels indicates the damage that is caused to the lungs and is also a biomarker in identifying the patients with coronavirus disease [24]. The coronavirus mostly affects the lungs but the symptoms like nausea, myalgia, vomiting, headache, loss of taste and smell, dizziness, impairment in the conscious are also found in patients infected with coronavirus, this shows that the virus shows neurotropism by affecting the central nervous system through a direct or an indirect way [25].

Imaging- As the coronavirus infects the lower respiratory tract of the infected individual, a chest computed tomography plays an important role in diagnosing the patients with coronavirus disease and also helps in the management of the disease. As there are advances in the imaging approaches using artificial intelligence it is used as an essential tool in differentiating COVID-19 from other respiratory diseases. The involvement of the Cardiovascular system in patients with COVID-19 is not negligible, it may result in the worsening of the disease and may even lead to the death of the infected individual. Cardiac magnetic resonance is used in diagnosing the involvement of the cardiovascular system in patients infected with the coronavirus [26].

COVID-19 has been found to have some typical clinical features which are discussed below-

Cough- Dry cough is the common symptom of patients infected with coronavirus, it is a cough that does not have phlegm or mucous from the airway tract. The patient with this symptom may experience dry, scratchy, rough, or a sore throat, and also have a tickling sensation in the throat. The patient does not find any relief from the cough even after coughing [27].

Fever- The body temperature of the patient infected with COVID 19 raises, it is the early symptom of the patient. It is a type of immune response to the infection [16,27].

Fatigue and dyspnea- The risk factors that are associated with dyspnea and fatigue are gender difference mostly in

females, comorbidities that are pre-existing, symptoms the patient exhibit after hospitalization [28].

URI symptoms- The symptoms of patients infected with coronavirus are dry cough, pneumonia. Pneumonia is caused due to the increase in the vascular permeability of the epithelial cells, which causes pulmonary edema [29].

Diagnostic criteria- The patients infected with the coronavirus are tested with the fluids of the respiratory tract and blood tests are also done to investigate the disease. The coronavirus can be diagnosed by viral tests; there are two types of viral tests, rapid tests, and laboratory tests. The virus is detected using samples from the nose or mouth. The rapid tests are done in minutes using the antigen. Laboratory tests take time to complete; it includes RT-PCR and some NAATs. Self-tests can be done at home or anywhere and results are produced in minutes, it includes rapid tests [13,26,30].

General management of COVID-19- If adequately counselled, people with mild symptoms (approximately 80% of the patients) can be managed in the community. It also makes them aware of what criteria should be considered for admission and can screen and monitor their condition and raise concerns [31]. Specific consideration regarding monitoring between 5-8 days after the onset of symptoms, while progression to severe disease is most frequent [32]. Usually, a COVID-19 positive patient is suggested to take complete bed rest and have adequate calorie and water intake to prevent dehydration. Monitoring of the vital signs, measuring of blood count and a urine test is also necessary [33]. For certain patients, watchful wait and self-observation might be acceptable management options, for many others active monitoring through telephones and telehealth methods might be reasonable. Some may require hospital admission or other sorts of monitoring such as in-person monitoring at home (e.g. Hospital at home) [34,35]. Patients whose home climate is not safe or helpful for administration or which is unsuitable from a contamination anticipation viewpoint ought to be conceded either to the clinic or to an elective safe environment. To ensure adequate follow-up and appropriate isolation and follow-up protocols are in place, public health authorities must be approached for discussions. Safe administration of low-risk patients in

the community will be fundamental in saving hospital space for the huge demands shortly [35,36].

Patients with moderate–serious sickness ought to for the most part be conceded to hospital. This incorporates the individuals who are dyspnoeic (while talking, sitting, standing, or with minor effort), tachypneic at rest (respiratory rate >22/minute), hypoxemia ($SpO_2 < 94\%$ on room air), hypotensive (systolic BP < 100 mmHg), altered mental state, or who has pulmonary infiltrates evident on chest imaging. Extreme ailment shown by, among different highlights, respiratory rate >30 breaths/min, or $SpO_2 < 92\%$ on room air or supported hypotension, warrens dire hospitalization, and intensive care. From the time a patient is suspected with COVID-19 until their infection is resolved, it is necessary to ensure optimal infection prevention [35-37].

Symptomatic management of COVID-19- Based on the severity of the disease, the patient's further decisions on hospitalization and treatment plans are categorized. A variety of treatment modalities are available such as antiviral drugs or specific therapy and supportive management in case of complications, including advanced organ support, if necessary. Therapeutic options currently available include anti-SARS-CoV-2 monoclonal antibodies (e.g., bamlanivimab/etesevimab, casirivimab/imdevimab), antiviral drugs (e.g., remdesivir), anti-inflammatory drugs (e.g., under FDA issued Emergency Use Authorization (EUA) are being evaluated in the management of COVID-19 [38]. The clinical course of COVID-19 is divided into 2 phases and these medications are used based on the severity of the illness in these phases. In the early phase when the SARS-CoV-2 replications are greatest before or soon after the onset of symptoms. Antiviral and antibody-based medications have been known to be effective at this phase of replication. The next phase which is regulated by the release of cytokines and the coagulation systems activation which induces a hyperinflammatory situation is battled with anti-inflammatory drugs such as corticosteroids, immunomodulation therapies, or a combination [39].

Antipyretic (e.g., ibuprofen, acetaminophen) should be administered in case the fever exceeds $38.5^\circ C$. Paracetamol is preferred over NSAIDs. The national institute of health (NIH) COVID-19 treatment guideline panel strongly recommends using dexamethasone in hospitalized patients, who require oxygen through

noninvasive or invasive ventilation. Severe SARS-CoV-2 pneumonia may require supportive intensive care. Lung protection strategies with careful monitoring are required. All patients must be maintained on prophylactic anticoagulation, considering COVID-19 is associated with the prothrombotic state [40].

Prevention of COVID-19- Human-human close interaction which initiates the process of transmission of the illness should be limited to prevent the magnifications of the disease. Although the disease is known to be airborne, disinfection of the air within the communities is not so effective in controlling the transmission. Also, the surgical masks that are being worn widely by the population everywhere around the world have not been clinically proven to prevent or reduce the contraction of the disease [41]. However, within the hospitals, the healthcare providers should wear personal protective equipment, N95 masks, goggles, gowns, while working with the infected patients. Upon identifying a COVID-19 infected patient, a strict protocol such as quick isolation and providing necessary care to the patient must be followed. Suspected individuals should be isolated and given a mask. All the patients and individuals should be requested to cover their mouth and nose, while sneezing and coughing. And should be encouraged and enforced to perform hand sanitization after contact with the respiratory secretions. All the aerosol-generating procedures should be performed in ventilated rooms. If possible, detachable or disposable equipment must be used in case of suspected situations. Surface contamination of the surrounding clinical environment should be avoided [42].

Non-pharmaceutical interventions had provided strict social isolation measures, which include the following, namely, case isolation, voluntary home quarantine, social distancing for those above 70 years old, social distancing for the entire population, closure of schools and universities. The most crucial step in containing the global pandemic is vaccination. Additionally, healthcare professionals must actively and attentively take part in infection control to protect both themselves and the community [43].

CONCLUSIONS

SARS-CoV2 incidences and its pandemic is a new disease that suddenly appeared at the end of 2019. There are experiments, debates, trial and error, formulation of

various diagnostic criteria and management processes. The present review has presented critical points regarding the updated diagnostic criteria and management guidelines. It is also been said that moderate cases need to be hospitalized. For symptomatic management, various treatment modalities are available like antiviral drugs or specific therapy and supportive management in case of complications, including advanced organ support. Antiviral and antibody-based medications have been known to be effective. Other drugs such as corticosteroids, immunomodulation therapies, or combinations have been proved to be effective in the management process. Overall, the review has presented the necessary points regarding proper prevention, diagnosis and effective management strategies including drug therapies, non-pharmaceutical methods and in-patient procedures.

CONTRIBUTION OF AUTHORS

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