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A Review on: Post-Covid Complications



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ABSTRACT

The "Coronavirus disease 2019" has resulted by infecting millions of people globally and indirectly affect the individuals through disruption of daily routine. Since the diagnosis of index case, linked to sea food and wet animal wholesale market in Wuhan, China, in December 2019. The discharge of this virus has spread worldwide and has threatened the whole world and considered as pandemic recently. World Health Organization (WHO) has declared COVID-19 Pandemic on March 2020. Long term health outcomes of COVID-19 have been reported with the similar diseases from other coronaviruses. "Middle East Respiratory Syndrome" and "Severe Acute Respiratory Syndrome". Major adverse outcomes was found to affect different body systems in humans (neurological system, GIT, hepatic an renal system, CVS, muscle pain, mental health outcomes, pulmonary outcomes, fungal infection and many more chronic symptoms were observed in patients in Post-COVID-19 recovery. Globally the community is focusing on trialing COVID-19 vaccines and its treatment, and its equally important to focus on recovered patients an possible events faced by patients in post recovery period. Thus this article emphasizes long-term COVID-19 health complications in patients during Post recovery period.

INTRODUCTION:

The (COVID-19) Coronavirus disease infected in 2019 is raised by MERS (Middle East Respiratory Syndrome) and SARS-CoV-2 are the similar species of Coronavirus. Now it has been international apprehension about public health emergency. Over a year into global pandemic more than 110 million COVID-19 cases has been reported worldwide with global mortality suppressing 2.5 million people in early 2021 [1,2]. Similarly large number of people have also been infected by coronavirus, but they remain undetected due to asymptomatic presentations.

Normal indications of coronavirus are shortness in breath, fever, muscle pain, migraine, joint pain, cough and in some instances pneumonia is diagnosed. After one or two months of recovery from COVID-19 patient start suffering major side effects and signs in post recovery period. The UK's (United Kingdom) current "National Institute of Health and Care Excellence" (NICE) guideline states that, long COVID incorporated ongoing symptomatic COVID-19 (where symptoms last for 4-12 weeks) and Post-COVID-19 Syndrome (When they persist beyond 12 weeks in absence of alternative diagnosis) [3,4].

Post-COVID symptoms are mainly diagnosed in geriatric patients and in comorbidities due to lower immunodeficiency as compared to adults. Thus, complications in elderly and people with cancer and other chronic disorders, diabetes, lung disease are primarily targeted. Therefore, long term complications may affect the human health system. The review explores various long-term health complications resulting from COVID-19 and understood day by day.

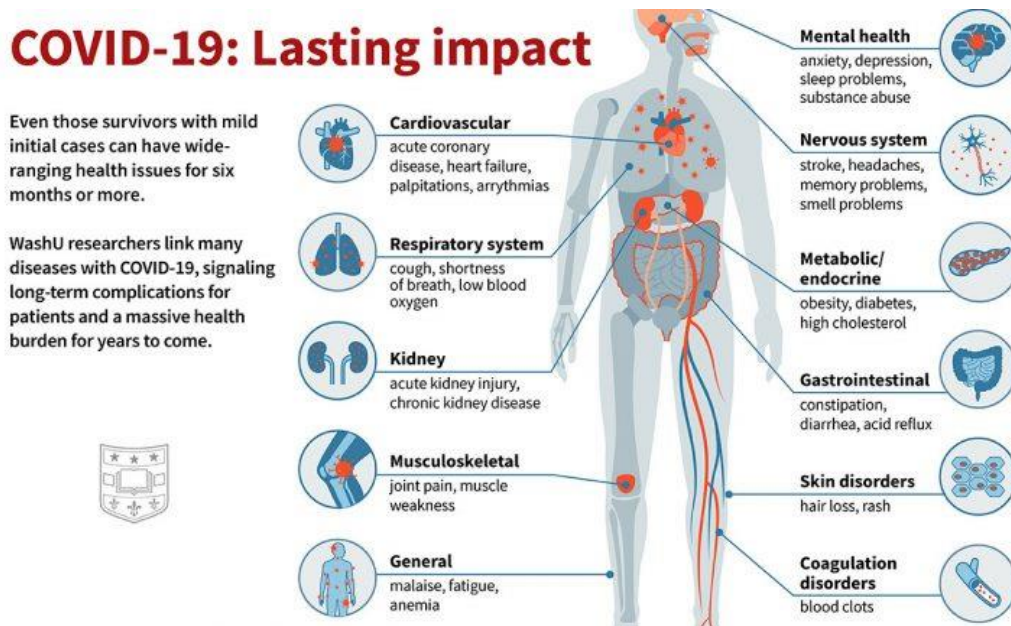


Figure no.1 Post-COVID complications: In patients recovering from COVID- 19

Based on the available data the majority of Post-COVID-19 symptoms seems to be linked with various health outcomes, wherein the mental health is adversely affected which may cause changes in the lifestyle routine.

After 2 months of recovery, patients start experiencing signs and major side effects, infected with acute and severe COVID-19. COVID-19 is multisystemic disease, complications may develop earlier or during the acute illness. Although many COVID-19 patients recover, some persist to have symptoms even after their COVID-19 polymerase chain reaction test become negative. Thus, post recovery symptoms may be acute on the basis of complications faced during the COVID-19.

POST-COVID-19 COMPLICATIONS:

1. Mental Health Outcomes

Mental health is adversely affected during the post-COVID phase which may cause changes in their everyday routine. COVID-19 patients with severe symptoms are treated in the “Intensive Care Unit” (ICU) along with mechanical assistance like ventilators to breathe, this event may lead to the development of post-traumatic stress syndrome, anxiety and depression and other mental health problems in the future [5].

Disruptions in sleeping patterns, including insomnia (disruptions in the ability to fall asleep) and hypersomnia (sleeping for longer duration than average) are commonly observed in

patients with mood an anxiety disorder [6] and identified one of the primary long term health consequences of COVID-19 [7, 8]. Greater psychological affect was observed in females during Post-COVID-19 with 2.2-2.5 fold higher odds of further developing psychiatric morbidity [9].

However, several people with no history of any psychiatric disorder before the COVID-19 pandemic develop mental health issues during treatment, recovery and post recovery period.

2. Autoimmune Neurological disorders

Evolution of adaptive immunity (mediated by T and B cells) identifies the chain of immunological events linked to SARS-CoV-2 [10, 11, 12]. Symptoms ranged from severe respiratory complications to motor paralysis [13].

“Guillain-Barre Syndrome” is typically demyelinating polyneuropathy (loss of myelin sheath) that manifests as acute ascending paralysis, thus the symptoms of GBS are detected after 2-3 weeks after COVID-19 symptoms [13].

GBS is diagnosed by the MR imaging and the detection of GBS and its variant include enlargement, signal hyperintensity and lenient to moderate contract enhancement of nerve roots. Aside from the Guillain-Barre Syndrome, post -infectious immunemediated neuropathies secondary to COVID-19 have been rarely reported [13, 14].

Miller-Fisher Syndrome is a GBS variant characterized by ophthalmoplegia (paralysis or weakness of one or more of eye muscles), areflexia (absence of deep tendon reflexes) and gait ataxia (failure of muscle coordination) is reported in correlation with COVID-19 [14].

Children have been diagnosed with autoinflammatory diseases including Kawasaki disease. Despite the large differences in Kawasaki disease next to pandemic, more study is needed to understand.

Kawasaki disease affects children under 5years age and is identified as inflammation process in small and medium-sized arteries, exhibiting greater cardiac involvement and activation of macrophages in the inflammatory response [15].

3. Cardiovascular Outcomes

The cardiovascular system gets affected by infection in respiratory tract caused by SARS-CoV-2 and MERS, further leads to increase risk of cardiac injury.

Myocardial injury is often reported cardiovascular complication of COVID-19 [16]. Pathophysiological findings in patient of COVID-19 are also associated with the myocarditis and heart failure. Cardiac arrhythmia, pneumonia which affects whole body, blood clotting and heart attack is the common complication in COVID-19. The high expression of angiotensin-converting enzyme-2 (ACE 2) receptors of myocardial tissue renders cardiomyocytes highly susceptible to attack by SARS-CoV [16,17].

Adverse response along with age, sex, and metabolic comorbidities and tokosubo syndrome are also risk factors in cardiac injury. Severe cardiac injury in hospitalized patients during COVID-19 is related with higher morbidity and mortality. The occurrence of catastrophic cardiovascular events, acute myocardial infarction Type-I and Type-II are also related to SARS-CoV-2.

4. Pulmonary System Outcomes

Recent evidence shows that lungs are organ most affected by COVID-19 [18]. Possible respiratory problems like chronic cough, pulmonary vascular disease, fibrotic lung disease, bronchiectasis are primarily affected by the COVID-19. The extent and severity of long term respiratory consequences of COVID-19 infection remain to be seen, but recent data show that many patients experience continuous respiratory complications months after their primary illness [19]. COVID-19 damages tiny air sacks in lungs [18].

When a person gets the condition, the virus binds to angiotensin-converting enzyme-2 (ACE-2) in alveolar cells, damaging them and impairing oxygen and carbon dioxide exchange in lungs. This, in turn, degrades many vital functions and primarily effect on lower an upper respiratory tract.

Commonly encountered clinical conditions are Post-COVID lung disease, pulmonary fibrosis, pulmonary embolism, whereas cavity lesions, small airway disease and development of pulmonary hypertension are mentioned in rare conditions [20].

According to the study, decline in the measurements obtained by the pulmonary function test develop after COVID-19, which may continue for up to 12 months, and may even become permanent especially in cases with fibrosis or in relation to angiopathic changes [20]. Pulmonary vascular thickening in COVID-19 plays vital role in development of acute respiratory failure, and based on results, we can detect that patients recuperating from COVID-19 may prone to develop right heart failure an pulmonary hypertension

[20]. Approximately 30% people with SARS or MERS persist lung abnormalities after their acute illness.

5. GIT, Hepatic, Renal Outcomes

Common symptoms found in COVID-19 patients are diarrhea, nausea and vomiting as well as abdominal pain [21]. Gastrointestinal (GI) symptoms are related with immune system changes in the intestinal flora, an existing comorbidities in patients affected by the COVID-19. Such symptoms may occur at early stage of disease, simply called as viral phase, or remain as long-term adverse gastrointestinal effects.

Obesity, nutritional diet, diabetes are such factors which may lead to systemic inflammation and dysfunction of intestinal metabolites.

Liver damage in COVID-19 patients is caused due attack of virus by directly infecting the liver cells. The occurrence of SARS can lead to hypoxic injury, which then leads to liver dysfunction. Liver injury primarily presented with abnormal elevation in alanine aminotransferase, aspartate aminotransferase and bilirubin levels [21]. Many studies have described that antibiotics (macrolides, quinolones), antiviral (ribavirin), steroids and other drugs used to treat SARS patients may cause liver damage. Antibiotics, antiviral medicines, and steroids have all been utilized to treat COVID-19 patients, just as they have for SARS patients. During the treatment of COVID-19, some of these medicines may cause liver damage [22]. Liver injury in patients affected with SARS-CoV-2 is observed about 30-40% after the diagnosis.

The kidney injury may cause due to entry of virus in kidney which leads to severe inflammation and apoptosis and directly affects the renal function. Incidence of acute kidney injury (AKI) was around 0.5% -29% in patients suffering from coronavirus. Acute Kidney Injury contributes to long-term outcomes such as microalbuminuria, and chronic renal disease that may require dialysis. Kidney damage is fact that kidney contains ACE-2 receptors, as COVID-19 patients showed higher level of COVID-19 and ACE-2 binding.

6. Muscle pain (Myalgia)

Muscle pain (myalgia) have been constantly reported in the COVID-19 patients. Muscle weakness is common chronic symptom observed in post-COVID recovering patients.

This may get severe due to ICU procedures an invasive treatment options, further may result in myalgia or chronic pain due to stress placed on human body. Physical movements might be restricted for patients being treated for COVID-19, especially in hospitalized patients. Generally, prolonged immobility and bed rest lead to muscular myopathy an atrophy, culminating in muscle deconditioning [23]. Myositis is related to inflammation of muscles and is linked to SARS-CoV-2[24]. Rhabdomyolysis is complication related to myositis, involving muscle infraction (myonecrosis).

7. COVID-19 related Mucormycosis (CAM)

Due to outbreak, the Indian Health Ministry, have informed all states to proclaim mucormycosis an epidemic. The Mucormycosis have been caused to linked with COVID-19 infection triggered by B.1.617.2 (Delta) variant, that has spread widely throughout the country. Along with ongoing series COVID-19, a severe fungal infection Mucormycosis has been progressively found in COVID-19 recovering patients [25].

Casually called as “Black fungus”, Mucormycosis often causes necrosis in head, neck including nose, paranasal sinuses, orbits and facial bones with possible intracranial spread [25].

Emerging complications related to COVID-19 are being reported with fungal infection mucormycosis becoming serious issue in India due to its high morbidity.

RESULT AND DISCUSSION:

The review describes about the Post COVID-19 complications in the recovering patients from the COVID19 variants (Middle East Respiratory Syndrome) MERS and SARS Cov-2. The Pandemic has adversely affected the physical as well as psychological health in the humans. Patients continue to experience a variety of symptoms months after recovery, and many patients who had never experienced serious health problems prior to the pandemic develop long-term behavioural and physiological concerns after being hospitalized with COVID-19. A lot of health complications related to autoimmune are also discussed, which suppress the immune system. In this review article we identified post-COVID complications including mental health outcomes, Cardiovascular Outcomes [26], Autoimmune Neurological Disorder [27,28] Pulmonary system outcomes [29], GIT, Hepatic, Kidney, Myalgia. COVID-19 associated Mucormycosis. Experts estimated that mild cases of COVID-19 would recover in 1-2 weeks in the early stages of the disease [30]. Many patients symptoms continued for 8 to

10 weeks or longer [30,31]. As a result, patients may endure a variety of long-terms effects in multiple organs.

CONCLUSION:

The review of current evidence on the post- COVID complications showed that the COVID-19 have affected multiple organ system and have led to affect patients mental health and caused certain changes in the lifestyle routine. The mental health outcomes has been the serious concern in the Post-COVID recovering patients. Risk factors is moderately seen in the patients suffering from the chronic diseases. However, additional research is needed to establish more about the Post-COVID complications. Future epidemiological studies are needed to investigate the risk variables associated with negative outcomes of COVID-19 and monitor the long-term health impact on patients health.

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