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## **Post COVID complications: Need to be vigilant in post epidemic era**

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**Abstract**---COVID-19 has occurred worldwide and left the detrimental effects affecting millions of people & caused deaths. It has affected almost every system of the body and left the survivors suffering with one or other complications. This review has studied and analyzed many articles published during and post COVID period. The post COVID symptom varies from psychological to multiorgan involvement. This review was undertaken with the purpose of presenting a current scenario regarding the long term complications among the survivors from the various literatures. This may help the health care providers to be vigilant for observing and monitoring these symptoms in patients who suffered with COVID-19, which may help to provide better health care and improve their quality of life.

**Keywords**---COVID-19, complications, post COVID.

**Introduction**

Coronavirus Disease 2019 (COVID-19) emerged in 2019 and has been a global health problem affecting all over the world affected millions of people and caused millions of deaths as well. [1] Apart from affecting physically, COVID-19 has affected psychologically and economically too. [2][3][4] It has been more than two years now after the emergence of the disease, which is now unfolding many aspects in terms of the long term complications following COVID-19. It may range from psychiatric complications to other systemic complications affecting most of the systems of body. [4] The COVID-19 has left a tremendous health care burden on society and on the health care system and deranged the economy of many countries. These complications, if studied well and their proper management as earlier stages may help many individuals who have survived during COVID-19

phase. The aim of this review is to study and analyze the existing data of post COVID-19 complications on long term and to increase the awareness and finally to reduce the post pandemic health care burden to some extent. [5]

## **Materials And Methods**

The various databases like PubMed, Scopus and Cochrane library were accessed for searching the articles. The research publications were searched using the words like COVID-19, long term complications, post COVID sequels etc. we reviewed 60 articles fully and 32 articles were included for the writing of this review depending on their similarity of our study title.

## **Post COVID-19 complications**

The COVID -19 disease has almost not spared any body system till yet. Post COVID syndromes were described for the first time in spring 2020 in the context of a survey of prolonged COVID-19 symptoms, run by the Patient-Led Research Collaborative, citizen's scientist group [6] The Post COVID-19 complications include organic diseases and psychological disorders.

## **Respiratory complications**

The prime target of this corona virus was the respiratory system. Patients who have suffered were left with alterations in pulmonary parenchyma, which could cause the pneumothorax leading to vasculitis and endothelitis [7] There have been patients suffering with cough and breathlessness even after being cured of COVID-19. There are patients with extensive pulmonary fibrosis with severe dyspnoea. There are no such reports that these pathological changes are reversible, hence COVID-19 has put all these patients at risk of a lifetime. [8][9][10]

## **Cardiovascular complications**

Patients who were already having cardiovascular problems were more prone to the cardiovascular complications by COVID-19. [11] Apart from causing mortality in cardiovascular patients, it caused new cardiovascular complications in those individuals. The major complications are myocarditis, which on acute onset can lead to ischemia and hypoxia. [9]. The over expression of Angiotension converting enzyme 2 (ACE2) increases the risk of hypertension and thrombosis [12]. It has been observed by a study that many patients who suffered with COVID-19 still have myocarditis detected by cardiac magnetic resonance imaging. The further cardiac magnetic resonance imaging in routine follow up, observed ongoing inflammation in 60% patients and elevated troponin T in 71% patients.[13]

## **Endocrine Complications**

It has been found that the diabetic patients were more vulnerable to COVID-19 infection. COVID-19 has affected various glands like Pancreas, adrenal, thyroid, etc. Some microscopic examinations showed adrenal ischemia, hemorrhage, degenerative changes and local inflammation. [14] Patients with pre-existing

diabetes had suffered most with COVID-19 and left even non diabetic with hyperglycemic condition. The new onset diabetes in patients who suffered with COVID-19 due to usage of steroids during the treatment period, proposed mechanism of hyperglycemia following infection, insulin resistance or decreased insulin secretion from beta cells of pancreas, probably due to damage by Corona virus. There are still not any established reports that whether new onset diabetes following COVID-19 is lifelong or not. [15][9]

### **Hematological Complications**

COVID-19 disease has affected many systems including hematopoietic system also at both acute and chronic phases. In the acute case, the risk of thrombosis is there in critically ill patients. According to a few studies, the rate of venous thrombo embolism in discharged patients who suffered with COVID-19 was 0.48 to 1.9%. One more study observed the post COVID hematological problems in patients after the discharge from hospital and it was found that the risk rate of venous thrombo embolism was 1.55% and for arterial thrombo embolism 1.71%. Hence it's needed to pay special attention for the recovered patients from COVID-19 to observe for late hematological manifestations. [15][16]

### **Neurological Complications**

Many neurological symptoms have occurred in patients who suffered with COVID-19. About 40% of total patients have experienced neurological manifestations. [17] It varies from seizures, delirium to even unconsciousness. The other neurological symptoms observed in the patients suffered with COVID-19 were psychosis, affective disorders, depression affecting cognitive functions. The survivors from COVID-19, who recovered have experienced symptoms like loss of impairment of memory and verbal fluency even for longer period after recovery. Many patients experienced anxiety, depression, loss of confidence, insomnia and other psychological disturbances. Hence, these symptoms are also needed to look for during the routine follow up as its hampering the quality of life at great extent in survivors.[18][19]

### **Dermatological Complications**

The common skin lesions observed in patients with COVID-19 were skin rashes, pruritus, cutaneous lesions, macula popular rashes, etc. [20] Following the discharge, the most commonly reported symptom was hair loss post COVID infection. Even after the recovery, many patients have still experienced it. It may be due to the temporary hair fall in the form of non scarring alopecia following any infection or trauma. But these symptoms affect patients psychologically and demand the treatment to gain their confidence back.[21][22]

### **Musculoskeletal Complications**

COVID-19 has affected the musculoskeletal system most in the acute tern as well post recovery also. The common symptoms found in patients who survived were arthralgia, myalgia, bodyache, fatigue etc... Any critical viral illness leaves patients with such symptoms to suffer for a longer period. It has been reported by

many people still suffering with symptoms like fatigue (53%), dyspnoea (43%), joint pain (27%), and chest pain (22%) even after recovering from COVID-19. A study has found the musculoskeletal changes at various anatomical levels in patients with COVID-19 and found the abnormalities in soft tissues, muscles, bones, and joints.[23][24][25] [15]

### **Gastrointestinal Complications**

It was observed that many survivors from COVID-19 were not free from gastrointestinal complaints even after recovery from COVID-19. The various symptoms a group of people experienced were vomiting, diarrhoea for a prolonged period, decreased appetite, dysgeusia, etc. [26] In survivors, they were found to have liver complications with abnormalities in liver function tests that may improve gradually. [15]

### **Renal Complications**

The kidney involvement in COVID-19 ranges from mild proteinuria to acute kidney injury. Acute kidney injury has been found to be the most common renal complication in COVID-19. Acute tubular necrosis, glomerulopathy and microvascular thrombi were common manifestations of acute kidney injury. The mortality in the COVID-19 phase was three times higher in patients who suffered with kidney injury in COVID. No data have been reported till yet for the long term outcomes regarding Kidney damage, hence we must monitor renal function tests during the routine follow up in patients who have recovered from COVID-19. [9][15][27]

### **Conclusion**

The COVID-19 has left a great negative impact on patients with respect to their health, wealth and psychologically. There have been wide ranges of symptoms and complications are experienced by patients, indicating the involvement of many systems. Many studies have reported multiorgan involvement and various post COVID sequel among the survivors. Hence, regular follow up and monitoring is essential for patients who recovered and especially who are at high risk with co morbidities. A robust health care system is required for better outcome and to decrease further burden on the health care system.

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