

## **An Overview of Post COVID-19 Complications**

The emergency of coronavirus disease 2019 (COVID-19) has resulted in an incomparable worldwide pandemic. Thus, the World Health Organization (WHO) has declared COVID-19 as a pandemic in March 12, 2020 <sup>1</sup>. Amid the acute phase of COVID-19, patients can be presented by several manifestations including cough, fever, nausea, diarrhea, vomiting, muscles and joints pain, headache, fatigue, and anosmia. Moreover, several studies reported different types of complications occur in multiple body systems during post viral infection phases <sup>2</sup>. Upon searching three data bases (PubMed, Google Scholar and WHO COVID-19 data bases, a recent systematic review found 69 articles from 15 countries reported post COVID-19 complications among survivors <sup>3</sup>. Respiratory complications were identified in 36 studies from several countries (China, Egypt, Germany, Italy, the UK, Netherland, Canada, Saudi Arabia, Iran, France, Spain and the United States) <sup>3</sup>. The commonly reported symptoms were breathlessness, lung function abnormalities, pulmonary fibrosis (interstitial thickening and crazy paving), residual ground glass opacity, abnormal diffusion, pneumonia, and pulmonary embolism. The longest duration of follow-up that reported respiratory sequelae was 4 months post hospital discharge <sup>4, 5</sup>. Although the lungs are the main organs affected by COVID-19, cardiovascular complications and neurological complications are involved in the identified studies <sup>6</sup>. Nine studies in China, Italy, Australia, and Germany have reported cardiovascular events of COVID-19 <sup>3</sup>. The longest duration of follow-up documented among these studies was 3 months post hospital discharge <sup>7</sup>. The cardiovascular complications included increase in the heart rates, increase palpitations, elevation in the blood pressure, chest tightness, pericardial chest pain, myocardial infarction, myocardial oedema, pericardial effusion,

diastolic dysfunction, pulmonary hypertension, and cardiac arrhythmia <sup>6, 8</sup>. However, 28 studies in China, Egypt, Germany, the UK, Italy, Ireland, Spain, Korea, the USA and Bangladesh have reported the neurological complications among COVID-19 survivors <sup>3</sup>. In these studies, COVID-19 survivors were presented with multiple symptoms included post-traumatic stress disorder, depression, anxiety, memory problems (immediate memory and delayed memory), cognitive impairment, insomnia and sleeping disorder<sup>4, 6</sup>. Chieffo et al reported neurological sequelae among survivors 4 months post hospital discharge <sup>9</sup>. Post-traumatic stress disorder is the commonly reported symptoms in these studies. It is presented commonly post intensive care unit (ICU) survivors, females, young population and survivors who had a previous history of psychological diseases <sup>4</sup>. In addition, 23 studies from 12 countries reported musculoskeletal complications including generalized pain, joint and muscle pain, fatigue and reduction in exercise tolerance as consequences after COVID-19 recovery <sup>3</sup>. Fatigue and physical decline were attributed to the pulmonary impairment and the shortness of breath which are commonly reported among the survivors <sup>4, 5, 10</sup>. Furthermore, gastro-intestinal tract (GIT) complications including nausea, vomiting, diarrhoea and acute liver injury (non-specific pattern) were among the prolonged complications which lasted in some cases up to 3 months after recovery. Four studies in the UK, Germany, and China have reported these GIT complications<sup>10, 11</sup>. Raman et al, reported urinary complications that involved residual renal failure among COVID-19 survivors who had no kidney injury prior to the infection <sup>10</sup>. Some other miscellaneous complications such as mild to moderate headache, fever, weight loss, alopecia, sore throat, and loss of smell and taste were reported after recovery. Seventeen studies had reported these symptoms among survivors and they lasted for 3 months post full recovery <sup>6, 11</sup>. Until now the literatures

cannot conclude the prolonged complications of COVID-19 and the residual organs damage that may persist among the survivors. Therefore, long term follow-up is recommended for COVID-19 survivors.

In summary, lung abnormalities, neurological complications, and exercise intolerance are frequently identified complications among COVID-19 survivors. Thus, some of these post COVID-19 complications may need long-term follow-up and management.

**Table 1: Reported post COVID-19 complications <sup>3</sup>**

<b>Complications</b>	<b>Symptoms</b>
Respiratory complications	1-Breathlessness/dyspnea/ tachypnea 2- Cough 3-Lung function abnormalities ( $\downarrow$ FEV1, $\downarrow$ FEV1/FVC, 4- Pulmonary fibrosis Interstitial thickening crazy paving 5-Residual ground glass opacity 6- Abnormal diffusion 7-Pulmonary embolism 8-Pneumonia
Cardiovascular complications	1- $\uparrow$ resting rates 2-Palpitation 3-Elevation in the blood pressure 4-Pericardial chest pain 5- Chest tightness 6- T2 signal and positive late gadolinium enhancement (LGE) 7-Myocardial edema 8-Pericardial effusion 9-Diastolic dysfunction 10-Pulmonary hypertension 11- Non-specific patterns of capillaries abnormalities 12- Hemosiderin deposits 13- Cardiac arrhythmias
Nervous system complications	1-Post traumatic stress disorder 2-Depression 3-Anxiety 4-Memory problems: Immediate verbal memory, delayed memory, semantic verbal fluency 5-Insomnia 6-Sleeping disturbance 7- Cognitive impairment & concentration problem 8-Stigma
Musculoskeletal complications	1- Generalized pain 2. Joint pain 3. Muscle's pain 4- Fatigue/physical decline
Gastrointestinal complications	1-Nausea, vomiting, and diarrhea 2-Acute liver injury
Urinary system complications	Residual renal impairment



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