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Review Article

POST-COVID-19 SYNDROME¹Dr. Zohor Ahmed Mohamed, ²Dr. Abdelaziz Mohamed Elamin Abdelaziz Ziena¹Family Medicine Specialist, Family Medicine Department, PHCC, Qatar University Health Center, Qatar. zamohamed@phcc.gov.qa²Family Medicine Consultant, Armed Forces Hospital, Jazan, Saudi Arabia, abdelazizzena@yahoo.com**Article Received:** November 2021 **Accepted:** November 2021 **Published:** December 2021**Abstract:**

Beyond the shadow of any doubt, infection of post-COVID-19 syndrome is challenging both physically and mentally. From causing chronic fatigue syndrome to brain fog, the reappearance of COVID-19 symptoms could pose serious health complications. The potential mechanisms involved in the pathophysiology of post-COVID-19 syndrome include expected sequelae of post-critical illness, inflammatory damage as a result of immunologic aberrations, and virus-specific pathophysiologic changes, resulting in the worsening of psychiatric, cognitive, and physical abnormalities. This review explains all the reported information about post-COVID-19 syndrome, its pathophysiology, and severe to moderate symptoms. The best way to prevent this syndrome is to protect oneself from the COVID-19 infection by adopting preventive measures and practicing social distancing as prevention is better than cure. Recovery is slow, the convalescence period is prolonged and to make it worse, its symptoms could have a huge downstream effect on the quality of life of an individual impacting their personal, social and professional life. Studies and researches related to Post COVID-19 Syndrome are underway worldwide to elucidate its clinical manifestation and pathogenesis. Hopefully, the world will be able to tackle it more properly in the coming days.

Keywords: COVID-19, Syndrome, Pathophysiology, physically, mentally.

Corresponding author:**Dr. Zohor Ahmed Mohamed,**

Family Medicine Specialist, Family Medicine Department,
PHCC, Qatar University Health Center, Qatar.
zamohamed@phcc.gov.qa

QR code



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INTRODUCTION:

While many countries and states are struggling to overcome the COVID-19 pandemic by fully understanding the infection and ongoing symptoms; many patients previously infected with COVID-19 are returning to their healthcare providers for seeking treatment against the after-effects of the virus. Typically, mild to moderate COVID-19 cases recover within 14 days after infection, but it has been reported that more severe to critical COVID-19 cases took three to six months for recovery. Recently, it has been reported that COVID-19 symptoms prevailed for months in some patients. On the other hand, COVID-19 symptoms have never gone away in some patients [1]. Based on preliminary data, the reappearance of COVID-19 symptoms even after the infection indicates “post-COVID-19 syndrome.” COVID-19 infection could cause many health complications like lungs disease, heart failure, stroke, and other neurological disorders. Fatigue and brain fog are some serious symptoms that should not be neglected because they often point towards post-COVID-19 syndrome. Brain fog occurs when the cytokines cross the blood-brain-barrier (BBB) [2]. COVID-19, a pandemic that has taken the world by storm, has incited panic everywhere even though its recovery rate is pretty high. The majority of the people suffering from COVID-19 focuses generally on its treatment neglecting the post-COVID-19 effects. To have proper well-being, proper care of the post-COVID-19 syndrome and its treatment should be considered.

METHODOLOGY:

Various keywords were used for search about Post Covid syndrome, like, Post COVID Syndrome, Post COVID illness, COVID Complications, and so on, and search was conducted in PubMed, Google Scholar, and other scientific databases.

DISCUSSION:

Post COVID-19 Syndrome is a set of ailments and maladies characterized by persistent clinical symptoms even after testing negative for COVID-19. These prolonged physical, psychological, and cognitive symptoms linger beyond a month. Different studies have defined the post-COVID-19 syndrome in several ways. Post-COVID-19 syndrome has been categorized into acute (short-term) and chronic (severe) syndrome. If the infection lingers for three weeks after the onset of first symptoms, it is called acute post-COVID-19 syndrome. On the other hand, persistence of infection for 12 weeks after the onset of first COVID-19 infection indicates chronic post-COVID-19 syndrome. Lay public has started calling the post-COVID-19 syndrome “long haulers” and

“long COVID” [3]. Previous reports have demonstrated that 40% cases do not develop any COVID-19 symptoms. The rest of the 60% cases develop mild symptoms that require no hospitalization. The prevalence of COVID-19 cases that require hospitalization is 15%. Ventilation and Intensive Care Unit (ICU) is required for 5% cases with critical condition like respiratory insufficiency [4]. Many research studies are being conducted to estimate the prevalence of Post-COVID-19 syndrome. However, one small study in the United Kingdom based on COVID-19 symptoms reported that patients infected with COVID-19 infection experienced different symptoms for three weeks and few people developed different symptoms for consecutive nine months. Meanwhile, what percentage of people is affected by post-COVID-19 syndrome is still unknown [5].

The most prevalent symptoms considered for Post COVID-19 syndrome are fatigue, shortness of breath, post-traumatic stress syndrome, chest pain, lungs dysfunction, smell dysfunction, insomnia, cough, brain damage, headaches, blood clots, brain fog, multi-system inflammatory syndrome, and blood vessel damage. The COVID-19 long haulers develop chronic fatigue syndrome (CFS) characterized by extreme tiredness. Data suggested that approximately 18 to 75% of COVID-19 survivors reported fatigue in the convalescence period. Fatigue lessens the physical, emotional, and mental energy of an individual [6]. The long-term consequence of COVID-19 is breathlessness. It is common to feel breathless both during the phase of illness and whilst recovery. Feeling breathless could also result in being anxious, panicked, and depressed which takes things from bad to worse. Difficulty in catching the breath eases with time. Not only physical health is at stake but also mental health is on the verge of devastation. The COVID-19 patient with severe respiratory symptoms is treated in the Intensive Care Unit (ICU) with mechanical assistance of ventilators. After the viral treatment, that mostly drains physically also affects the patients mentally, raises mental issues like depression, anxiety, mood changes to the surface that's why survivor is more prone to post-traumatic stress syndrome (PTSD). PTSD symptoms might affect 1 in every 5 patients with a high expected prevalence 1 year after discharge [7].

Lingering chest pain is another common complaint of post-COVID -19 patients. Persistent severe chest pain often is accompanied by nausea, shortness of breath or light-headedness that needs serious medical advice. Loss of sense of smell is associated with Post COVID-19 Syndrome. Olfactory dysfunction affects

about 11-15% patients. A significant percentage of people reports loss of smell sensation after COVID-19 for as long as one year [8].

COVID-19 is a disease that causes drastic effects on the lungs. Pneumonia associated with COVID-19 could cause long-term damage to tiny air sacs called alveoli in the lungs, the main site of respiration. The damage results in tissue damage that could lead to breathing problems. People with COVID-19 observe sleep problems, such as disturbed sleep problems whilst recovering from COVID-19. Sleeplessness even after recovering from the novel coronavirus is affecting mental health of the world's population. Post-COVID-19 syndrome patients are unable to sleep enough which is a hurdle in their way to mental well-being. So, it is evident that post-COVID-19 syndrome has not only impacted people physically but also mentally [9]. Post-COVID-19 syndrome has also been shown to be associated with persistent dry cough that might also be experienced for a few weeks. Some people experience a cough with mucus, which gradually disappears and the time period varies from person to person.

Apart from these symptoms, some more serious symptoms have been reported in patients with very critical COVID-19 infection. The brain, control center of the human body, is also damaging by the post-COVID-19 syndrome. It causes stroke and seizures even in young patients. It increases the risk of several degenerative diseases of the brain e.g.: Parkinson's disease, Alzheimer's disease, etc. It could also result in Guillain Barre Syndrome, a condition that causes temporary paralysis. In a nutshell, the patient is vulnerable to different types of brain infection due to deregulation of the autonomic nervous system [10]. Headache is a nagging pain that COVID-19 survivors are suffering from. This debilitating pain continues to affect those individuals who were sick with COVID-19 months ago. Even though they no longer have the virus in their body but still they continue to have headaches as a predominant and lingering symptom. Major cases have been reported where COVID-19 patients have complained about the critical problem of brain fog even after weeks and months as their concentration is diverted and not sharp. The patient feels sluggish and fuzzy. It impairs thinking and memory. Losing thoughts and memory lapses affect the psychological health of a person [11]. Improper treatment of COVID-19 could cause blood clotting. The chances of heart attack and stroke increase to a high level because of these clots. The organs of the human body affected by the formation of blood clots include the following; lungs, liver, leg, and kidney. Most of the damage to the heart is considered to stem from a tiny

blood clot that blocks small and narrow capillaries in the heart resisting the smooth flow of blood resulting in ischemia of the heart.

The weakening of blood vessels is also considered to be a major symptom of post-COVID-19 syndrome. The weakened blood vessel is more likely to leak. The rupture of blood vessels is a serious complication that contributes to the potentially long-lasting problem related to the kidney and liver. Multisystem Inflammatory syndrome (MIS) is a novel and serious syndrome that occur specifically in those individuals who were previously infected with the COVID-19 infection affecting their vital organs. Signs and symptoms depend on which organ and tissue of the body are affected. The syndrome includes pyrexia, raised heartbeat, nausea, skin rash, pain, tiredness, headache, dizziness, red eyes, redness and swelling of the tongue, lips, hand, and foot, etc. [12].

In the COVID-19 infection, the following mechanisms are involved: immune system dysregulation, maladaptation of the angiotensin-converting enzyme 2 (ACE2), macro thrombosis, hypercoagulability, micro vascular injury, and endothelial damage. The potential mechanisms involved in the pathophysiology of post-COVID-19 syndrome include: (1) expected sequelae of post-critical illness, (2) inflammatory damage as a result of immunologic aberrations, and (3) virus-specific pathophysiologic changes, resulting in the worsening of psychiatric, cognitive, and physical abnormalities. Many healthcare providers have reported the pathophysiology of post-COVID-19 syndrome to be multifactorial that might lead to metabolic alterations, immobility, and micro vascular injury during critical illness. Moreover, it has also been reported that people infected with COVID-19 are more susceptible to bacterial and fungal infections [13]. A powerful mechanism of microbial destruction is neutrophils extracellular traps (NETs) in which myeloperoxidase (MPO) and neutrophil elastase (NE) containing neutrophils die, resulting to an increased hallmark of many autoimmune processes. If the fatal and severe evolution of COVID-19 is the result of necrosis, patients with COVID-19 must be ready to experience the surge of post-COVID-19 syndrome [14].

According to a survey of non-hospitalized adults with RT-PCR positive COVID-19, one third out of 274 adults reported that they were unable to return to their normal health after two to three weeks of testing with COVID-19 [1]. Another survey of discharged patients reported that patients reported difficulty concentrating, sleep disorders, memory loss, and dyspnea after the COVID-19 infection. The viral

infection affects majority of the systems in the human body primarily the respiratory system along with causing a drastic impact on the circulatory, gastro-intestinal, and nervous system. The most common reported symptoms by a mass majority of population are body-ache, night sweats, persistent, fever and dry cough. The physical fitness of individuals on the onset of viral infection varies as 65-70% of them felt perfectly well prior to contracting the virus but after the onset of the symptoms, their physical activity got limited [5].

Pulmonary lesions could lead to severe lung diseases in patients suffering with COVID-19 infection. But these lesions heal with time, but in other cases, lesions could cause increased growth of cells, leading to lung fibrosis and limited oxygen supply. Shortage of breath could be seen during post-COVID-19 syndrome treatment whereas patients who had not seek medical help or been hospitalized are not prone to serious breathing issues. Breathing activity improves with time and in case of breathing issues, medical experts recommend daily exercises. The viral infection also impacts the circulatory system and causes cardiac issues like pericardium infection, myocardial infarction, cardiac arrest and even palpitation is common in patients suffering with this virus. These cardiovascular diseases mostly occur in patients with a cardiac history but the recent data has reported that 20% COVID-19 patients have experienced cardiac issues after the viral treatment [15].

The researchers have not yet made any big progress related to post-COVID-19 syndrome as the recovery rate of every patient is different and varies according to their physical health. In the US, about 65-70% patients have recovered and gone back to their normal well-being after 14-21 days of contracting the virus. The rest have severe intensity of symptoms for prolonged days. COVID-19 patients suffering with severe fatigue and tiredness are not yet recommended any exercises as there is still an ongoing debate. But if there are exercises being performed, should immediately be stopped if the patient is experiencing fever and breathing issues after the exercises. Persistent cough lasts for about 8 weeks but in case of severe infection leading to breathe limitation; breathing exercises are proved to be beneficial for these patients. Body-ache, fatigue and tiredness could easily be treated with good rest, 8- hour sleep and quality diet.

Patients with history of diabetes if contract the virus, should closely be monitored, remain hydrated and should be given proper medications. Early diagnosis

of COVID-19 could be very favorable for the patient as it will lessen the intensity of symptoms.

CONCLUSION:

This review explains all the reported information about post-COVID-19 syndrome, its pathophysiology, and severe to moderate symptoms. The best way to prevent this syndrome is to protect oneself from the COVID-19 infection by adopting preventive measures and practicing social distancing as prevention is better than cure. Recovery is slow, the convalescence period is prolonged and to make it worse, its symptoms could have a huge downstream effect on the quality of life of an individual impacting their personal, social and professional life. Studies and researches related to Post COVID-19 Syndrome are underway worldwide to elucidate its clinical manifestation and pathogenesis.

REFERENCES:

1. Kabi A, Mohanty A, Mohanty AP, Kumar S. Post COVID-19 Syndrome: A Literature Review. *J Adv Med Med Res*, 2020;32:289–95. <https://doi.org/10.9734/jammr/2020/v32i2430781>
2. Perrin R, Riste L, Hann M, Walther A, Mukherjee A, Heald A. Into the looking glass: Post-viral syndrome post COVID-19. *Med Hypotheses*, 2020;144:110055. <https://doi.org/10.1016/j.mehy.2020.110055>
3. Greenhalgh T, Knight M, A'Court C, Buxton M, Husain L. Management of post-acute covid-19 in primary care. *BMJ*, 2020;370:m3026. <https://doi.org/10.1136/bmj.m3026>
4. Carfi A, Bernabei R, Landi F. Persistent symptoms in patients after acute COVID-19. *J Am Med Assoc*, 2020;324:603–5. <https://doi.org/10.1001/jama.2020.12603>
5. Davido B, Seang S, Tubiana R, de Truchis P. Post-COVID-19 chronic symptoms: a post infectious entity? *Clin Microbiol Infect*, 2020;26:1448–9. <https://doi.org/10.1016/j.cmi.2020.07.028>
6. Scordo KA, Richmond MM, Munro N. Post COVID-19 Syndrome: Theoretical Basis, Identification, and Management. *Adv Crit Care*, 2021;32:188–94. <https://doi.org/10.4037/AACNACC2021492>
7. Nuzzo D, Cambula G, Bacile I, Rizzo M, Galia M, Mangiapane P, et al. Long-Term Brain Disorders in Post Covid-19 Neurological Syndrome (PCNS) Patient. *Brain Sci*, 2021;11. <https://doi.org/10.3390/brainsci11040454>
8. Goërtz YMJ, Van Herck M, Delbressine JM, Vaes AW, Meys R, Machado FVC, et al. Persistent symptoms 3 months after a SARS-

- CoV-2 infection: the post-COVID-19 syndrome?
ERJ Open Res, 2020;6:542–2020.
<https://doi.org/10.1183/23120541.00542-2020>
9. Wijeratne T, Crewther S. Post-COVID 19 Neurological Syndrome (PCNS); a novel syndrome with challenges for the global neurology community. *J Neurol Sci*, 2020;419. <https://doi.org/10.1016/j.jns.2020.117179>
 10. Nalbandian A, Sehgal K, Gupta A, Madhavan M V, McGroder C, Stevens JS, et al. Post-acute COVID-19 syndrome. *Nat Med*, 2021;27:601–15. <https://doi.org/10.1038/s41591-021-01283-z>
 11. Najjar S, Najjar A, Chong DJ, Pramanik BK, Kirsch C, Kuzniecky RI, et al. Central nervous system complications associated with SARS-CoV-2 infection: integrative concepts of pathophysiology and case reports. *J Neuroinflammation*, 2020;17. <https://doi.org/10.1186/s12974-020-01896-0>
 12. Afrin LB, Weinstock LB, Molderings GJ. Covid-19 hyperinflammation and post-Covid-19 illness may be rooted in mast cell activation syndrome. *Int J Infect Dis*, 2020;100:327–32. <https://doi.org/https://doi.org/10.1016/j.ijid.2020.09.016>
 13. Inoue S, Hatakeyama J, Kondo Y, Hifumi T, Sakuramoto H, Kawasaki T, et al. Post-intensive care syndrome: its pathophysiology, prevention, and future directions. *Acute Med Surg*, 2019;6:233–46. <https://doi.org/10.1002/ams2.415>
 14. Papayannopoulos V. Neutrophil extracellular traps in immunity and disease. *Nat Rev Immunol*, 2018;18:134–47. <https://doi.org/10.1038/nri.2017.105>
 15. Hull JH, Lloyd JK, Cooper BG. Lung function testing in the COVID-19 endemic. *Lancet Respir Med*, 2020;8:666–7. [https://doi.org/10.1016/S2213-2600\(20\)30246-0](https://doi.org/10.1016/S2213-2600(20)30246-0)