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Long COVID Syndrome and its Impacts

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Abstract- Introduction: When addressing the COVID-19 pandemic, one must also address its remnants, as well as the Long COVID-19 Syndrome, or just Long COVID-19, which addresses a group of symptoms common to COVID, but which persist even after the infectious picture has ended. The main symptoms are fatigue, dyspnea, joint and muscle pain, headaches, and brain fog. Other symptoms, such as arrhythmias, anxiety, and sleep disorders, have been described, but the cause of these sequelae and the reason for them are not known for certain.

Methodology: This is a literature review based on the SciELO and PubMed data platforms. The search period was July 2023, meeting the inclusion criteria of articles from 2000 to 2023, in Portuguese and English, online, and in full text. The following health descriptors (DeCS) were used as strategies to better evaluate the texts: "Long COVID syndrome", "COVID" and "Post COVID syndrome".

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Long COVID Syndrome and its Impacts

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Methodology: This is a literature review based on the SciELO and PubMed data platforms. The search period was July 2023, meeting the inclusion criteria of articles from 2000 to 2023, in Portuguese and English, online, and in full text. The following health descriptors (DeCS) were used as strategies to better evaluate the texts: "Long COVID syndrome", "COVID" and "Post COVID syndrome".

Results: COVID-19 is a disease caused by a novel coronavirus that can trigger severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). The first case of the disease was reported in China in December 2019 but spread worldwide in 2020. The number of cases exceeds half a billion people, which means that a large number of people have persistent health consequences after recovering from COVID-19 and can persist for a long time with symptoms, and these conditions have been conglomerated into the Long COVID Syndrome (LCS). [1] After much analysis of the cases of the pandemic, it was possible to conclude that there are conditions that can infer a greater possibility of the development of the long COVID-19 syndrome, which would be clinical relapse of the disease in already vaccinated non-immunodeficient patients, the presence of a latent autoimmune response during COVID-19 infection, the explicit ability of the virus to overcome innate and adaptive immunity, the presence of the virus in fluids after 2 months of infection, and long-term persistence of the virus in the body of immunodeficient patients.

Final Comments: In view of the above, it is possible to conclude that the remnants left by the COVID-19 pandemic have repercussions that have not yet been studied and discussed. There are several factors that are not discussed together, addressing all the important factors for the case, especially patients with long-term COVID syndrome.

I. INTRODUCTION

When addressing the COVID-19 pandemic, one must also address its remnants, as well as the Long COVID-19 Syndrome, or just Long COVID-19, which addresses a group of symptoms common to COVID but which persist even after the infectious picture has ended. The main symptoms are

fatigue, dyspnea, joint and muscle pain, headaches, and brain fog. Other symptoms, such as arrhythmias, anxiety, and sleep disorders, have been described, but the cause of these sequelae and the reason for them are not known for certain

According to Schneider - 2021, there are some points, such as the persistent or abnormal immune response, due to some factor of the virus, not yet identified or reported, that causes this chronic response of the body.

In addition, the impacts on patients with chronic diseases or autoimmune diseases must be understood since, as they are in a continuous and exaggerated response, COVID-19 ends up creating various impacts and new symptoms.

II. METHODOLOGY

This is a literature review whose sources were taken from the SciELO and PubMed data platforms. The search period was July 2023, meeting the inclusion criteria of articles from 2000 to 2023 in Portuguese and English, online, and in full text. The following health descriptors (DeCS) were used as strategies to better evaluate the texts: "Long COVID Syndrome", "COVID" and "Post COVID Syndrome".

III. RESULTS AND DISCUSSION

COVID-19 is a disease caused by a new coronavirus that can trigger severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). The first case of the disease was reported in China in December 2019, but it spread worldwide in 2020. The number of cases exceeds half a billion people, which means that a large number of people have persistent health consequences after recovering from COVID-19 and can persist for a long time with symptoms, and these conditions have been conglomerated into the Long COVID Syndrome (LCS). [1] This means that a large number of people have persistent health consequences after recovering from COVID-19 and can persist for a long time with symptoms, and these conditions have been conglomerated into the Long COVID Syndrome (LCS).

To understand LCS, it is necessary to elucidate the pathogenicity of the causative agent of COVID-19, SARS-Cov-2, and its characteristics in terms of the four stages of viral infection. To this end, these four stages

are: invasion; primary blocking of antiviral innate immunity; involvement of the virus's protective mechanisms and the factors of adaptive immunity; and acute and long-term complications of COVID-19. The first stage (invasion) takes place through the recognition of the spike (S) protein of the SARS-CoV-2 target cell receptors, i.e., the main receptor (angiotensin-converting enzyme 2, ACE2), its co-receptors, and potential alternative receptors. The number of different receptors allows the virus to infect cells from many different tissues. In the second stage, most of the polyfunctional proteins that SARS-Cov-2 produces are involved in the primary blocking of innate immunity against the virus. A high degree of redundancy and systemic action that characterizes these pathogenic factors allows SARS-CoV-2 to overcome antiviral mechanisms in the early stages of invasion. The third stage is mainly based on the protection of the virus against adaptive immunity factors, overcoming the barrier function at the focus of inflammation, and the spread of SARS-CoV-2 throughout the body. The fourth stage is associated with the deployment of acute and long-term complications of COVID-19, which is related to the ability of SARS-CoV-2 to induce autoimmune and autoinflammatory pathways of tissue invasion and the development of mechanisms that cause disorder in the index immune system, causing a condition of systemic inflammation [1].

The main route of transmission for SARS is via respiratory droplets, but contact with an infected surface can also be a route. The incubation period for COVID-19 is between 3 and 14 days, depending on the individual's immune status. The typical symptoms of COVID-19 are a sore throat, fatigue, fever, loss of taste associated or not with loss of smell, shortness of breath, gastrointestinal symptoms, a dry cough, and general malaise [1, 4].

The development of COVID will depend on a series of factors that can be environmental, comorbidities, and the patient's immune system, and this will determine whether COVID can stop at stages 1 or 2 and move towards total cure or worsen to more advanced stages and effectively affect several systems and develop complications and the persistence of symptoms that would be the Long COVID Syndrome. The "long COVID" phenomenon affects around 10% of patients with SARS-CoV 2 and is mainly associated with long-term disorders of the central nervous system, persistent alterations in the immune system (including long-term lymphopenia), and complications in other organs. It has not yet been fully elucidated, but there are several indications that it is based on processes of self-promotion of inflammation, in addition to the long-term viral presence and vascular comorbidities due to the relationship with angiotensin II. [2,4]

After much analysis of the cases of the pandemic, it was possible to conclude that there are

conditions that can infer a greater possibility of the development of the long COVID-19 syndrome, which would be clinical relapse of the disease in already vaccinated non-immunodeficient patients, the presence of a latent autoimmune response during COVID-19 infection, the explicit ability of the virus to innate and adaptive presence of the virus in fluids after 2 months of infection, and infectionistence of the body of immunodeficient patients. [3,4,5].

Long-term COVID is present at all ages and severities that have already been documented, with the highest incidence between the ages of 36 and 50. There are several conditions related to this syndrome that can last for years or even a lifetime and can make the individual disabled in many ways. There are several causes, and they can even be combined with each other. Some ideas about how it happens are that it's caused by a problem with the immune system, changes in the microbiota in the gut, autoimmunity and molecular mimicry, thrombotic events, endothelial dysfunction, and poor brain stem signaling [5, 7].

The main impacts on the body and symptoms of COVID-19 are chest pain and palpitations due to cardiac impairment and myocardial inflammation, cough and dyspnea due to abnormal gas exchange, abdominal pain due to intestinal dysbiosis and viral persistence, cognitive impairment, fatigue, unregulated sleep, and memory loss due to dysautonomia, neuroinflammation, and reduced cerebral blood flow, as well as kidney, spleen, and liver damage, diabetes, autoimmunity, DVT, stroke, pulmonary embolism, erectile dysfunction, and irregular menstrual cycles. [3,6]

Diagnosis through tests has not yet been established, but the use of magnetic resonance imaging to identify abnormalities in the organs as well as specific markers for the conditions, an electrocardiogram, and ultrasound, among other tests, As for treatments, there aren't any specific ones for Long COVID Syndrome. However, there are treatments for the conditions listed that work well often, such as antihistamines, blood thinners, epheresis, corticosteroids, and immunoglobulins. There are also non-drug treatments, like exercise (though this isn't generally suggested) and a certain diet that stimulates the brain. [5,6]

Currently, managing long-term COVID-19 is challenging due to a series of intrinsic and extrinsic factors, such as the lack of knowledge and access to information about this syndrome and the conditions related to it, as well as the neglect of this condition, the lack of research on the subject, and the consequent foundation of a formal treatment for the condition, in addition to prejudice towards affected individuals who suffer daily from judgments and often from uninformed health professionals who treat them as irrelevant cases. [2,5]

IV. FINAL CONSIDERATIONS

Considering the above, it is possible to conclude that the remnants left by the COVID-19 pandemic have repercussions that have not yet been studied and discussed. There are several factors that are not discussed together, addressing all the important factors for the case, even more patients with Long COVID Syndrome.

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