

Beyond the Pandemic: The Interplay and Biological Effects of COVID-19 on Cancer Patients -A Mini Review

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ABSTRACT: This article delves into the relationship between COVID-19 and cancer. The challenges and effects of the COVID-19 pandemic on cancer patients are highlighted, along with an explanation of the most crucial strategies that must be adhered to avoid this virus. Explaining the importance of healthcare systems in providing services to patients and assisting them to improve their health condition. This article concentrates on recent studies and clinical observations as it allows for an accurate and comprehensive understanding of the effects of this pandemic on cancer patients. The main issues will be focused on the impact of viral infections on cancerous tumours while clarifying the long-term consequences on patients' lives. The main goal of this article is to inform healthcare workers, physicians, and researchers about the impact and seriousness of COVID-19 on cancer patients.

Keywords: Healthcare systems, COVID-19 pandemic, Cancer, Viral infections, Health crises.

1. INTRODUCTION

More than three years have passed since the spread of the SARS-COV-2 (COVID-19) pandemic in our lives, with the number of deaths from this disease reaching approximately 7 million people as of October 18, 2023. This disease appears in older adults and people who have respiratory problems [1][2]. Over the past years, many projects have been conducted on people who were infected with COVID-19 while suffering from other diseases such as diabetes, heart disease, cancer, severe pneumonia, and others [3-5]. These projects included methods and practices to study the impact of COVID-19 on people with other diseases and show the bilateral relationship that may result in the development of the disease within the patient's body. Studying the interplay between COVID-19 and cancer in the human body is a significant and unprecedented challenge, as healthcare workers must comprehensively examine the interplay between them [6-8]. In the first period of the pandemic, cancer patients find themselves at significant risk and routine oncology care increases. The relationship between viral infections and cancer has been a critical topic for researchers and specialists in the last two years. The severity of COVID-19 infection is being analysed in people with pre-existing malignant tumours while showing the patient's behaviour during periods of illness [9][10]. Highlighting this interaction is important to healthcare workers, as caring for oncology patients is a source of significant concern for physicians and researchers. The emergence of the pandemic in the first period led to a delay in diagnosing cancer and providing patients with appropriate treatment and care, as the collateral damage to patients with malignant tumours increased significantly, leading to premature loss of life. Health institutions sought to set strategies through a healthy environment that provides diagnostic services and treatment facilities, pays attention to the psychological and social aspects of patients, and reduces anxiety and stress due to the presence of this pandemic.

COVID-19 enters the lung epithelial cells in the human body using Angiotensin-Converting Enzyme 2 (ACE2) as an entry receptor, after which the viral RNA enters the cell nucleus and undergoes multiplication and spread in the lung, causing deficiency in the human respiratory system [11-13]. Figure 1 shows the structure of COVID-19. Cancer patients suffer from significant respiratory weakness and weakness in confronting this virus, which leads to rapid loss

of life. Screening is vital to determine the compatibility between COVID-19 and cancer as interaction behaviours are studied and evolving healthcare needs are identified and addressed. Health institutions seek to contribute to analysing research and clinical observations and providing human resources while adapting healthcare systems. These contributions lead to understanding the interaction between COVID-19 and cancer (see Figure 2), which is critical for making informed decisions [14-16]. Understanding this interaction makes it more effortless for physicians to make an accurate and correct diagnosis and develop strategies to mitigate the impact of this virus and improve the condition of cancer patients. The interaction and conjunction between COVID-19 and cancer represents a major challenge in healthcare, as it requires detailed examination to monitor epidemiological concerns about the deterioration of the health condition of cancer patients. Current studies indicate a possible correlation between viral infections resulting from COVID-19 and the growth of cancer outcomes in the human body in a significant way [17][18]. This interconnection affects the poor response of malignant tumour patients to any proposed treatment. Healthcare workers seek to fill knowledge gaps and provide solutions that contribute to alleviating the severity of COVID-19 on patients and assist in providing them with appropriate medical care. These solutions aim to control oncological disorders caused by COVID-19, whereby routine cancer diagnosis is performed, appropriate treatment is given to them, and integrated healthcare solutions are provided. Moreover, this contribution reduces the psychological and social impacts that may affect patients' health and develops practices to mitigate long-term consequences and enhance resilience in cancer care. These procedures contribute to analysing the ability of cancer patients infected with COVID-19 to respond to the treatments proposed by physicians and specialists and their impact on patients. The development of healthcare systems plays a significant role in controlling the spread of infectious and chronic diseases through the use of modern technology and artificial intelligence techniques [19-22]. These techniques provide solutions and insights in analysing the behaviour of the spread of the COVID-19 pandemic, studying disease patterns, and analysing all patient data [23].

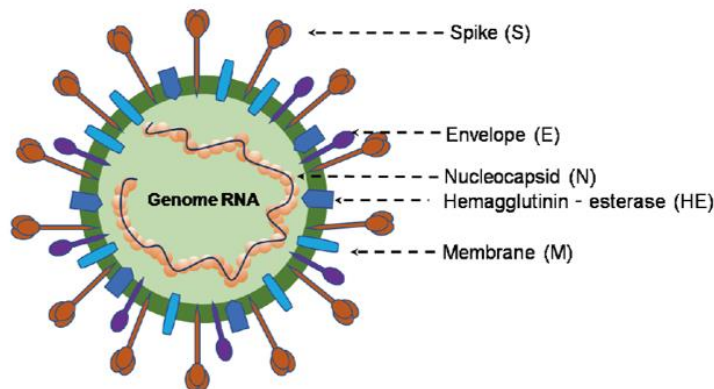


FIGURE 1. - COVID-19 structure [24].

The main contribution of this article is a short review that provides comprehensive knowledge of the interplay between COVID-19 and cancer patients and the impact of viral infection on the growth of malignant tumours in patients. In addition, it provides solutions to enhance patient outcomes, develop healthcare systems, and direct future research in developing appropriate treatments for cancer patients. This article aims to compile current knowledge while proposing ways for researchers and specialists to find the necessary tools to develop treatments and vaccines that reduce the impact of COVID-19 on cancer patients.

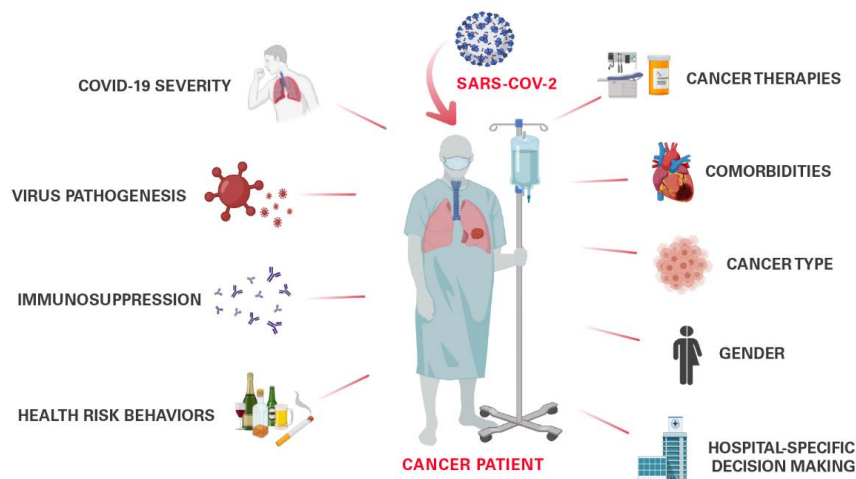


FIGURE 2. - COVID-19 Infection in Cancer Patients [25].

2. COVID-19 ON CANCER PATIENTS

Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) is a new coronavirus responsible for the COVID-19 pandemic that is 70% like SARS-CoV [26][27]. This virus can infect humans with the cell entry receptor (ACE2) [28][29]. This virus is transmitted through contact with respiratory droplets, where viral multiplication occurs in the upper respiratory tract and is further spread in the mucous membrane of the digestive tract through the lower respiratory tract. In the first stage of virus entry, detecting the infection is very difficult because there are no symptoms appearing on the patient. After that, severe symptoms appear, such as weak breathing and diarrhoea, which may lead to kidney failure and damage to the liver and heart [30][31]. ACE2 receptors have a very significant effect on the bronchi, nasal mucosa, lung, heart, and stomach, where the S protein found in COVID-19 binds to them. This connection dramatically affects the body's organs, causing weakness in the affected person's performance. COVID-19 has a major impact on the infected person's health, as it causes serious damage to the body's organs, primarily caused by the virus's ways of mixing with the blood. A cytokine storm occurs as a physiological reaction in humans, where the innate immune system causes an excessive and uncontrolled secretion of cytokines, indicating inflammation in the body. Cytokine storm is a condition that increases the death rate due to the COVID-19 virus [32][33]. Cytokines are usually part of the body's immune response to infection and may lead to death. Existing methods are simple therapeutic methods that assist in reducing mortality and regulating the cytokine storm.

Inflammation is the cause of diseases and is a tissue response against the causes of infection and tissue damage. As a person grows older, the effect of these infections on the body becomes greater, becomes more challenging to overcome, and increases the possibility of developing cancer. Therefore, immune disorders occur from tumours and lung diseases, as they appear in older adults or patients with chronic pneumonia, which leads to causing an increase in cytokines, which increases the infection with COVID-19. Moreover, Immune checkpoint inhibitors (ICIs) increase the risk of death from COVID-19[34][35], as pneumonia caused by this virus has clinically similar patterns to autoimmune pneumonia and may lead to the risk of death because they increase the cytokine storm. People with a history of cancer are more susceptible to contracting COVID-19 than people who do not suffer from any chronic disease or cancer. This is considered a danger indicator that indicates that the immune system of cancer patients does not fully recover, even if they survive it, and therefore, they are susceptible to COVID-19. In general, coronaviruses are considered dangerous epidemics that cause death if the patient does not adhere to the advice of physicians or healthcare workers. Still, other diseases cause high deaths, such as diabetes, heart disease, and cancer. The immune state is significant to confront COVID-19, and the weaker the immunity of patients and those diagnosed with cancers, the faster their death rate increases. Cancer patients infected with the COVID-19 virus require spatial ventilation three times more than ordinary people infected with the same virus. Cancer patients infected with COVID-19 suffer from issues in routine examination as a result of the limited resources of treatment centres and the lack of specialists and healthcare workers. Treatment is carried out according to priority after analysing the patient's data and diagnosing the patient's condition. This process is named elective treatment. A patient's visit to hospitals and medical clinics poses a significant danger to him and others, as he may transmit the virus to healthy people and thus help spread this virus faster and more dangerously. Chemotherapy and immunotherapy are among the most popular methods of treating malignant tumours in the body because they have the ability to suppress the patient's immune system and make them susceptible to infection with COVID-19. Also, the COVID-19 virus infects children whose immune systems are weakened by cancer and who are infected with COVID-19. Most children's cancers are aggressive, so it is preferable to begin intensive chemotherapy for them. This treatment differs in children from therapy in adults because it requires the presence of children in hospitals often, and this leads to the risk of contracting COVID-19 and infecting their households [36-39]. Patients with hepatocellular carcinoma (HCC) suffer from major health problems as a result of taking some chemotherapy drugs used in the treatment of COVID-19, as they lead to undesirable outcomes. Surgical operations for infected cancer patients are carried out according to priority during the epidemic period so that they do not risk infection or infect doctors. According to the recommendations of the German Society of Hematology and Medical Oncology (DGHO), SARS-CoV-2 blood transfusions performed during chemotherapy should also not be restricted, as transmission of COVID-19 is estimated to be low. In addition, treatments such as anti-CD20 agents should be continued for patients with chronic lymphocytic leukaemia (CLL) [40]. The rapid spread of COVID-19 has created many challenges and concerns for healthcare workers and patients worldwide. Many infected with this virus gathered in hospitals and medical clinics to undergo tests and diagnosis. Patients with diseases other than COVID-19 coming to the hospital for treatment increase this cluster and, at the same time, increase the risk of contracting COVID-19.

3. CONCLUSIONS

The COVID-19 pandemic is considered a dangerous disease for the world, as it has caused a significant change in the healthcare and economic sectors. The spread of this virus has led to the death of many people in a short time, especially people with chronic diseases and people over the age of 65 years. Health institutions continue to develop various treatment methods, vaccines, and herd immunity. This virus continues rapidly despite its less impact in the last period of 2023. Still, no final immunity method has been found, and no effective treatment contributes to getting rid of it. Some studies have found that cancer patients are more sensitive to COVID-19 and that their prognosis is much

worse than other diseases, as chemotherapy or radiation therapy reduces the effectiveness of the immune system and increases the effect of COVID-19 due to the high level of ACE2 protein, depending on age and type of cancer in the human body. People with cancer have been exposed to COVID-19 through their visits to hospitals or medical clinics for routine examinations. In addition, this virus led to disruptions in healthcare services, as it led to delays in cancer examinations and diagnosis, which led to a deterioration in the health condition of patients. The anxiety and stress associated with the pandemic dramatically affect the health of the person infected with the virus, as well as the mental health of cancer patients, as it leads to social isolation, doubts about continuing life, and changes in treatment plans. Health institutions in some nations have prioritised cancer patients for vaccination against COVID-19 and established mechanisms for consulting physicians remotely through cancer care protocols. Cancer patients should observe the directions of physicians and healthcare workers if they are found to be infected with COVID-19 and follow health measures to prevent this virus.

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CONFLICTS OF INTEREST

The authors declare no conflict of interest

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