

CHAPTER 77

The Impact of Pandemic COVID-19 on Human Immunodeficiency Virus Patients: A Brief Integrative Literature Review

 [10.56238/pacfdnsv1-077](https://doi.org/10.56238/pacfdnsv1-077)

Elisangela Da Cunha Magno

Pharmacy Student, Nilton Lins University (UNL) - AM - Brazil.

Address: Parque das Laranjeiras, Av. Prof. Nilton Lins, 3259 - Flores, Manaus - AM, Brazil.

Email: elisangela.33magno@gmail.com

Aline De Almeida Benchaya

Specialist. Professor at the Nilton Lins University (UNL) - AM - Brazil.

Address: Parque das Laranjeiras, Av. Prof. Nilton Lins, 3259 - Flores, Manaus - AM, Brazil.

Email: aline.benchaya28@gmail.com

Daniel Barros Morais

Pharmacy Student at the Nilton Lins University (UNL) - AM - Brazil.

Address: Parque das Laranjeiras, Av. Prof. Nilton Lins, 3259 - Flores, Manaus - AM, Brazil.

Email: barrosdaniel009@gmail.com

José Teobaldo da Costa Neto

Medical Student at Nilton Lins University (UNL)

Institution: Nilton Lins University (UNL)

Address: Rua Marquês do Maranhão, 721, Flores

Email: teobaldoneto216@gmail.com

Rebecca Pillar Lira da Cunha

Pharmacy Student, Nilton Lins University (UNL) - AM - Brazil.

Address: Parque das Laranjeiras, Av. Prof. Nilton Lins, 3259 - Flores, Manaus - AM, Brazil.

Email: rebecca.lira@hotmail.com

ABSTRACT

Objective: To describe the impact of the pandemic of COVID-19 on patients living with human immunodeficiency virus. **Methods:** This is a descriptive and exploratory research; the search for data was conducted through the Virtual Health Library (VHL), SCIELO (Scientific Electronic Library Online), and CAPES Periodicals. For the selection of articles, it was taken into consideration the application of inclusion criteria: publications between 2020 and 2022 and exclusion: publications before the year 2020. **Results:** According to the research carried out it was necessary to do a bibliographic survey on top of the keywords: human immunodeficiency virus, SARS-CoV-2, and CD4, where we saw that many of these articles were related to patients living with HIV/AIDS and that in the isolation period, the same ones for remained without doing some tests such as CD4 and leading, at the same time, the hospitalization of the same ones in the reference units for COVID-19. **Final Considerations:** However, it is not known if the infection by HIV/AIDS associated with low CD4 levels, when not controlled correctly, can lead to a greater risk for SARS-CoV-2, because it is a potent virus.

Keywords: Antigen, CD4; COVID-19; HIV.

1 INTRODUCTION

In December 2019, an unknown SARS-CoV-2 viral infection began in the city of Wuhan, located in China. This Severe Acute Respiratory Syndrome 2, where its main etiological agent is a virus that belongs to the Nidovirales family and the Coronaviridae lineage, having positive ribonucleic acid (RNA) as responsible. The infection caused by this was defined as COVID-19, which has reached more than 27 million people around the world so far, making it a challenging pandemic for the World Health Organization (WHO) and other public bodies of health. health (RODRIGUES; GALLI, 2022; DUARTE¹; QUITANA, 2020).

In Brazil, the scenario was devastating, especially in the face of governments that were oblivious to the situation experienced by all, where social vulnerability made it difficult for people

who experienced the greatest social inequality to have access to health care. Access to health at the moment is not limited to health equipment, but comprises the right established by the organic health law, the Federal Government, State and Municipalities have to guarantee education, food, basic sanitation, housing, among others, and safety. financial support that make it possible to maintain social isolation without government assistance (SILVA; CEIA; TAVARES, 2020; CHIORO et al., 2021).

In September 2020, the country accumulated more than 126,000 deaths from the new Coronavirus , after its contamination and symptoms were confirmed, medical intervention and care carried out immediately had a deadline for satisfactory results, but many of these patients could not go beyond 14 days of treatment. treatment and died. The symptoms were confused with those of a flu or virus, the protocols implemented in the countries took a long time to get off the ground, as it was common to arrive at the health units with fever, cough and fatigue, and diarrhea , dyspnea , hemoptysis, headache and lymphopenia could also occur (TEIXEIRA et al., 2020; SILVA et al., 2021).

After the control measures and protocols signed between the countries and their health regulatory agencies, such as the National Health Surveillance Agency (ANVISA) in partnership with the Ministry of Health and its secretariats in the Brazilian states, it was determined that patients with these symptoms had priority to be tested for COVID-19 and for many of these patients it was too late, as some had age and comorbidities against them even though they left their immune system defenseless (SANTOS, 2021).

Analyzing the relationship between immune response and severe acute respiratory syndrome virus 2 (SARS-CoV-2) infection, the disease that affects immunocompromised people, especially those living with the Human Immunodeficiency Virus (HIV) or the Immunodeficiency Syndrome (AIDS), we know that the HIV virus was discovered in 1983, despite this, the policies implemented still represent an important public health problem in Brazil (ALCOCHETE; CATUMBELA, 2020).

In 2020, there were about 37.7 million people living with HIV, among them 36 million are adults, 1.7 million are children (0 to 14 years old). When talking about gender, 53% of people living with HIV are women and girls, and those living with HIV 84% are aware of their clinical condition. Even so, we have those who did not know that they were living with or that they had HIV, about 6.1 million people. In the current scenario, the COVID-19 pandemic, social isolation had to be carried out, which made it difficult for this population at risk to access health services, thus hampering the diagnosis of new cases and the monitoring of seropositive individuals (UNIDAS, 2022).).

Coronavirus pandemic , a more careful and targeted look at people living with HIV/AIDS should be taken, considering the clinical implications of COVID-19 that may have on the health of this immunologically vulnerable population. In addition, it is necessary to count the cluster of differentiation 4 or cluster of differentiation (CD4) which will measure the amount of lymphocytes present in the body. In Brazil, these tests are free, and the population had access to them, and the expected results can demonstrate

the stability of the infection are those in which CD4 cells are in large numbers (COSTA SOUZA et al., 2020).

Faced with the clinical picture of several of the patients affected by the HIV virus, and with this arrival of a new virus such as SARSCoV-2 highly destructive with apparent symptoms of a common flu. This new virus has thrombolytic action in blood vessels and arteries, which lead to pulmonary and coronary complications. In this context, there was curiosity to know how patients living with HIV are dealing with the COVID-19 pandemic, and whether there have been sudden changes due to a new infection associated with the HIV virus. Since CD4 cells are highly immune cells, where they have the function of fighting the invaders that are active during their mutation by the acquired syndrome and at the same time the bone marrow has to redouble its production of defense cells.

The aim of this study is to describe the impact of the COVID-19 pandemic on patients living with the human immunodeficiency virus.

2 METHODS

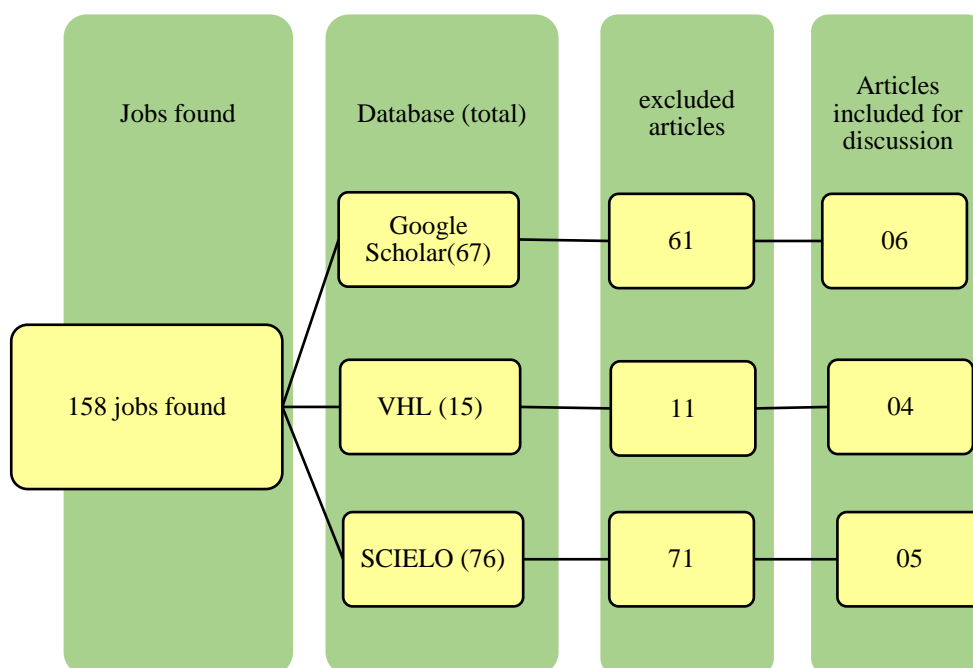
This is a descriptive and exploratory research, in the form of integrative review. Data collection took place in a virtual way, with a search for articles in databases such as: Virtual Health Library (BVS), SCIELO (Scientific Electronic Library Online), CAPES Periodicals (Coordination for the Improvement of Higher Education Personnel) and university websites that contained published scientific works.

For the selection of articles, the application of inclusion criteria was taken into account: publications between 2020 and 2022, full-text articles, publications in Portuguese and English, free of charge and that met the objectives of the integrative review. Exclusion criteria: publications prior to 2020 and unpublished articles.

3 RESULTS & DISCUSSION

The results obtained since the initial search were 158 articles in the following bases: Virtual Health Library (VHL), Google Scholar, *Scientific Electronic Library* (SCIELO), which contained published scientific works. Referring to the years 2020 to 2022, where we apply inclusion and exclusion criteria through careful reading to carry out the selection of publications.

Figure 1 : Flowchart of selection and inclusion of articles in the review.



Source: Prepared by the author, 2022.

In Google Scholar, 67 articles were initially found, after applying the inclusion and exclusion criteria, 06 articles corresponding to the theme were used. In the VHL platform initially 15 articles were obtained, after applying the inclusion and exclusion criteria, only 04 articles corresponding to the theme were used. Initially, 76 articles were found on the SCIELO platform, after applying the inclusion and exclusion criteria, it was found that the articles with titles referring to the topic were repeated on the other platforms, therefore, we obtained 05 articles used.

Therefore, the selected articles totaled 11 articles, which will make up the discussion of the present study. As described in **Table 1**.

Table 1 - Categorization of research according to author/year, title, methodological bases, results and conclusion.

AUTHOR/YEAR	TITLE	BASES METHODOLOGICAL	RESULTS	CONCLUSION
ALVES et al., 2021.	Clinical consequences of COVID-19 in people with HIV/AIDS: an integrative literature review	Integrative Literature Review	The clinical picture presented by the patients coinfectad with COVID-19 and HIV did not show differences when compared to patients without HIV. It was observed that other comorbidities influenced consequences of the clinical course of patients, regardless of the	Some of the data that showed the greatest discrepancy, such as the high mortality rate, younger than usual age, and the presence of severe dyspnea symptoms, can be justified by the high prevalence of comorbidities in the analyzed population. Therefore, it cannot be said that these characteristics presented by patients

			co-infection with HIV. Thus, the results showed discrepancies, not making it possible to evidence the clinical worsening of COVID-19 by the presence of HIV.	are exclusively derived from HIV infection.
BARBOSA, 2022.	DEVELOPMENTS OF THE IMMUNOLOGICAL RESPONSE TO HIV VIRUS INFECTION: A SYSTEMATIC REVIEW	Descriptive Study	Defense mechanisms against HIV infection begin with the entry of the virus through the epithelial barrier, mediated by chemokine receptors CCR5 and CXCR4 and the cell surface molecule CD4.	Opportunistic infections that occur in HIV/AIDS patients are mainly related to the depletion of CD4+ T lymphocytes caused by the virus.
DAYS, 2022.	Vaccines to combat COVID-19: their differences related to forms of production, immune response and efficacy	Comparative Method	In addition to the form of vaccine production, this study also aims to point out the characteristics of the SARS-CoV-2 virus, such as its viral structure and its mode of replication and dissemination, so that a better understanding of the disease and its etiological agent can be achieved.	The scale of the economic and humanitarian impact caused by the SARS-CoV-2 virus pandemic were the main reasons for creating vaccines in a speed never seen before, when we talk about vaccines; More than 175 research teams around the world were mobilized to study several possibilities of vaccines and technologies involved in their production.
FALAVIGNA et al., 2022.	Brazilian guidelines for the pharmacological treatment of hospitalized patients with COVID-19: Joint guideline of the Brazilian Association of Emergency Medicine, Brazilian Association of Intensive Medicine, Brazilian Medical Association, Brazilian Society of Angiology and Vascular Surgery, Brazilian Society of Infectious Diseases, Brazilian Society of Pulmonology and	Descriptive Study	16 recommendations were generated. These include strong recommendations for the use of corticosteroids in patients on supplemental oxygen, for the use of anticoagulants in prophylaxis doses for thromboembolism, and for not using antibacterials in patients without suspected bacterial infection.	To date, few therapies have proven effective in the treatment of hospitalized patients with COVID-19, with only corticosteroids and prophylaxis for thromboembolism recommended. Several drugs were considered ineffective and should be discarded, in order to offer the best treatment based on evidence-based medicine and to promote the economy of ineffective resources.

	Tisiology and Society			
FERREIRA; SANTOS, 2022.	Building nodes: parallels and lessons between HIV/AIDS and COVID-19 from the analysis of semantic networks on Twitter	Quantitative-qualitative method of semantic network analysis	As a result, we identified the political-partisan polarization of comments about COVID-19 and HIV/AIDS on Twitter, the re-emergence of stigmas associated with specific groups, such as homosexuals and Asians, and the large-scale spread of misinformation about the two diseases, revealing a field of tensions and narrative and media disputes as a ' necropolitics ' tool.	Our theoretical and empirical trajectory allowed us to arrive at some considerations. The posts by Brazilians about HIV/AIDS and COVID-19 in April 2021 indicate that discussing, in this case, public health in the Brazil is also talking about (necro)politics, stigma and excessive circulation of (mis)information on websites and social networks.
GONÇALVES et al., 2021.	Analysis of the release of NETs by neutrophils from people living with HIV, and their effect on the replication of HIV-1 in macrophages	Field research.	High levels of DNA-elastase complexes in plasma were observed, which correlate positively with the concentration of circulating LPS, and that neutrophils from these individuals are able to release NETs in vitro upon activation with IL-8 and TNF- α . This suggests that HIV-1 infection enhances the formation and circulation of NETs and that microbial translocation may contribute to this phenomenon. It was also observed that NETs reduce viral replication in macrophages infected in vitro by HIV-1 and that recombinant myeloperoxidase is able to reproduce this inhibition. Furthermore, a reduction in the integration of the viral cDNA into the host cell genome	These results, therefore, indicate the participation of NETs in the pathophysiology of HIV-1 infection.

			was observed, which explains, at least in part, the inhibition of replication by the NETs .	
KREWER et al., 2022.	Rhodococcus Equi	Descriptive Study.	It has three levels of virulence according to the different antigens expressed on its surface. Virulent strains have a plasmid encoding the surface protein VapA and are mainly isolated from foals with pneumonia and from some human patients. Strains with intermediate virulence express the VapB protein and predominate in swine and humans with AIDS.	In the last decade, important advances have been made in understanding the mechanisms used by R. equi to proliferate in the host. Currently, research has focused on identifying the molecular bases used by R.equi .
RODRIGUES; GALLI, 2022.	Pathophysiological analysis of clinical respiratory manifestations in people infected with the SARS-CoV-2 virus.	Descriptive and Qualitative Integrative Review.	The results found indicate that the pathophysiological changes manifested in SARS-CoV-2 infection have characteristics closely similar to those found in severe acute respiratory syndrome (SARS - CoV) and middle east respiratory syndrome (MERS-CoV), which are triggered by other pathogens of the coronavirus family .	It is concluded that we are dealing with a specific type of pneumonia that has a progressive and fatal involvement, leading to the destruction of pulmonary structures essential for the diffusion of gases (hematosis).
NAPOLEÃO et al., 2021.	COVID-19: Understanding the “Cytokine Storm”	Literature revision.	In some individuals, the exacerbated response of the immune system causes the hyperstimulation of its defense cells, causing hyperinflammation due to the storm of pro-inflammatory cytokines (TNF- α , IL-1- β , IL-6, IL-12 and chemokines). This hyperinflammation	It is concluded that elevations in serum levels of pro-inflammatory cytokines are usually present in severe COVID-19. However, more studies are needed to establish differences between patients with COVID-19 who develop a protective and balanced inflammatory reaction from those who develop an exaggerated inflammatory reaction, with a consequent

			characterizes the pathophysiology of severe COVID-19, which causes pathological changes mainly in the lungs, being a predictor of disease severity due to the strong association with multiple organ failure, which can lead to death.	pathological cytokine storm. Keywords: SARS-CoV-2, COVID-19, cytokines.
WOLDAY; NDUNGU; GÓMEZ-PEREZ; WIT, 2021.	Chronic Immune Activation and CD4+ T Cell Lymphopenia in Healthy African Individuals: Perspectives for SARS-CoV-2 Vaccine Efficacy	Descriptive Review.	It is characterized by increased levels of soluble immune activation markers, such as the cytokines interleukin (IL)-4, IL-10, TNF- α , and cell activation markers, including HLA-DR, CD-38, CCR5, along with with naïve reduction and increase in memory cells in the CD4+ and CD8+ subsets. Furthermore, it is accompanied by low CD4+T cell counts when compared to Europeans. There is also evidence that mononuclear cells from African babies secrete less innate cytokines than South and North Americans and Europeans in vitro.	Finally, we strongly recommend that highly prevalent infections such as those discussed in this manuscript be controlled in future vaccine trials, not just for SARS-CoV-2 infection, to assess the true magnitude of the impact of these conditions on vaccine efficacy, to guide the design of vaccines adapted for Africa, if necessary.
PEAR TREE; GIR; SANTOS, 2021.	People living with HIV and changes in daily routine resulting from the COVID-19 pandemic	Qualitative research.	Different changes were identified in the daily routine of people living with HIV resulting from the COVID-19 pandemic, among them, the use of preventive measures, such as the use of masks and social isolation, in addition to changes in the work and leisure environment, in the family life, individual	Many changes and challenges of a physical, biological and psychosocial nature have been shown to be experienced by the participants in the face of the pandemic world scenario, resulting mainly from social isolation. To this end, coping strategies become fundamental in the daily lives of people living with HIV in order to ensure continuity and uninterrupted treatment, and the prevention of a pandemic, thus

			emotional aspects and treatment.	mitigating the repercussions of COVID-19 on the health of these individuals. who belong to the risk group.
SANTOS et al., 2022.	Relationship between SARS-CoV-2 infection and the occurrence of thromboembolic events	Literature revision.	Although hospitalization and, especially, help in the ICU, by itself, are factors of greater risk for thromboembolism, it is observed that the processes of thrombogenesis are patients tend to be more prevalent in the face of Invasion by SARS-CoV-2, especially the storm storm. cytokines due to the virus, with emphasis on the release of interleukin 6, tumor necrosis factor and chemokines , which provide the capacity for the coagulation cascade of the hypercoagulable state.	However, the risk factors and pathophysiological mechanisms associated with thromboembolism have not yet been fully elucidated, gaps that should be thoroughly researched by future scientists to assist in the understanding of studies such as better diagnostic , therapeutic and prophylactic complications.
SILVA et al., 2021.	COVID-19: Health professionals in in-hospital patient care COVID-19: Health professionals in in-hospital patient care	Reflective descriptive review.	Even so, when we need to carry out these transfers, the help of qualified professionals is necessary to preserve the patient's life, and allows professionals to have greater control of risk situations, in addition to conducting treatments and detecting future unwanted complications.	However, it is expected that such evidence will collaborate to support strategies aimed at training these professionals, both during the training period and during the services that were assigned to them, in order to improve the quality of care provided to the patient in the intra-hospital situation. hospital.
OLIVE TREE; MARQUES, 2020.	The panacea of anticoagulants in COVID-19 infection	Literature review.	However, despite the growing network of research that has been created around COVID-19, it is noted that most of these studies have weak evidence, as what we have so far	Knowledge about the response of this disease to any type of treatment suggested is extremely volatile with daily renewal of concepts, requiring a lot of criteria and parsimony in the conduct, always trying to keep in mind a

			are, in general, guidelines from societies of specialties, expert opinions, in vitro studies, case reports and some case series (with a small sample size).	palpable and solid scientific basis so as not to cause harm to the patient. .
STURZA; TONEL, 2020.	The challenges imposed by the COVID-19 pandemic: from measures to protect the right to health to impacts on mental health	Literature review.	It was found that isolation, the constant fear of illness and the threat of unemployment cause immeasurable damage to the mental health of the population.	The main contribution of this research lies in the possibility of reflecting and asking about the various issues relevant to the unfortunate spread of this new coronavirus, which has been leading a rigorous health and humanitarian crisis, with damage to the right to health, individual and collective freedoms. and people's livelihoods.

Source: Prepared by the author, 2022.

According to Alves et al. (2021), the pandemic brought with it a care network to work directly with infected people during social isolation. It is essential to work on the principle of integrality and interdisciplinarity with the expectation of satisfactory results for this population at risk. It is of paramount importance to have CD4 cell counts below the reference number (< 500 cells/mm³ of blood), that is, immunosuppressed clients, who have some advantages of SARS-CoV-2 infection.

For Barbosa (2022), the COVID-19 pandemic had a large participation of empirical actions and interventions and based on findings, often exclusively derived from in vitro tests, which showed the intense release of pro-inflammatory cytokines, responsible for the worsening of the clinical picture of patients with COVID-19.

Dias (2022), comments that the treatment was often out of control, and the search to treat with effective drugs was usually dubious, even so, the treatment is arduous and needs to follow the treatment protocols. The medical procedure of clinical decision, which is usually guided by a rational approach, based on evidence, becoming clearly emotional.

Falavigna et al. (2022), describes that the pharmacological treatment of hospitalized patients with COVID-19 and the HIV virus is highly complex because we are treating different pathologies that have in common attacking the CD4 of these immunosuppressed patients. The target population has indications for hospitalization in cases of diagnosis or suspicion of COVID-19. We know that the demand during the crisis was intense and led to the death of these patients who lived with the HIV virus.

Ferreira & Santos (2022); KREWER et al. (2022), reports that COVID-19 can have a cure through biosecurity measures, including all the necessary guidelines to combat the opportunistic

pathologies of HIV/AIDS. This can also lead to another situation that is not visible, which is depression, due to the few acceptable cultural and social advances to overcome social exclusion and the historical stigma of the disease.

Gonçalves et al. (2021), comments that the appreciation of the release of neutrophils from people living with HIV/AIDS, exists between, one or another, variation with symptoms and characteristics that do not fit among the diagnoses of pneumonia directly, however, it is a characterized form. diagnosis that is usually infected by *Mycoplasma Pneumoniae*, from which place, according to the symptoms, it presents pain in the lung base, reported by the client as back pain, and absence of secretion.

Rodrigues & Galli (2022) report that the respiratory system is the main organ affected, according to studies published in scientific databases, which identified the relationship of some pathologies such as influenza associated with clinical manifestations and in different body systems. human associated with SARS-CoV-2, such as: cardiovascular, digestive and central nervous system.

Napoleon et al. (2021), says that the invasion of pathogens, known as: viruses, bacteria and fungi, is fought by two major defenses of the immune system: an initial defense, conducted by innate immunity; and a later one, mediated by acquired immunity. However, this initial innate defense can prevent the entry of invaders into the body, using physical barriers such as: skin and mucous membranes of the respiratory and gastrointestinal tract and antimicrobial peptides, secreted by epithelial cells and by some leukocytes.

COVID-19 patients living with the HIV virus also have lymphopenia. Low baseline CD4 cell counts of generally African individuals will increase the acuity risk of COVID-19. Immune triggering in Africans is associated with environmental factors such as parasitic infections, other infections and vaccines. It is unclear whether the immunogenicity and efficacy of anti-SARS-CoV-2 vaccines will also be reduced by similar cell defense mechanisms (WOLDAY; NDUNGU; GÓMEZ-PÉREZ; WIT, 2021).

According to Pereira, Gir & Santos (2021), the control measures together with social distancing were the biggest move in history to mitigate the damage caused by the COVID-19 pandemic. However, Santos et al. (2022), comments that HIV needs regular monitoring and biannual monitoring of CD4 rates and viral load, seeking the necessary medications to continue treatment, in addition to dealing with opportunistic HIV diseases.

According to Silva et al. (2021), hospitalizations during the pandemic period brought with them the imminent fear of death, and even with all the correct care and treatments to maintain the survival of these clients living with HIV, it was not possible to keep everyone alive, as the disease is overwhelming, and brought with it terror in the country's intra-hospital units.

Sobreira & Marques (2020), corroborate Sturza & Tonel (2020), when they say that social isolation was necessary for the prevention and control of infection by the COVID-19 virus; still, they

wonder if “it was good for whom” many people believe that the quarantine constitutes an unwarranted decrease in personal freedom, while on the other hand the uncertainties of the labor market, where many have lost their jobs and their housing. The economic and financial impact in general was considered a major contributor to the increase in psychological disorders, evidencing the negative effects on the mental health of these individuals, even post-quarantine.

4 FINAL CONSIDERATIONS

Serum positive patients who have been contaminated by COVID-19 will suffer not only from physiological damage, but also from their emotional structure that has been totally shaken, such as seclusion, lack of care and loneliness. This scenario of a new infection challenged our seropositive patient to be more aware of their own health. However, these individuals had their lives interrupted due to numerous cases of SARSCoV-2, where their families did not have the right to watch over that body.

COVID-19, without a shadow of a doubt, has brought insecurity and uncertainty for tomorrow, it has certainly been causing devastation in the world and we have to deal with the situations imposed by our rulers, where it suffocates, social inequalities and the overlap of the economy and of profit on human life. However, it is not known whether HIV/AIDS infection associated with low CD4 levels when not properly controlled can lead to a greater risk for SARSCoV-2, as it is a potent virus, for this reason, it is necessary to have all hygiene care and have the habit of wearing masks even if released by the health authorities of our country.

REFERENCES

ALCOCHETE, Antonio; CATUMBELA, Emanuel. SARS-COV-2 and Risk Environments: Evidence Synthesis, 2020.

ALVES, Mayara Mayer et al. Clinical consequences of COVID-19 in people with HIV/AIDS: an integrative literature review. **Journal of Public Health of Paraná** , v. 4, no. 1, p. 108-118, 2021.

BARBOSA, Karen Eduarda. DEVELOPMENTS IN THE IMMUNOLOGICAL RESPONSE TO HIV VIRUS INFECTION: A SYSTEMATIC REVIEW. **Multidisciplinary Journal in Health**, v. 2, no. 2, p. 08-08, 2021.

CHIORO, Arthur et al. Covid-19 in a Metropolitan Region: social vulnerability and public policies in contexts of inequalities. **Health in debate** , v. 44, p. 219-231, 2021.

COSTA SOUZA, Hildegard et al. CD4+ T lymphocyte count and viral load in HIV+ patients from a reference laboratory. **Brazilian Military Journal of Science** , v. 6, no. 15, 2020.

DIAS TAVEIRA, Victor. Vaccines to combat COVID-19: their differences related to forms of production, immune response and efficacy. 2022

DUARTE¹, Geraldo; QUINTANA, Dra . Silvana Maria. Coronavirus SARS-CoV-2 infection in obstetrics. Facing the unknown. 2020

Statistics - UNAIDS Brazil, 2022. Available at: <https://unids.org.br/estatisticas/#:~:text=Em%202020%2C%20havia%2037%2C7,HIV%20s%C3%A3o%20mulheres%20e%20girls> . Accessed on: 07/09/2022

FALAVIGNA, Maicon et al. Brazilian guidelines for the pharmacological treatment of hospitalized patients with COVID-19: Joint guideline of the Brazilian Association of Emergency Medicine, Brazilian Association of Intensive Medicine, Brazilian Medical Association, Brazilian Society of Angiology and Vascular Surgery, Brazilian Society of Infectious Diseases, Brazilian Society of Pulmonology and Tisiology and Brazilian Society of Rheumatology. **Brazilian Journal of Intensive Therapy** , v. 34, p. 1-12, 2022 .

FERREIRA, Raquel Marques Carriço ; DOS SANTOS CORDEIRO, Gabriel. Building nodes: parallels and lessons between HIV/AIDS and covid-19 from the analysis of semantic networks on Twitter. **Electronic Journal of Communication, Information and Innovation in Health** , v. 16, no. 1, 2022.

GONÇALVES, Barbara Simonson et al. Analysis of the release of NETs by neutrophils from people living with HIV, and their effect on the replication of HIV-1 in macrophages. 2021. Doctoral Thesis.

KREWER, CC et al. Rhodococcus equi . **Archives of the Biological Institute** , v. 75, p. 533-545, 2022.

NAPOLEÃO, Raffaella Neves Mont'Alverne et al. COVID-19: Understanding the “cytokine storm”. **Research, Society and Development** , v. 10, no. 5, p. e43710515150-e43710515150, 2021.

PEREIRA, Tassiana Maria Vieira; GIR, Elucir ; SANTOS, Andressa Silva Torres dos. People living with HIV and changes in daily routine resulting from the COVID-19 pandemic. **Anna Nery School** , v. 25, 2021.

RODRIGUES, Sidney Souza; GALLI, Rachel Andrade. Pathophysiological analysis of clinical respiratory manifestations in people infected with the SARS-CoV-2 virus. **Rev. av. Minas Gerais**, p. 32201-32201, 2022.

SANTOS Mendonça, André et al. Relationship between SARS-CoV-2 infection and the occurrence of thromboembolic events Relation between SARS-CoV-2 infection and the occurrence of thromboembolic events . **Brazilian Journal of Health Review** , v. 5, no. 2, p. 5232-5241, 2022.

SANTOS, Amuzza Aylla Pereira dos. Vulnerabilities and their impacts on human groups in times of covid-19. 2021.

SANTOS, Jackson Paulo de Lima. Covid-19 pandemic in Brazil, risk society and the conduct of the federal government. 2021.

SILVA, Cayo Cesar et al. Covid-19: Aspects of origin, pathophysiology, immunology and treatment - a narrative review. **Electronic Magazine Health Collection** , v. 13, no. 3, p. e6542-e6542, 2021.

SILVA, Cláudio Nunes; CEIA, Filipa; TAVARES, Margaret. Immunity in SARS-CoV-2 infection: What we know. *Internal Medicine*, p. 60-67, 2020.

SILVA, Michelli Domingos et al. Covid-19: Health professionals in in-hospital patient care Covid-19: Health professionals in in-hospital patient care _ *Brazilian Journal of Development* , v. 7, no. 11, p. 107699-107709, 2021.

Sobreira, Marcone Lima; MARQUES, Marcos Areas . The panacea of anticoagulants in COVID-19 infection. **Brazilian Vascular Journal** , v. 19, 2020.

STURZA, Janaina Machado; TONEL, Rodrigo. The challenges imposed by the COVID-19 pandemic: from measures to protect the right to health to impacts on mental health. **Legal Opinion Magazine (Fortaleza)** , v. 18, no. 29, p. 1-27, 2020.

TEIXEIRA, Carmen Fontes de Souza et al. The health of health professionals in the face of the Covid-19 pandemic. **Science & public health** , v. 25, p. 3465-3474, 2020.

WOLDAY D, NDUNGU FM, GÓMEZ-PÉREZ GP, by WIT TFR. Chronic Immune Activation and CD4+ T Cell Lymphopenia in Healthy African Individuals: Perspectives for SARS-CoV-2 Vaccine Efficacy. **Front Immunol**, 2021.