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Original article

Long COVID in Brazilian healthcare workers: Case-Control study on physical and mental health outcomes in northeastern Brazil

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Abstract. Long COVID syndrome causes a variety of neurocognitive, respiratory, and cardiac symptoms, which can be persistent and debilitating, which result in significant impacts on quality of life in terms of mental and physical health. In this work, we conducted a case-control study with 53 healthcare workers. The investigation of Long COVID was carried out with the ONS questionnaire and the assessment of quality of life and physical and neuropsychological health with the PROMIS Global 10 questionnaire. Notably, 66.7% of individuals with intense impact on quality of life belonged to the low physical health score group, while 40% belonged to the low mental health group. Out of 53 subjects, 26 were identified with Long Covid, where 7% had a reduction in their mental health score, and the impact on quality of life was intense for 14 and moderate for 11 of them. These results indicate that prolonged Long COVID symptoms have a substantial effect on the quality of life of patients, especially those with low levels of physical and mental health. The study identified significant impacts between intense and moderate on the physical and psychological health of the healthcare professionals studied, highlighting the association with those who had a loss of smell and taste during the acute phase of the infection. (www.actabiomedica.it)

Key words: long covid, healthcare workers, quality of life, mental health, physical health, case-control studies

Introduction

Recovery from acute COVID-19 infection can be complete, without sequelae, however symptoms may persist for more than 4 weeks (2-4). This situation is defined as Long COVID, and it has started to become increasingly frequent since 2021 and it is estimated that approximately 100 million people around the world suffer from this Long COVID situation (5). The limited understanding of this condition makes diagnosis, prognosis, as well as therapeutic interventions in health care services difficult (5). Healthcare workers being in direct contact with infected patients and those with fragile health situations, constitute a public at high risk of acquiring, transmitting the new coronavirus, transmission of the new coronavirus, as well as for the development of post-acute complications, such as Long COVID (6). Studies indicate high infection rates among nursing professionals (40.5%), doctors (24.1%), and other healthcare workers, such as health assistants and administrative staff, with significant prevalence of post-COVID conditions (7). Long COVID syndrome causes a variety of neurocognitive, respiratory and cardiac symptoms, which can be

persistent and debilitating, such as fatigue, respiratory difficulty and cognitive dysfunction, which result in significant impacts on quality of life in terms of mental and physical health (8). More research is needed to establish the causality of the consequences of Long COVID and its impact on daily life (9,10). Neurological, cognitive, and psychological symptoms, such as anxiety and memory impairment, have a profound impact on quality of life, making routine activities, such as driving and cooking, very difficult or impossible (9). Previous studies have revealed that healthcare professionals with Long COVID symptoms face significant emotional and physical barriers, which not only hinder their full recovery but also interfere with their job performance, exacerbating the strain on healthcare systems (10). Despite this, return-to-work policies often fail to account for persistent symptoms, further compounding the challenges faced by these professionals (10). These symptoms often limit daily activities, work, social and domestic life. Therefore, research is urgently needed on the consequences of Long COVID on quality of life (11). The objective of this study was to analyze the impact of Long COVID on the mental and physical health of healthcare workers in a Brazilian northeastern city.

Methodology

Population

The sample of 53 healthcare workers linked to the healthcare service in Vitória de Santo Antão-PE, Brazil. Participants were selected from a database generated by the project "ANTI-SARS-CoV-2 ELISA serological diagnosis (IgA, IgM and IgG) and cytokine profile in healthcare professionals". Participants were identified according to the inclusion and exclusion criteria, considering the results of serological tests carried out between June 2020 and May 2021. The SerumCovid database, which contains information about participants, was described in a publication by our group in Lins et al (2022) (12). Briefly, regarding the profession of the sample participants, 25.2% were hospital professionals, 38.1% were on the front line in fighting the pandemic, 23.1 % were working in primary care in the healthcare network, and 13.6% were professionals in the laboratory area. This is a cross-sectional observational study, where the following inclusion criteria were adopted: minimum age of 18 years; acting on the front line of health services against COVID-19; previous serological history; and access to cell phones and chat applications such as WhatsApp. Exclusion criteria included: history of changes in smell and/or taste before COVID-19 diagnosis (due to facial trauma, nasal surgery, chronic rhinosinusitis, Alzheimer's, Parkinson's, or salivary gland problems); and previous or current treatment with chemotherapy or radiotherapy. Participants were individually invited to participate in the research by message or phone call in 2021. After receiving information about the objective and methodology of the study and expressing interest in participating, the Free and Informed Consent Form was sent in PDF format for analysis and virtual consent through an audio declaration containing the full name and expression of interest in participating in the research. After approval, the individual was included in the study and allocated to a group based on examination results and symptomatic history. Participants responded to these questionnaires through unrecorded telephone interviews, with their responses recorded on the questionnaire form. We highlight that the interviews took place between June and November 2021. The study was approved by the Research Ethics Committee of the Vitória Academic Center of the Federal University of Pernambuco (CEP/CAV/UFPE), under number 4.744,490.

Long COVID investigation

The investigation of Long COVID and persistent symptoms in the post-COVID period was carried out with the help of the ONS questionnaire (13), which is composed of 2 objective questions. Of the 53 participants, 31 responded to this questionnaire, as they were classified as Long COVID cases.

The first asked the interviewee whether the symptoms of COVID-19 lasted more than 4 weeks, with the option: a) Yes or b) No. If the interviewee marked yes, they would inform whether the Long COVID situation reduced his ability to carry out daily activities compared to the time before having COVID-19,

classifying it as: a) Yes, a lot, b) Yes, a little, c) No way. In the second question, the interviewee informed which symptoms persisted/persist in the post-COVID period. They must answer yes or no for each of the symptoms, namely: fever, tiredness, diarrhea, loss of taste, loss of smell, shortness of breath, vertigo, difficulty sleeping, headache, nausea/vomiting, loss of appetite, sore throat, chest pain, anxiety, memory loss or confusion, muscle pain, abdominal pain, cough, palpitations, low mood and difficulty concentrating.

Quality of life assessment

The assessment of quality of life and physical and neuropsychological health in the post-COVID period was carried out using the PROMIS Global 10 questionnaire (14), which contains 10 questions. In this evaluation, with the aim of identifying the interference of Long COVID in the physical and mental health levels of health professionals, of the 31 cases identified as Long COVID, only 29 responded to this questionnaire since two did not test positive for COVID -19. In the first five questions, the interviewee was asked to classify their answer as 1-Poor, 2-Regular, 3-Good, 4-Very good, or 5-Excellent. The questions were: 1) In general, would you say your health is; 2) In general, would you say your quality of life is; 3) In general, how would you classify your physical health?; 4) In general, how would you rate your mental health, including your mood and reasoning ability?; 5) In general, how would you rate your satisfaction with social activities and relationships? In question 6 – To what extent can you perform daily physical activities such as walking, climbing stairs, carrying grocery shopping, or moving a chair –, the interviewee classified their response as: 1-Not at all, 2-A little, 3-Moderately, 4-To a great extent, 5-Completely. The seventh question asked how the interviewee classified their pain, as one response in a sale from 0-No pain to 10-The worst pain imaginable. The eighth question asked how they would classify their fatigue, and they must mark 1-None, 2-Mild, 3-Moderate, 4-Intense, or 5-Very intense. In the ninth question, the interviewee classified how they can perform their frequent activities and social functions as 1-Poor, 2-Regular, 3-Good, 4-Very good, or 5- Excellent. Finally, in the last question, the interviewee reported how often he feels bothered by emotional problems, such as feeling anxious, depressed, or irritated, classifying their answer as 1-Never, 2-Rarely, 3-Sometimes, 4-Often, or 5-Always. PROMIS responses were used to calculate a physical health (PH) and mental health (MH) score on a scale from 4 to 20, with higher scores indicating better health. The PH and SM scores were also used to generate a T-score using the Health Measures Scoring Service.

Data analysis

Data were described using absolute and relative frequencies. We used Pearson's $\chi 2$ test and Fisher's exact test to compare qualitative data. The level of statistical significance adopted was $\alpha = 0.05$. Statistical analyzes were performed using the Statistical Package for the Social Sciences (SPSS) version 20.0.

Results

In total, 53 healthcare professionals participated in this study, 47 females and 6 males. Of the participants, 9 (16.98%) tested negative for COVID-19, while 44 (83.02%) tested positive. Of those who tested positive, 17 had risk factors or comorbidities, and for the 9 participants in the SARS-CoV-2 IgA and IgG negative groups, only 4 (44.5%) had any risk factors or comorbidities (Table 1).

Of the participants who tested positive for SARS-CoV-2 (44), 31 reported symptoms lasting more than 4 weeks, classifying them as Long COVID patients. In Figure 1, it is observed that the most frequently mentioned lasting symptoms were: loss of smell (48%, n = 16), loss of taste (48%, n = 16), weakness/tiredness (35%, n = 11), bad mood (25%, n = 8), memory loss or confusion (25%, n = 8), difficulty concentrating (19%, n = 6) and headache (16%, n = 5).

Using the chi-square statistical test, it was possible to infer that there is no dependent relationship between Long COVID and the presence of comorbidities ($p > 0.05$). Additionally, it was observed that there is no significant association between having Long COVID and presenting symptoms in general ($p > 0.05$) (Table 2). However, it is important to

Table 1. Description of the study population

Sex, n (%)				
Sex	**IgA and/or IgG positive for SARS-Cov-2 (n = 44)**		**IgA and IgG negative for SARS-Cov-2 (n=9)**	
Feminine	38 (86.3%)		9 (100%)	
Masculine	6 (13.7%)		0 (0,0%)	
Risk factors/comorbidities, n (%)				
Has risk factors/ comorbidities	**IgA and/or IgG positive for SARS-Cov-2 (n = 44)**		**IgA and IgG negative for SARS-Cov-2 (n = 9)**	
Yes	17 (38,64%)		4 (44.5%)	
No	27 (61,36%)		5 (55.5%)	
Risk factors/ comorbidities	**IgA and/or IgG positive for SARS-Cov-2 (n = 17)**		**IgA and IgG negative for SARS-Cov-2 (n = 4)**	
Smoke	Yes	1 (5,88%)	Yes	0 (0.0%)
	No	16 (94,12%)	No	4 (100%)
Sinusitis/ allergy	Yes	8 (47,06%)	Yes	1 (25%)
	No	9 (52,94%)	No	3 (75%)
Chronic respiratory disease/asthma	Yes	2 (11,76%)	Yes	0 (0.0%)
	No	15 (88,24%)	No	4 (100%)
Heart disease	Yes	3 (29,41%)	Yes	2 (50%)
	No	12 (70,59%)	No	2 (50%)
Other	Yes	8 (47,06%)	Yes	2 (50%)
	No	9 (52,94%)	No	2 (50%)

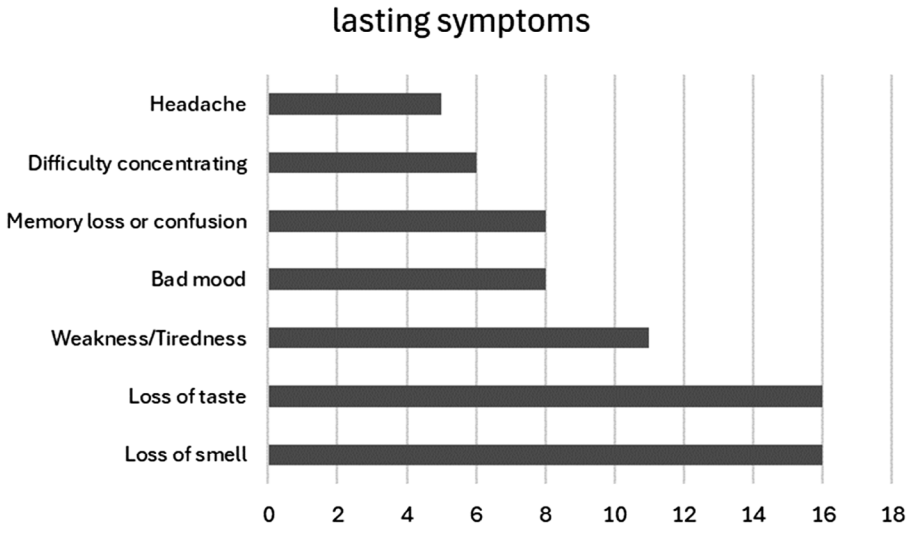

Figure 1. Symptoms that persisted for more than 4 weeks.

highlight that, among persistent symptoms, the chi-square test revealed a significant dependence relationship between Long COVID and loss of smell as well as loss of taste, with $p < 0.05$ (Table 2).

Of the 53 participants in this study, 31 reported having Long COVID, but two did not test positive for COVID-19, being excluded from subsequent analyses, as presented in Table 3, to ensure the accuracy of the results. This resulted in 29 (51.79%) individuals testing positive and experiencing symptoms for more than four weeks. Among these, 26 reported a significant impact on their health, where 12 (46.2%) had high levels of physical health, while 14 (53.8%) had low levels. On the other hand, the majority (73.1%) had a high mental health score, with only 7 (26.9%) reporting reduced mental health scores (Table 3). Although not statistically significant, these data reveal a notable prevalence of low physical and mental health scores among those with prolonged symptoms.

The impact of Long COVID on quality of life was assessed as intense for 15 and moderate for 11. Notably, 66.7% of individuals with intense impact on quality of life belonged to the low physical health score group, while 40% belonged to the low mental health group. These results indicate that prolonged Long COVID symptoms have a substantial impact on the quality of life of patients, especially those with low levels of physical and mental health. Analysis of specific symptoms in patients with Long COVID revealed important associations with reduced physical and mental health scores. Of the 16 individuals with long-lasting smell loss, 43.8% were in the low physical health group, while 31.2% were in the low mental health group. Regarding loss of taste, 50% were in the low physical health group and 25% in the low mental health group. Of the 10 individuals with persistent weakness,

Table 2. Long COVID correlated with comorbidity, symptoms, and loss of smell and/or taste

	Long COVID (at least one symptom > 4 weeks) (n=31)	**p-value**
Comorbidity, n (%)	13 (41,9)	0,779[1]
Symptoms, n (%)	31 (100%)	0,066[2]
Loss of smell and/or taste, n (%)	27 (87,1%)	0,005[1]*

Note: [1]: Chi square test; [2]: Fisher exact test; *P < 0.05

Table 3. Levels of physical and mental health concerning Long COVID

Variables	**Coorte total**	**High PH**	**Low PH**	**High MH**	**Low MH**
Positive Long COVID	29	16 (51,6%)	15 (48,4%)	21 (67,7%)	10 (32,2%)
Long COVID impacted daily activities	26	12 (46,2%)	14 (53,8%)	19 (73,1%)	7 (26,9%)
Level of impact of Long COVID on daily activities					
Moderate	11	7 (63,6%)	4 (36,4%)	10 (9,9%)	1 (3%)
Intense	15	5 (33,3%)	10 (66,7%)	9 (60%)	6 (40%)
Persistent Symptoms					
Loss of smell	16	9 (56,2%)	7 (43,8%)	11(68,8%)	5 (31,2%)
Loss of taste	16	8 (50%)	8 (50%)	12 (75%)	4 (25%)
Weakness	10	4 (40%)	6 (60%)	5 (50%)	5 (50%)
Loss of memory	7	3 (42,9%)	4 (57,1%)	3 (42,9%)	4 (57,1%)
Presence of comorbidities					
Comorbidity	13	7 (53,8%)	6 (46,2%)	10 (76,9%)	3 (23,1%)

Fisher's exact test, *Abbreviations:* PH = Physical Health; MH = Mental health

60% belonged to the low physical health group and 50% to the low mental health group. Among the 7 individuals with memory loss, 57.1% were in the low physical health group, with similar numbers in the low mental health group (Table 3). Of the 26 individuals, 13 had some comorbidity. Among these, 7 (53.8%) were in the high physical health score group and 6 (46.2%) in the low physical health score group; 10 (76.9%) were in the high mental health group and 3 (23.1%) in the low mental health group (Table 3).

Discussion

An increasing number of patients infected with SARS-CoV-2 experience persistent symptoms, known as Long COVID, even after mild acute infections. These patients suffer from a variety of long-lasting and debilitating symptoms, including neurocognitive, respiratory, and cardiac symptoms. Studies to date have identified a wide range of manifestations, including fatigue, headache, dyspnea and anosmia (5). Affected people describe these symptoms as disabling and complex, often preventing them from working and participating in social activities (9). According to our findings, the most frequently cited lasting symptoms were loss of smell, loss of taste, weakness/tiredness, bad mood, memory loss or confusion, difficulty concentrating, and headache, in which a dependent relationship was evidenced between loss of smell and taste with Long COVID (Table 1). In agreement, Wanga (2021) analyzed and compared individuals from the United States who tested positive for SARS-CoV-2 and reported the persistence of fatigue (48.4%), changes in smell or taste (46.4%), cough (36, 2%), and headache (31.1%) (15). According to the same study, one of the most common and persistent symptoms was changes in smell and taste. SARS-CoV-2 is subject to constant mutations, which can result in the emergence of variants with new characteristics and symptomatological conditions. At the end of 2020 and the beginning of 2021, the predominant variant in Brazil was Gamma, which was closely related to symptoms of loss of smell and taste (16,17), a scenario in which this study was developed. In our sample, 26 individuals reported that Long COVID significantly impacted their daily life; of these, 15 classified the impact as "intense". These finding reinforces results by TAK's (2023) (18) showing that PROMIS scale scores for physical and mental health a fall below the midpoint of the proposed scale in individuals with Long COVID.", indicating that these debilitating symptoms affect multiple areas of life. These impacts include long-term complications, reduction in physical health, exercise capacity and quality of life. Here it was highlighted that individuals with weakness and memory loss as lasting symptoms mostly fall into the low physical and mental health group (Table 2). The occurrence of dysautonomia and mental confusion suggests that Long COVID has a significant neurological contribution. Fatigue, one of the most common post-COVID symptoms, may be associated with neurological and neuromuscular dysfunction. Studies indicate that post-COVID fatigue is related to physical and cognitive activities, both dependent on neural circuits (4). According to Nittas et al., (2022) (9), neurological, cognitive, and psychological symptoms, such as anxiety or memory impairment, strongly impact daily life and quality of life. The results suggest that Long COVID, particularly symptoms like loss of smell, taste, weakness, and memory loss, significantly affect patients' physical and mental health. This highlights the need for multidisciplinary follow-up and targeted interventions. Unexpected findings, such as the lack of a significant relationship between comorbidities and Long COVID, may be due to sample size. Further studies with larger samples and variant control are needed to clarify these associations.

This study has as limitation the number of samples that were analyzed and the bias of the subjects analyzed as being healthcare professionals, which may lead to conclusions to this specific group to the detriment of the general population. However, the findings provide valuable insights into the prevalence and severity of long-lasting symptoms in individuals with Long COVID, highlighting the urgent need for interventions and treatment strategies to improve the quality of life for these patients.

Conclusion

The study points out that, among the Long COVID cases in the sample, significant impacts between intense and moderate were identified on the physical and mental health of the healthcare professionals studied. It evidenced the association with those who had a loss of smell and taste during the acute phase of the infection. Also, surprisingly, there was no association between Long COVID and the comorbidities described.

Ethic Approval: Research Ethics Committee of the Vitória Academic Center of the Federal University of Pernambuco (CEP/CAV/UFPE), in 2021, under number 4.744,490.

Conflict of Interest: Each author declares that he or she has no commercial associations (e.g. consultancies, stock ownership, equity interest, patent/licensing arrangement etc.) that might pose a conflict of interest in connection with the submitted article.

Authors Contribution: DAMB writing, analysis, application of questionnaires; EHC application of questionnaires; MRSS writing, research; CSM statistical analysis; IDL statistical analysis and review; AVA guidance; ALVG guidance, fixes, analysis.

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References

1. Tong JY, Wong A, Zhu D, Fastenberg JH, Tham T. The prevalence of olfactory and gustatory dysfunction in COVID-19 patients: a systematic review and meta-analysis. Otolaryngol Head Neck Surg. 2020;163(1):3-11. doi: 10.1016/j.anl.2021.07.007
2. Centers for Disease Control and Prevention. Long COVID or post-COVID conditions. Atlanta: CDC; 2020. Available from: https://www.cdc.gov/coronavirus/2019-ncov/long-term-effects.html. Accessed: Mar 19, 2021.
3. Sudre CH, Murray B, Varsavsky T, et al. Attributes and predictors of long COVID. Nat Med. 2021;27(4):626-631. doi: 10.1101/2020.10.19.20214494
4. Astin R, Banerjee A, Baker MR, et al. Long COVID: mechanisms, risk factors and recovery. Exp Physiol. 2022;108(1):12-27. doi: 10.1113/EP090802
5. Perumal R, Shunmugam L, Naidoo K, et al. Long COVID: a review and proposed visualization of the complexity of long COVID. Front Immunol. 2023;14:1-18. doi: 10.3389/fimmu.2023.1117464
6. Lim SH, Lim YC, Zaki RA, et al. Prevalence and predictors of post-acute COVID syndrome among infected healthcare workers at University Malaya Medical Centre. PLoS One. 2024;19(4):e0298376.
7. Malesevic S, Sievi NA, Baumgartner P, et al. Impaired health-related quality of life in long-COVID syndrome after mild to moderate COVID-19. Sci Rep. 2023;13:7717. doi: 10.1038/s41598-023-34678-8
8. Nittas V, Gao M, West EA, Ballouz T, Menges D, Hanson SW, et al. Long COVID through a public health lens: an umbrella review. Public Health Rev. 2022;43:1-10. doi: 10.3389/phrs.2022.1604501
9. Fouad MM, Nermin HZ, Lobna AM. Work performance among healthcare workers with post COVID-19 syndrome and its relation to antibody response. Infection. 2023;51(4):839-849.
10. Vélez-Santamaría R, Fernández-Solana J, Méndez-López F, et al. Functionality, physical activity, fatigue and quality of life in patients with acute COVID-19 and long COVID infection. Sci Rep. 2023;13:47218. doi: 10.1038/s41598-023-47218-1
11. Lins ID, Raupp LS, Maior CBS, et al. SerumCovid database: description and preliminary analysis of serological COVID-19 diagnosis in healthcare workers. PLoS One. 2022;17(3):e0265016. doi: 10.1371/journal.pone.0265016
12. Ayoubkhani D, Gaughan C, Jenkins J. Update on long COVID prevalence estimate. ONS; Feb 2021.
13. Zumpano CE, Mendonça TMS, Silva CHM, Correia H, Arnold B, Pinto RMC. Adaptação transcultural e validação da escala de saúde global do PROMIS para a língua portuguesa. Cad Saude Publica. 2017;33(6):e00107616. doi: 10.1590/0102-311X00107616
14. Wanga V, Chevinsky JR, Dimitrov LV, et al. Long-term symptoms among adults tested for SARS-CoV-2. MMWR Morb Mortal Wkly Rep. 2021;70(36):1235-1241. doi: 10.15585/mmwr.mm7036a1
15. Muschi AL, Borges IC, Faria E, et al. Clinical features of COVID-19 by SARS-CoV-2 Gamma variant: a prospective cohort study of vaccinated and unvaccinated healthcare workers. J Infect. 2022;84(3):248-288. doi: 10.1016/j.jinf.2021.09.005
16. Turabian JL. COVID-19 breakthrough infections in vaccinated people with vaccine booster in 2022 versus

COVID-19 cases in unvaccinated people in 2020: a new disease whose clinic we should know or another cause of the old symptoms of the common cold. J Gen Med Clin Pract. 2022;5(1):1-7. doi: 10.31579/2639-4162/060

17. Tak CR. The health impact of long COVID: a cross-sectional examination of health-related quality of life, disability, and health status among individuals with self-reported post-acute sequelae of SARS-CoV-2 infection at various points of recovery. J Patient Rep Outcomes. 2023;7:57. doi: 10.1186/s41687-023-00572-0

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