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RESEARCH ARTICLE (ORIGINAL)

Prevalence of COVID-19 and post-COVID-19 symptoms among nursing professionals in the primary health care sector

Prevalência de COVID-19 e sintomas pós-infeção entre os profissionais de enfermagem na atenção primária à saúde

Prevalencia de COVID-19 y síntomas posinfección entre los profesionales de enfermería de atención primaria

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Abstract

Background: Nursing professionals are a risk group for COVID-19 because they are in the front line of health care delivery.
Objective: To determine the prevalence of COVID-19 infections and post-COVID-19 symptoms among nursing professionals in the primary health care sector and identify the factors associated.
Methodology: A cross-sectional study was conducted among nursing professionals in the primary health care sector in a region of the Brazilian state of Rio Grande do Sul. Data were collected in 2022 using an online questionnaire.
Results: Among the professionals tested for COVID-19 (83.8%), 43.8% tested positive once, 16.4% were re-infected, and 39.6% experienced post-COVID-19 symptoms, mainly memory loss or difficulty concentrating, followed by body aches and loss of smell and taste, among others. The prevalence of COVID-19 infections and post-COVID-19 symptoms was higher among health professionals taking regular medication for a medically diagnosed chronic condition.
Conclusion: Strategies for monitoring the health of nursing professionals are suggested, as the results will help manage future health crises.

Keywords: nurse practitioners; primary health care; occupational health; COVID-19; prevalence

Resumo

Enquadramento: Os profissionais de enfermagem são grupos de risco para a COVID-19, por estarem na linha de frente na prestação de cuidados à saúde.
Objetivo: Identificar a prevalência de COVID-19 e de sintomas pós-infeção entre os profissionais de enfermagem na atenção primária à saúde e os fatores associados.
Metodologia: Estudo transversal, realizado com profissionais de enfermagem na atenção primária à saúde de uma região do Rio Grande do Sul. A colheita de dados ocorreu em 2022 por meio de formulário eletrónico.
Resultados: Dentre os profissionais testados para COVID-19 (83,8%), 43,8% positivaram numa ocasião e 16,4% tiveram reinfeção; 39,6% manifestaram sintomas pós-infeção, destacando-se perda de memória ou dificuldade de concentração, seguido de dores no corpo, perda de olfato e/ou paladar e outros. A prevalência de COVID-19 e sintomas pós-COVID-19 foi maior entre os profissionais de enfermagem com uso de medicação contínua e diagnóstico médico de patologia crónica.
Conclusão: Sugerem-se estratégias de acompanhamento da saúde dos profissionais de enfermagem. Os resultados contribuem para o enfrentamento de futuras crises sanitárias.

Palavras-chave: profissionais de enfermagem; atenção primária à saúde; saúde ocupacional; COVID-19; prevalência

Resumen

Marco contextual: Los profesionales de enfermería son un grupo de riesgo frente al COVID-19, ya que se encuentran en primera línea de prestación de asistencia sanitaria.
Objetivo: Identificar la prevalencia de COVID-19 y los síntomas posinfección entre los profesionales de enfermería de atención primaria y los factores asociados.
Metodología: Estudio transversal realizado con profesionales de enfermería de atención primaria en una región de Río Grande del Sur. Los datos se recogieron en 2022 mediante un formulario electrónico.
Resultados: Entre los profesionales sometidos a la prueba de COVID-19 (83,8%), el 43,8% dio positivo en una ocasión y el 16,4% tuvo reinfección; el 39,6% manifestó síntomas posinfección, sobre todo pérdida de memoria o dificultad para concentrarse, seguidos de dolores corporales, pérdida de olfato o gusto, y otros. La prevalencia de los síntomas de COVID-19 y pos-COVID-19 fue mayor entre los profesionales de enfermería que utilizaban medicación continua y tenían un diagnóstico médico de patología crónica.
Conclusión: Se sugieren estrategias para vigilar la salud de los profesionales de enfermería. Los resultados contribuyen a hacer frente a futuras crisis sanitarias.

Palabras clave: profesionales de enfermería; atención primaria; salud laboral; COVID-19; prevalencia

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Introduction

Brazil recorded the highest number of COVID-19 deaths among nursing professionals in the world, surpassing the United States of America, Spain, and Italy. In June 2020, 200 Brazilian nursing professionals died from COVID-19. At that time, this number represented 30% of the COVID-19 deaths in nursing professionals worldwide. In other words, according to surveys by the Brazilian Federal Nursing Council (COFEN) and the International Council of Nurses (ICN), three out of 10 nursing professionals who died were Brazilian (COFEN, 2020).

COFEN data also show that, on June 19, 2023, Brazil registered 65,029 nursing professionals infected with COVID-19 and 872 COVID-19 deaths among nursing professionals. In particular, the southern region of Brazil reported 13,471 cases of COVID-19 infections and 109 COVID-19 deaths among nursing professionals (COFEN, 2023).

International literature highlights the relevance of the work of nursing professionals during the COVID-19 pandemic, demonstrating how these health professionals were central and indispensable to care provision (Liu et al., 2020). Their work ranged from the delivery of humanized direct care to patients and their families to management activities, which included epidemiological surveillance, reorganization and adaptation of physical structures, operationalization of health services and human resources, and implementation of safety measures for patients and health teams (COFEN, 2022).

According to the World Health Organization (WHO, 2023), approximately 10 to 20% of people experience medium- and long-term effects after recovering from COVID-19 symptoms. These effects may last for weeks, months, or even years. However, no current studies have been found on the prevalence of COVID-19 among nursing professionals (nurses and nursing technicians and assistants) in the primary health care (PHC) sector as well as its impact on their health in the Brazilian Federal State of Rio Grande do Sul.

With this in mind, our study aimed to determine the prevalence of COVID-19 infections and post-COVID-19 symptoms among PHC nursing professionals and identify the associated factors.

Background

The year 2020 had a significant impact on the history of nursing. The Pan American Health Organization (PAHO) and the WHO designated 2020 as the "International Year of the Nurse and the Midwife" in recognition of the contributions made by these health professionals. The celebration also aimed to raise the profile of these professionals through investments and improvements in their working conditions, education, and professional development (PAHO, 2020). However, in 2020, the world's healthcare systems and health professionals faced the difficult challenge of the COVID-19 pandemic caused by a novel coronavirus (Brazil, 2020).

COVID-19 was first detected in the Chinese province of Wuhan in December 2019. By mid-January 2020, the infection was reported in countries from other continents (WHO, 2020a), and, at the end of February 2020, the first case of COVID-19 was confirmed in Brazil, brought from the European continent. By mid-March, the WHO declared COVID-19 as a pandemic and at the end of March, the Brazilian Ministry of Health decreed the state of community transmission in the Brazilian territory (WHO, 2020a; Brazil, 2020). According to the WHO (2023), global vaccination has reduced the incidence of COVID-19, with more than 13 billion doses administered. However, more than 768 million COVID-19 cases have been reported worldwide and the number of COVID-19 deaths has exceeded 6 million people.

COVID-19 is an infectious disease caused by the SARS-Cov-2 virus, which is transmitted by direct contact with a contaminated person or contaminated objects and surfaces. The disease mainly affects the respiratory system and can cause anything from mild flu-like signs and symptoms to severe acute respiratory syndrome and death, especially in the presence of risk factors, such as age, and chronic respiratory and cardiovascular problems, among other comorbidities that affect immunity. Moreover, COVID-19 is a systemic disease and can affect other systems besides the respiratory system, causing post-acute sequelae (WHO, 2023).

The presence of signs and symptoms that persist or develop after acute COVID-19 infections have been called *long COVID* or *post-COVID-19 condition* (Martín-Garrido & Medrano-Ortega, 2022). Some review studies showed that the most prevalent post-COVID-19 symptoms were fatigue, headaches, attention deficit, hair loss, dyspnea, persistent cough, cognitive impairment, neurological sequelae, loss of smell or taste, muscle pain, and inflammatory diseases (Brasil, 2023; Martín-Garrido & Medrano-Ortega, 2022; Lopes et al, 2023). It is also worth highlighting mental symptoms and disorders such as anxiety, insomnia, and depression (Lopes et al, 2023), especially among nursing professionals who were on the front line fighting COVID-19. A PAHO study on health professionals and COVID-19 showed that almost a quarter of these professionals who were interviewed in 2020 had symptoms associated with depression (PAHO, 2022).

Some Brazilian studies carried out with PHC health and nursing professionals involved in fighting COVID-19 also underscored the presence of mental health issues, such as exhaustion, emotional exhaustion, psychological suffering and exhaustion, burnout syndrome, high exposure to stress, and a higher risk for developing mental disorders, among these professionals (Rezer and Faustino, 2022; Tamborini et al, 2023).

Work is an important determinant of health disease processes. In nursing, the type of work performed contributes significantly to the progressive deterioration of nursing professionals' health over the years. This encourages reflection on the invisibility of the work done by nursing professionals and their lack of recognition in the work environment (Nascimento et al., 2022). Many nursing professionals work with health problems characterized

by high psychological demands, poor social support, and common mental disorders, which hinder care delivery, imply loss of productivity and harm patients' health (Silva-Costa et al, 2020).

Adverse situations such as pandemics, catastrophes, and other unpredictable stressful events require professionals to be technically competent and highly psychologically and emotionally prepared (Marques et al., 2020). In addition to concerns about personal safety, it is necessary to consider health professionals' physical and mental exhaustion, difficulties in decision-making, and anxiety due to the pain of losing patients and colleagues and the possibility of transmitting the disease to their loved ones. It is also worth noting that the complexity associated with care delivery, the management of clinically unstable patients, and frequent contact with death worsen the physical and mental exhaustion of nursing professionals (Miranda et al., 2020).

Research questions

What is the prevalence of COVID-19 infections and post-COVID-19 symptoms among PHC nursing professionals? What sociodemographic, professional, and health factors are associated with the prevalence of COVID-19 infections and post-COVID-19 symptoms among PHC nursing professionals?

Methodology

This descriptive cross-sectional study had a target population of 423 nursing professionals (nurses, nursing technicians, and nursing assistants) from a health region in the Brazilian Federal State of Rio Grande do Sul that was on the front line of care delivery during the COVID-19 pandemic. This health region includes 33 municipalities, 70 PHC establishments registered in the Brazilian National Register of Health Establishments, and approximately 230,814 inhabitants. Nursing professionals who did not work for municipal PHC services, such as those managed by the Brazilian National Foundation for Indigenous Peoples (FUNAI), were excluded.

All 423 nursing professionals were invited to complete an online questionnaire during the four months of our study. A total of 78 nursing professionals responded to the invitation. Of these, two were excluded for refusing to participate, one for not completing the questionnaire, and one for not belonging to the municipalities in the target region. As a result, a total of 74 responses were considered eligible for our study.

In an attempt to expand the sample, the invitation to take part in our study was sent three times to representatives of the 33 municipalities. The managers of the health region were also asked to publicize the study via e-mail and *WhatsApp* to all nursing professionals in their area of administration. An interview was given to the city's television station to publicize the study. However, the face-to-face interview was not recommended by the ethics committee because the study was carried out during the COVID-19 pandemic.

Our study aimed to determine the prevalence of COVID-19 infections in nursing professionals and the prevalence of post-COVID-19 symptoms in nursing professionals, based on the following variables: In-service COVID-19 Test (*No; Yes – periodically*; *Yes - due to exposure*; *Yes - due to symptoms*); Positive Result for COVID-19 (*No*; *Yes – once*; *Yes - on different occasions*); and Post-COVID-19 Symptoms (*Yes - if so*, *which ones [open-ended question]; No*).

The following exposure variables were also considered: Gender (male; female); age in years (continuous); skin color (white; brown; black; yellow; indigenous); marital status (with or without a partner); current profession (nurse; nursing technician; nursing assistant); work area (urban; semi-urban; rural); length of work experience in years (continuous); whether they smoke or have ever smoked (yes; no); whether they have any medically diagnosed illnesses (yes; no), and if so, what type of illness (multiple choice question - cardiovascular, respiratory, musculoskeletal, mental, renal, and/or endocrine disorder); use of medication (yes; no), and if so, whether it was medically prescribed (yes; no). For analytical purposes, the age variable was categorized using a cut-off point of 40 years, with the minimum age being 25 and the maximum 60. The variable length of work experience was also categorized using a cut-off point of 5 years, bearing in mind that this period allows the professional to become acquainted with the service and the population's health.

Data were collected from April to July 2022 using a single, online, structured, pre-coded, and self-administered questionnaire, developed by researchers from the Postgraduate Nursing Program at the Federal University of Pelotas (UFPel) and later adapted by researchers from the *Universidade Regional Integrada do Alto Uruguai e das Missões* - URI Erechim. For this adaptation, a pilot test of the questionnaire was conducted, which revealed the need to adjust and modify some items according to the reality of the region and the pandemic period.

The online questionnaire was sent to PHC nursing professionals via the health region representative. The data collected were entered into an Excel spreadsheet, coded, and then analyzed using the same program. A descriptive analysis of the variables was carried out, including prevalence calculations for ordinal and nominal categorical variables, and mean, median, and standard deviation for continuous and discrete numerical variables. A descriptive analysis and the chi-squared test were used to compare proportions, with $p < 0.05$ considered to be statistically significant. The data were analyzed using the statistical program Stata - version 14.0.

Our study was submitted to the Ethics Committee of the *Universidade Regional Integrada do Alto Uruguai e das Missões* - URI Erechim and approved under opinion no. 4.607.988 and CAAE 44631321.5.1001.5351, in April 2021.

Results

Of the nursing professionals who answered the online questionnaire, 96% were women, 87.8% were white, 51.4% worked as nursing assistants or technicians, 48.6% were nurses, 76.4% worked in PHC services in urban areas, and 85.1% worked for six years or more. The participants had a mean age of 39.5 (*SD* = 8.0).

Considering the participants' health profiles, 86.3% did not smoke or had never smoked, and 36.5% had some medically diagnosed illness. Of these, 40.7% had been diagnosed with a cardiovascular disorder, 37.0% with an endocrine disorder, 29.6% with a mental disorder, 11.1% with a respiratory disorder, 14.8% with a musculoskeletal disorder, 3.7% with a cancer/tumor, 3.7% with a kidney disorder, and 3.7% with an immune system disorder. Forty-two participants (56.8%) were taking medically prescribed medication (see Table 1).

During the pandemic, 60.8% of professionals were tested for COVID-19 only when they had symptoms, 43.8% (n = 32) tested positive only on one occasion, and 16.4% (n = 12) on different occasions (reinfection). As shown in Table 2, the association analysis showed that the prevalence of positive COVID-19 test results was significantly higher among women (p = 0.029) and among professionals who were taking regular medication for some illness (p = 0.023).

Table 1

Sample distribution according to sociodemographic, professional, and health factors

Variables		*n* (%)
Gender		
	Male	3(4.0)
	Female	71(96.0)
	Total	74(100.0)
Age		
	18-39	42(56.8)
	40-60	32(43.2)
	Total	74(100.0)
Skin Color		
	White	65(87.8)
	Brown	9(12.2)
	Total	74(100.0)
Job		
	Nursing Assistant/Technician	38(51.4)
	Nurse	36(48.6)
	Total	74(100.0)
Work Area		
	Urban	55(76.4)
	Semi-urban and rural	17(23.6)
	Total	72(100.0)
	Missing Data	2
Length of Work Experience		
	0-5 years	11(14.9)
	6 years or more	63(85.1)
	Total	74(100.0)
Smokes or Has Smoked		
	Yes	10(13.7)
	No	63(86.3)
	Total	73(100.0)
	Missing Data	1
Medically Diagnosed Morbidities		
	Yes	47(63.5)
	No	27(36.5)

Total	74(100.0)
Regular Medication	
Yes	32(43.2)
No	42(56.8)
Total	74(100.0)
In-service Covid-19 Test	
No	12(16.2)
Yes - periodically	7(9.5)
Yes - due to exposure	10(13.5)
Yes - due to symptoms	45(60.8)
Total	74(100.0)
Positive Result for Covid-19	
No	29(39.7)
Yes - once	32(43.8)
Yes - on different occasions	12(16.4)
Total	73(100.0)
Missing Data	1
Post-Covid-19 Symptoms	
Yes	17(38.6)
No	27(61.4)
Total	44(100.0)

Among the participants, 38.6% (n = 17) reported the presence of post-COVID-19 symptoms, with most participants highlighting memory loss or difficulty concentrating (58.8%), followed by body aches (23.5%), loss of smell and taste (17.7%), fatigue (17.7%), and hair loss (11.8%), among others (see Figure 1). In the analysis of the factors associated with post-COVID-19 symptoms, the prevalence was significantly higher among nursing professionals with medically diagnosed illnesses (p = 0.022; Table 2).

Figure 1

Post-COVID-19 symptoms among Primary Health Care nursing professionals

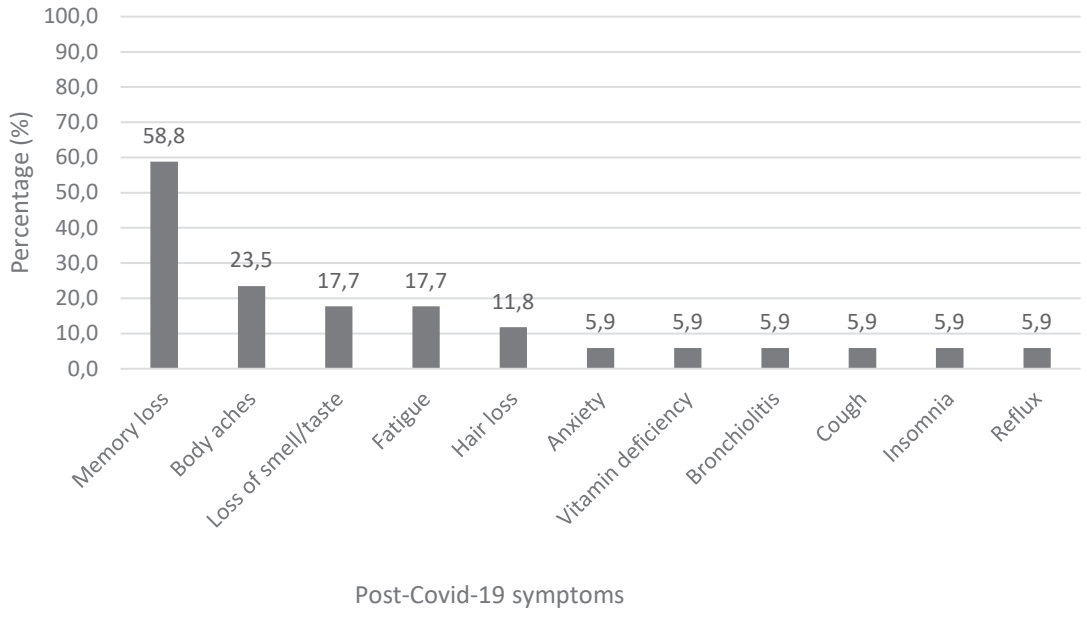

Table 2

Factors associated with the prevalence of COVID-19 infections and post-COVID-19 symptoms among Primary Health Care nursing professionals

	COVID-19 (n.73)		*Post-COVID-19 symptoms (n.44)*	
Variables	X^2	*p*	X^2	*p*
Gender		**0.029**		-----
Male	33.3		0.0	
Female	62.0		38.6	
Age		0.302		0.074
18-39	54.8		26.1	
40-60	67.7		52.4	
Skin Color		0.875		0.947
White	60.9		38.5	
Brown	55.6		40.0	
Job		0.988		0.353
Nursing Assistant/Technician	59.5		45.5	
Nurse	61.1		31.8	
Work Area		0.104		0.430
Urban	65.5		33.3	
Semi-urban and rural	37.5		50.0	
Length of Work Experience		0.436		0.942
0-5 years	72.7		37.5	
6 years or more	58.1		38.9	
Smokes or Has Smoked		0.547		0.844
Yes	70.0		42.9	
No	58.1		38.9	
Medically Diagnosed Morbidities		0.217		**0.022**
Yes	70.4		57.9	
No	54.4		24.0	
Regular Medication		**0.023**		0.109
Yes	71.4		46.7	
No	45.2		21.4	

Note. X^2 = Chi-square test.

Discussion

Nursing professionals are on the front line of care and therefore are more likely to be infected. Several lines of evidence point to high levels of exposure and contamination of healthcare workers by COVID-19 (Teixeira et al., 2020). According to a survey conducted by COFEN and ICN in June 2020, of the nursing professionals who died from COVID-19, most were female, young (with a higher percentage in the 40-60 age range), with some health condition, and who should not have been in contact with suspected cases of COVID-19 (COFEN, 2020).

More than a third of the participants of our study had some form of morbidity, and the vast majority of them had chronic illnesses - or illnesses belonging to the risk group for COVID-19. Many of the nursing professionals reported having disorders of the cardiovascular, endocrine, mental, respiratory, and immune systems. Of these, more than half were taking medically prescribed medication. These findings are consistent with the publications of the Brazilian Ministry of Health regarding the conditions and risk factors to be considered for possible complications of COVID-19 (Brazil, 2023).

The data for our study were collected in mid-2022. In this sense, the different health problems reported by nursing professionals may be a consequence of the COVID-19 pandemic/infection. However, only a retrospective longitudinal study can confirm this cause-effect relationship.

Concerning COVID-19 in-service testing, the results show weaknesses in the health services provided to nursing professionals, either when they were not tested or when they were tested due to the development of symptoms. According to the WHO, most people infected with COVID-19 may be asymptomatic (WHO, 2023). However, transmission to co-workers, loved ones and patients is still possible.

Healthcare workers are a risk group for COVID-19 because they are directly exposed to infected individuals and high viral loads (Teixeira et al., 2020). In addition, they are vulnerable to reinfection due to direct contact with infected individuals, often under critical conditions and inadequate working conditions (Teixeira et al., 2020). Furthermore, reinfection among nursing professionals can be associated with poor adherence to personal safety recommendations. Although there is no literature to support this claim, professionals exposed to occupational stress, physical and mental exhaustion, wear and tear, and psychological distress seem more likely to develop attention deficit disorders (Huang et al., 2020; Tamborini et al., 2023).

Findings show that the naturally acquired active immunity that occurs through infection is absent in COVID-19, or if present, it is only for a very short time. WHO (2020b) states that achieving herd immunity by protecting people through vaccination, rather than exposing them to infection, will make the disease rarer and save more lives. Exposing the population to the COVID-19 virus to achieve "herd immunity" is scientifically problematic and unethical. Furthermore, allowing COVID-19 to spread to any segment of the population, regardless of age or health status, has led to unnecessary infection, suffering, and death (WHO, 2020b).

A recent review by Lopes et al. (2023) highlighted that nearly 60% of nursing professionals reported memory loss or difficulty concentrating as post-COVID-19 symptoms. A recent experimental study also showed that memory dysfunction is a late consequence of brain exposure to the spike protein of the SARS-CoV-2 virus, which is released from cells during infection and reaches the central nervous system (Fontes-Dantas et al, 2023). Other post-COVID symptoms reported by participants included body aches, loss of smell and taste, fatigue, and hair loss, as well as anxiety, vitamin deficiency, bronchiolitis, cough, insomnia, and gastric reflux. In Italy, a study of people recovering from hospitalization for COVID-19 found that 87.4% of patients (regardless of age) still had at least one persistent symptom after COVID-19, the most common being fatigue and dyspnea (Nogueira et al., 2021). A cohort study conducted at Jin-in-Tan Hospital in China found that patients had common sequelae after COVID-19, including fatigue, sleep disturbances, anxiety, depression, and, in more severe cases, impaired lung function and hair loss.

The COVID-19 pandemic affected the organization of healthcare services and the physical and mental health of health professionals, particularly those providing frontline care. Regarding the nature and conditions of the work of nurses, Silva and Araújo (2021) observed weaknesses and vulnerabilities from various sources that generate negative feelings, psychological changes, and physical and mental exhaustion. Dantas (2021) also demonstrated that health professionals experience emotional exhaustion daily due to exposure to stressful factors in their work environment, which are exacerbated during epidemics and pandemics. Mental stress and psychological disorders affect the cardiovascular and endocrine systems, metabolism, social health, memory, cognition, sleep, personal dissatisfaction, and interpersonal relationships, and interfere with work performance (Loures et al., 2002; Silva and Torres, 2020).

Both the prevalence of COVID-19 infections and the prevalence of post-COVID-19 symptoms were higher among professionals who reported the presence of morbidities and the use of regular medications for chronic illnesses. According to Marziale et al (2022), the presence of comorbidities such as systemic arterial hypertension and obesity in frontline health professionals offered a greater risk of COVID-19 infection. According to the Brazilian Health Department of Minas Gerais (2024), the presence of chronic comorbidities causes chronic inflammation, making individuals susceptible to other more serious inflammatory or infectious diseases with complications, such as COVID-19. Considering only the initial period of the COVID-19 pandemic until May 2020, 72% of COVID-19 deaths occurred in people over 60 years of age, 70% of whom had at least one risk factor, most commonly diabetes, obesity, and hypertension (Minas Gerais State Health Department, 2024).

Our study had several limitations. The small sample size reduced the statistical power of the analyses performed, affected the ability to identify other possible and significant associations, and prevented the use of more sophisticated tests and analyses. Because it was self-funded, the investigators were not able to travel to meet with nursing professionals in person. Also, although our study examined whether the diagnosis of morbidities occurred before or during the pandemic, it could not establish a definitive cause-and-effect relationship. Therefore, a longitudinal study is recommended. In addition, although some of the findings of our study have been reported in the literature, they cannot be generalized because our study focused on a specific geographic region.

Conclusion

Of the PHC nursing professionals tested for COVID-19 during the pandemic, approximately half tested positive on a single occasion and a significant percentage tested positive on multiple occasions (reinfection). Nearly one-third of the health professionals experienced post-COVID-19 symptoms, mainly memory loss, followed by body aches, loss of smell and taste, fatigue, and hair loss. The prevalence of COVID-19 infections and post-COVID-19 symptoms was higher among nursing professionals with a medically diagnosed illness and who were taking regular medication.

The results of our study support the understanding of the health needs of healthcare workers and underscore

the importance of strategies that address the health of these workers. The pandemic and its negative impact on physical and mental health still have repercussions today (post-pandemic period). In this sense, it is urgent to implement policies that support health professionals, since their weaknesses have repercussions on the quality of care provided. Therefore, our study proposes strategies aimed at minimizing the sequelae and restoring the health of health care professionals, such as early follow-up in consultation with physical and mental evaluation, cognitive stimulation programs to recover memory loss, specific rehabilitation, and psychological support.
Longitudinal studies are recommended to establish the cause-effect relationship between COVID-19 infections, post-COVID-19 symptoms, and comorbidities. In addition, further studies should be conducted to demonstrate the impact of the pandemic on the mental health of health professionals, as the results will contribute to the improvement of health services and their management, and help to address future health crises.

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