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ORIGINALS

Impact of fatigue on nurses recovered from COVID-19 in a northeastern Brazilian state

Impacto de la fatiga en enfermeros recuperados de COVID-19 en el noreste de Brasil

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ABSTRACT:

Introduction: Post-COVID-19 fatigue is a condition exerting various impacts on people, especially on health professionals.
Objective: To analyze the impact exerted by fatigue on nurses recovered from COVID-19 in a northeastern Brazilian state.
Method: A quantitative-qualitative study conducted in a northeastern Brazilian state by means of an online survey. Data collection took place between May 2021 and August 2024. A bivariate analysis and binary logistic regression were performed for the quantitative data. The qualitative data were presented through thematic categorical content analysis. All ethical precepts were respected, with due approval from a Research Ethics Committee.
Results: A total of 301 nurses were included, with predominance of female, married and brown-skinned subjects. The prevalence of self-reported post-COVID-19 fatigue was 52.3%. The participants working in the Intensive Care Unit and Emergency sectors presented higher chances of reporting fatigue. The qualitative analysis revealed that fatigue exerted an impact on the performance of activities of daily living and on the need for sleep and rest. Difficulties were found for health professionals to recognize post-COVID-19 conditions. Other fatigue-associated symptoms reported included memory and hair fall and difficulty concentrating.
Conclusion: Post-COVID-19 fatigue exerted negative impacts on nurses' personal life and work activities.

Keywords: Post-acute COVID-19 syndrome; Fatigue; Nurses.

RESUMEN:
Introducción: La fatiga post-COVID-19 es una condición que genera diversos impactos en los individuos, especialmente en los profesionales de la salud.
Objetivo: Analizar las repercusiones de la fatiga en enfermeros recuperados de COVID-19 en un estado del nordeste de Brasil.
Método: Estudio cuantitativo-cualitativo realizado mediante una encuesta *online* en un estado del noreste de Brasil. La recolección de datos tuvo lugar entre mayo de 2021 y agosto de 2024. Se utilizó análisis bivariado y regresión logística binaria para los datos cuantitativos. Los datos cualitativos se presentaron mediante análisis de contenido categorial temático. Se respetaron los preceptos éticos, con la aprobación del Comité de Ética de Investigación.
Resultados: Se incluyó a un total de 301 enfermeros, con predominio del sexo femenino, casadas y de raza mestiza. La prevalencia de fatiga autoinformada post-COVID-19 fue del 52,3%. Los participantes que trabajaban en unidades de cuidados intensivos y servicios de urgencias fueron más propensos a reportar fatiga. El análisis cualitativo reveló que la fatiga impactó en la realización de actividades de la vida en la necesidad de sueño y reposo. Los profesionales sanitarios tuvieron dificultades para reconocer las afecciones post-COVID-19. Otros síntomas reportados asociados con la fatiga incluyeron pérdida de memoria, caída del cabello y dificultad para concentrarse.
Conclusión: La fatiga post-COVID-19 tuvo un impacto negativo en la vida personal y las actividades laborales de las enfermeras.

Palabras clave: Síndrome post agudo de COVID-19; Fatiga; Enfermeros.

INTRODUCTION

In 2021 and by means of Delphi consensus, the World Health Organization established the clinical definition of the post-COVID-19 condition as “presence of new, recurrent or persistent symptoms lasting for at least two months and that cannot be explained by any other diagnosis 12 weeks after the onset of a SARS-CoV-2 acute infection”[1]. The Brazilian Ministry of Health officially recognizes this condition through Technical Note No. 57/2023, adopting the term “post-COVID-19 conditions” to characterize this multi-systemic clinical ailment[2].

Persistent fatigue is one of the most common and disabling symptoms of the post-COVID-19 condition and has been widely documented as a central manifestation of the syndrome. A number of systematic reviews and cohort studies indicate that fatigue affects between 30% and 70% of all individuals recovering from acute infections, with higher prevalence among health workers[3,4]. Specifically, fatigue impairs physical, cognitive and psychosocial functionality, with the possibility of lasting for months and interfering in quality of life, professional performance and mental well-being[5].

Post-COVID fatigue presents considerable clinical, occupational and psychosocial implications among health professionals (particularly nurses, who represented the predominant workforce in the front line against the pandemic). A study points out that this symptom is associated with reduced attention, work memory impairment, cognitive slowness and higher risk of clinical errors, thus compromising patient safety[6]. In addition to that, nurses affected by chronic fatigue show increased presenteeism, are more willing to leave their jobs and present higher emotional overload, especially in the absence of adequate institutional support[7].

From the occupational point of view, fatigue impairs workforce planning and overloads already weakened health systems. Diverse recent evidence shows that nurses with persistent symptoms report higher emotional exhaustion levels, sleep disorders and functional performance decline, even after more than one year from their acute COVID-

19 episode[8]. A qualitative research study conducted with health professionals from the United Kingdom and other European countries evidences that returning to work when prolonged symptoms are present is frequently marked by stigma, organizational non-welcoming and failures in readaptation to work[9].

In the psychosocial field, post-COVID-19 fatigue interacts with Burnout and compassion fatigue cases, exerting negative impacts on the professionals' mental health. Persistent physical and emotional exhaustion impairs work-related satisfaction, interpersonal relationships and the perception about professional efficacy[10].

Based on the relevance of the theme and on the scarcity of studies in Brazil addressing fatigue among nurses after COVID-19, the study objective was to analyze the impacts exerted by fatigue on nurses recovered from COVID-19 in a capital city from northeastern Brazil.

MATERIAL AND METHOD

This is a quantitative-qualitative study of the online survey type, which allows for an in-depth exploration of the impacts exerted by fatigue on nurses recovered from COVID-19 by collecting quantitative and qualitative data, thus promoting an encompassing understanding about the theme[11].

The subjects considered to comprise the sample were 14,946 nurses from the state of Paraíba (Brazil), according to data from the Federal Nursing Council (*Conselho Federal de Enfermagem*, COFEN) for 2021. The optimal allocation method was used, considering the number of COVID-19 beds (clinical/adults) as ancillary variable. In order to determine sample size, it was estimated that the online collection procedure would consider approximately 150 interviews. However, for admitting a 95% confidence level, 5.6% desirable error margin and 50% estimated frequency, sample size calculation resulted in 300.12. Therefore, in order to ensure the maximum value after rounding, it was decided to consider collecting information from a sample comprised by 301 participants. In relation to qualitative data collection, the participants were recruited for convenience considering the data saturation technique and totaling 15 nurses.

As for the eligibility criteria, the nurses included were those from the capital city of the aforementioned state with laboratory-confirmed COVID-19 diagnoses (through rapid or PCR-RT tests) and having worked for at least six months in care settings during the pandemic. Retired professionals were excluded from the studies.
The quantitative data were collected between March 2021 and March 2023; in turn, the qualitative ones were gathered between March 2023 and March 2024. In order to operationalize the collection procedure, a team of previously trained collaborators comprised by nurses was resorted to. The qualitative data were collected by means of a structured questionnaire consisting of three sections. In turn, the qualitative data were gathered through semi-structured interviews.

Section 1 addressed the following sociodemographic and professional characteristics:

- Gender (Female/Male);
- Age (Age group);
- Skin color (White/Black/Brown/Asian/Indigenous);
- Marital status (Single/Married/Widowed);

- Training level (Undergraduate studies/Specialization-Residency/MSc/PhD);
- Performance sector (Outpatient/Intensive Care Unit/Ward/Surgical Center/First Aid Unit/Basic Health Unit/Private Medical Office/Others [home-based care, clinics specialized in Hemodialysis and Orthopedics]).

Section 2 contained questions about the clinical characteristics (how many times the participants had their COVID-19 diagnosis confirmed in laboratory tests, comorbidities and whether they had been applied any COVID-19 vaccine dose). Section 3 dealt with the presence of self-reported post-COVID-19 conditions (symptoms persisting twelve weeks after an acute infection) by addressing all organic systems through Yes/No questions.

The semi-structured interviews dealt with questions about fatigue and other post-COVID-19 conditions in the professionals' routine, in their performance of activities of daily living, in their professional demands and in sleep and rest, in addition to recognizing such conditions in health services.

The participants were selected using the *Respondent Driven Sampling* (RDS) method, adapted to the online environment[12]. In this method, each participant is responsible for recruiting other individuals that would meet the research inclusion criteria, by means of the *WhatsApp* social network. It is noted that this social network was only used as a means to announce the research and as a way to recruit participants. After taking part in the quantitative data collection process, the nurses were invited to participate in a second moment, when the semi-structured interviews would be conducted. Those who agreed to take part were subsequently contacted by the team of collaborators to schedule the interviews.

An online structured questionnaire prepared in the REDCap® platform was used to collect quantitative data. The data were entered into a *Microsoft Excel* (version 2015) spreadsheet and analyzed in the *Statistical Package for the Social Sciences* (SPSS) software (version 20.0 for *Windows*). Descriptive and inferential statistics were performed.

In order to investigate the variables associated with presence of self-reported fatigue, a bivariate analysis was implemented using the Chi-square test. The statistically significant ($p<0.05$) variables were introduced into a binary logistic regression model, generating *Odds Ratios* (ORs) and identifying risk or protection factors for the outcome (fatigue)[13].

Qualitative data collection was conducted through semi-structured interviews via the *Zoom* platform and lasted a mean of 15 minutes. The interviews were audio-recorded, subsequently transcribed to a word processor and excluded after being transcribed. The NVivo® software was used for qualitative data analysis, enabling thematic categorical content analysis, which allowed identifying categories and subcategories[11]. In order to ensure anonymity, each participant was coded with the letter “N”, followed by a number representing the order in which each interview was conducted. Consequently, they were identified as N1 to N15.

All ethical procedures were followed as per National Health Council Resolution No. 466/2012. The study was approved by a Research Ethics Committee (*Comitê de Ética em Pesquisa*, CEP) under Opinion No. 5,542,659. The participants were invited to read

the Free and Informed Consent Form (FICF) and had to select the "*Li e concordo em participar desta pesquisa*" ("I have read this information and I agree to take part in this research") option.

RESULTS

The study participants were 301 nurses (100%). Their mean age was 39 years old (SD±8) and most of them belonged to the age group from 31 to 60 years old (82.7%). In all, 87.4% of the participants were female, 48.5% self-declared as brown-skinned, 51.1% were married and 62.0% had some specialization or residency as training level. Most of them worked in ward sectors (36.5%) and 98.7% had been vaccinated against COVID-19. The prevalence of self-reported fatigue twelve weeks after the COVID-19 diagnosis was 52.3%.

As for the post-COVID-19 persistent symptoms, 51.9% of the nurses reported other symptoms such as coughing (49.4%), hair loss (49.4%), anxiety (40.6%), memory loss (40.2%) and anosmia (38.5%).

The bivariate association analysis between the nurses' profile characteristics (independent variables) and presence of fatigue reports (dependent variable) indicated that marital status ($p<0.05$), performance in the Intensive Care Unit sector ($p=0.03$) and in the Emergency Unit ($p=0.03$) were associated with presence of fatigue reports (Table 1).

Table 1. Association between the nurses' profile and presence of fatigue. A capital city from the Northeast region, Brazil, 2021-2023. (n=301).

Variables	Fatigue		*p-value**
	Yes (n=125) n (%)	No (n=114) n (%)	
Age group			0.33
18-30 years old	17 (7.1)	15 (6.3)	
31-60 years old	108 (45.2)	97 (40.6)	
61+ years old	0 (0.0)	2 (0.8)	
Gender			0.50
Female	110 (46.0)	97 (40.6)	
Male	15 (6.3)	17 (7.1)	
Skin color			0.75
White	54 (22.6)	45 (18.8)	
Black	9 (3.8)	12 (5.0)	
Brown	60 (25.1)	56 (23.4)	
Asian	2 (0.8)	1 (0.4)	
Indigenous	0 (0.0)	0 (0.0)	
Marital status			<0.05†
Single	59 (24.7)	53 (22.2)	
Married	66 (27.6)	60 (25.1)	
Widowed	0 (0.0)	1 (0.4)	
Training level			0.18
Undergraduate degree	23 (9.6)	29 (12.1)	
Specialization/Residency program	84 (35.1)	62 (25.9)	
MSc	14 (5.9)	20 (8.4)	
PhD	4 (1.7)	3 (1.3)	

Variables	Fatigue		*p-value**
	Yes (n=125) n (%)	No (n=114) n (%)	
Performance sector			
Outpatient Unit	9 (3.8)	8 (3.3)	0.95
Intensive Care Unit	39 (16.3)	22 (9.2)	0.03†
Ward	44 (18.4)	47 (19.7)	0.33
Surgical Center	17 (7.1)	8 (3.3)	0.09
First Aid Unit	14 (5.9)	18 (7.5)	0.29
Emergency Unit	21 (8.8)	9 (3.8)	0.03†
Basic Health Unit	14 (5.9)	15 (6.3)	0.69
Private Medical Office	3 (1.3)	2 (0.8)	0.72
Other	29 (12.1)	19 (7.9)	0.20
Vaccinated against COVID-19			0.27
Yes	124 (51.9)	111 (46.4)	
No	1 (0.4)	3 (1.3)	

Source: Research data, 2024. *Chi-square test. †Statistically significant association, p<0.05.

In the final logistic regression model, it was verified that married nurses and those working in Intensive Care or Emergency Unit sectors were more prone to fatigue (Table 2).

Table 2. Binary logistic regression analysis for presence and report of post-COVID-19 fatigue among nurses. Northeast region, Brazil, 2021-2023. (n=301).

Variables	*Odds Ratio* (OR)	*95%CI**	*p-value*
Marital status			
Married	1.14	0.59-2.21	<0.00†
Performance sector			
Intensive Care Unit	3.90	1.86-8.18	<0.01†
Emergency Unit	2.80	1.07-7.29	<0.00†

Source: Research data, 2024. *95%CI: 95% Confidence Interval. †Statistically significant association, p<0.05.

The subjects interviewed in the qualitative data collection procedure were 15 nurses that had taken part in the quantitative stage, with a mean age of 35 years old, mostly female (60%), brown-skinned (60%) and married/in consensual union (73.3%).

The following categories and sub-categories emerged after analyzing the interviews in the NVivo® software: Category 1 (C1) - Impacts exerted by fatigue on the routine, with the following sub-categories: 1 (SC1) - Difficulties performing activities of daily living; and 2 (SC2) - Changes in the need for sleep and rest. Category 2 (C2) - Health professionals recognizing the post-COVID-19 condition symptoms. Category 3 (C3) - Impact exerted by other post-COVID-19 conditions. The testimonies are presented in Table 3.

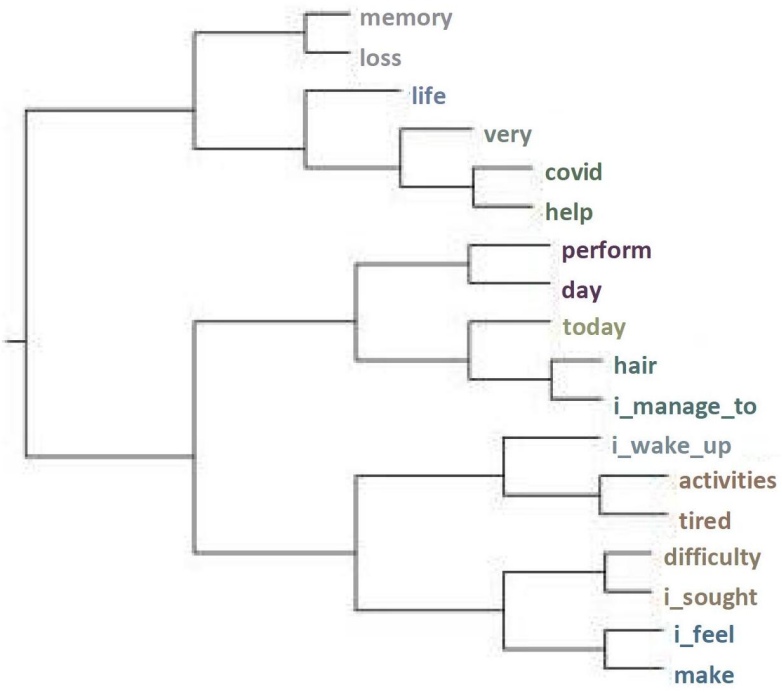
Table 3. Presentation of the categories, sub-categories and the respective testimonies. Northeast region, Brazil, 2024.

Category	Sub-category	Testimonies
C1 - Impacts exerted by fatigue on the routine	SC1 - Difficulties performing activities of daily living	"It's been virtually impossible for me to practice physical activity, as I just can't explain how tired I feel." (N14) "I find it difficult to do activities that used to be part of my routine, such as walking or jogging." (N2) "I've noticed some difficulty performing all my activities of daily living, from going to the university to household chores, which I love doing, but I feel very tired now." (N3) "In relation to sexual practices, I feel unwilling, uneasy and more tired when compared to before COVID." (N1)
	SC2 - Changes in the need for sleep and rest	"My sleep's been impaired since COVID, I sleep more and feel more tired, as if I hadn't slept a bit." (N12) "I need to sleep a whole lot more, I feel very tired, I want to be lying down all the time." (N7) "My sleep quality changed a lot since I had COVID, I have problems waking up and already feel tired the moment I wake up." (N13)
C2 - Health professionals recognizing the post-COVID-19 condition symptoms	-	"I saw a doctor for lab tests to find out if I had something wrong, but everything was OK to my surprise, the doctor himself couldn't understand my whole clinical history of extreme tiredness, as it was quite unexplainable." (N6) "I went to the doctor for some blood tests, I believed it was some vitamin or ferritin deficit, but everything was within normal to my surprise. The only explanation was post-COVID fatigue." (N14)
C3 – Impact exerted by other post-COVID-19 conditions	-	"Extreme hair loss, even with visible blanks. Memory loss, problems concentrating. The number of duties in the post-COVID world increased and I feel affected, as I just can't manage to do everything I set myself to." (N1) "I find it difficult to concentrate when I'm studying. As I've just graduated, I'm going to sit for several tests now for the Residency and open selection now, but lack of concentration has affected the quality of my studies." (N13)

Source: Research data, 2024.

Figure 1 presents the dendogram generated in the qualitative analysis software with the most frequent words mentioned by the participants in the interviews.

Figure 1. Dendogram showing the most frequent terms mentioned in the nurses' testimonies. Northeast region, Brazil, 2024.



Source: Research data, 2024. Figure generated in the NVivo® software.

DISCUSSION

Post-COVID-19 fatigue represents a global Public Health challenge, especially for the front-line professionals that faced intense psychological and physical burdens during the pandemic, including prolonged workdays, work overload, scarcity of guidelines and emotionally exhausting environments[14]. Associated with individual aspects such as insomnia, work-related stress and depressive symptoms, these organizational factors tend to intensify the functional impacts, potentiating fatigue and impairing quality of life[15].

The association between marital status (Married/Consensual union) and presence of fatigue stands out among the results obtained in this study, a hypothesis that can be related to the accumulation of family and professional roles, generating functional overload. However, it is necessary to acknowledge that this overload is not the only factor involved. Other elements such as work-family conflicts, social support, organizational conditions (autonomy at work, hour load management and team support, for example) and emotional resilience can also act as mediators or moderators of this relationship, exerting a direct influence on the professionals' quality of life[16].

In this sense, previous studies show that work-family conflicts are related to worse physical and mental quality of life in nurses, reflecting themselves as more fatigue, emotional exhaustion and lower work-related satisfaction[17]. In addition to that, diverse evidence indicates that support from leaders and professional autonomy can reduce these conflicts, mitigating the negative effects exerted by fatigue[17-18]. In turn, high workload is inversely correlated with quality of life at work, which reinforces the need to pay attention to organizational factors and to striking a proper balance between

demands and available resources[19]. Scarcity of professionals and assistance-related pressure are additional factors that intensify these risks and exert a negative impact on professional performance and on care safety[20]. A cohort study conducted in the Netherlands found that 42% of the health professionals reported persistent fatigue three months after having recovered from COVID-19, with direct repercussions in their work routine and performance[21].

In parallel, reports about difficulties caring for patients after COVID-19 (such as unclear diagnoses and lack of clinical guidelines from the health team) converge with the literature findings, which point to fragmentation in health services and to non-existence of specific monitoring protocols[22]. The challenges inherent to accessing specialized care are added to this, as well as long waiting lists and inconsistency in appointments, aspects that reveal the health system's limitations in fully meeting these individuals' recovery needs[23]. This scenario evidences the urgency of implementing public policies targeted at these professionals' functional recovery and well-being.

In the current study, the qualitative reports pointed to fatigue as a limiting factor for activities of daily living, frequently accompanied by other symptoms such as memory deficits and hair loss. These findings are corroborated by international surveys like a study conducted with health professionals in China, which identified fatigue as the most prevalent symptom, followed by memory loss, reduced physical capacity and sleep disorders, all directly impairing functionality and quality of life in those affected[24].

Also in this context, recent research studies suggest that persistent fatigue among professionals that have recovered from COVID-19 affects their return to work, reducing their ability to maintain the usual productivity level and increasing the risk of clinical errors[25]. A systematic review emphasizes that workers affected by post-COVID-19 fatigue face difficulties in cognitive tasks and state being afraid of compromising patient safety due to physical and mental exhaustion[26].

Another relevant aspect is related to the impacts on the mental health of nurses with fatigue, especially referring to reduced quality of life and limitations to fully develop activities of daily living. These findings are in line with a number of studies showing that chronic fatigue exerts negative impacts on the efficacy of health services, which strongly depend on the Nursing workforce[27-30]. Similarly, a prospective cohort study identified that the post-COVID-19 condition symptoms affected physical capacity, quality of life and participation in everyday and work-related activities[31].

The association between fatigue and functional impairments is widely recognized in the literature[32-33]. When added to the demands inherent to the professional practice, this condition gives rise to relevant repercussions for health systems such as reduced physical and mental performance, in addition to cognitive and psychomotor changes resulting from the post-COVID-19 condition, such as diminished attention and lower performance capacity[31].

Although this study has limitations (such as having encompassed a single state from northeastern Brazil and its cross-sectional design, which limits causality inferences), it contributes to a deeper understanding of the impacts exerted by post-COVID-19 fatigue on nurses. Longitudinal studies are recommended to broaden understanding about the repercussions of this post-COVID-19 condition among these professionals, with a view

to developing public health policies that strengthen the assistance provided to this population group.

CONCLUSIONS

The current research provides quantitative and qualitative data about the impacts exerted by fatigue on nurses recovered from COVID-19. There was predominance of professionals aged between 31 and 60 years old, belonging to the female (biological) gender, brown-skinned, married and with some specialization or residency as training level. In addition to that, most of them worked in ward sectors and had been vaccinated against SARS-CoV-2. The prevalence of self-reported fatigue persisting for more than twelve weeks was 52.3%.

Statistically significant associations were noticed with the “Marital status” and “Professional performance sector” variables. As for the qualitative data, three categories emerged for discussion. They addressed the Impacts exerted by fatigue on the routine (difficulties performing activities of daily living and changes in the need for sleep and rest), the Health professionals recognizing the post-COVID-19 condition symptoms and the Impacts exerted by other post-COVID-19 conditions. The data evidenced that post-COVID-19 fatigue exerted negative impacts on nurses' personal life and work activities.

The results reinforce the need to know the COVID-19 pandemic impacts throughout time, given that the studies evidence persistent symptoms mainly in health professionals, as they were more frequently exposed to SARS-CoV-2. Consequently, it is important to develop health care strategies for nurses affected by post-COVID-19 fatigue, the condition analyzed in this study.

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