

Predictors of poor sleep quality among hospital healthcare workers during the COVID-19 pandemic

Preditores da má qualidade do sono em profissionais da saúde hospitalar durante a pandemia COVID-19

Predictores de mala calidad del sueño en profesionales sanitarios hospitalarios durante la pandemia de COVID-19

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ABSTRACT

Objective: to analyze predictors of poor sleep quality among hospital healthcare workers during the COVID-19 pandemic. **Methods:** cross-sectional study involving 244 healthcare professionals from inpatient and intensive care units working on the COVID-19 frontline in Teresina, Piauí. Data collection occurred between September 2022 and May 2023 using self-administered questionnaires containing sociodemographic data and the Pittsburgh Sleep Quality Index. Descriptive analyses and binary logistic regression were performed to identify predictors of poor sleep quality. All ethical requirements were observed. **Results:** predictors of poor sleep quality included anxiety, sleep difficulties, sadness, mental and physical fatigue, stress, distress, frustration, altered sleep patterns, and daytime sleepiness. **Conclusion:** poor sleep quality was associated with mental health factors, physical fatigue, and sleep pattern disturbances.

Descriptors: COVID-19; Health Personnel; Nursing; Sleep; Sleep Quality.

RESUMO

Objetivo: analisar os preditores da má qualidade do sono em profissionais da saúde hospitalar durante a pandemia da Covid-19. **Método:** estudo transversal com 244 profissionais da saúde de unidades de internação e de terapia intensiva que atuaram na linha de frente da Covid-19, em Teresina, Piauí. A coleta aconteceu entre setembro de 2022 e maio de 2023, por questionário autoaplicável com dados sociodemográficos e o Índice de Qualidade do Sono de Pittsburgh. Foram realizadas análises descritivas e regressão logística binária para identificação dos preditores da má qualidade do sono. Aspectos éticos respeitados. **Resultados:** os preditores da má qualidade do sono foram: ansiedade, dificuldades para dormir, tristeza, cansaço mental e físico, estresse, angústia, frustração, alteração no padrão de sono e sonolência diurna. **Conclusão:** a má qualidade do sono esteve associada a aspectos da saúde mental, cansaço físico e distúrbios no padrão do sono.

Descritores: COVID-19; Pessoal de Saúde; Enfermagem; Sono; Qualidade do Sono.

RESUMEN

Objetivo: analizar los predictores de la mala calidad del sueño en profesionales sanitarios hospitalarios durante la pandemia de Covid-19. **Método:** estudio transversal con 244 profesionales de la salud de unidades de hospitalización y cuidados intensivos que prestaban servicios en la primera línea de la Covid-19 en Teresina, Piauí. La recolección de datos se realizó entre septiembre de 2022 y mayo de 2023, mediante un cuestionario autoadministrado con datos sociodemográficos y el Índice de Calidad del Sueño de Pittsburgh. Se realizaron análisis descriptivos y regresión logística binaria para identificar predictores de la mala calidad del sueño. Se respetaron las consideraciones éticas. **Resultados:** los predictores de la mala calidad del sueño fueron ansiedad, dificultad para dormir, tristeza, agotamiento mental y físico, estrés, angustia, frustración, alteraciones en el patrón de sueño y somnolencia diurna. **Conclusión:** la mala calidad del sueño se asoció con problemas de salud mental, agotamiento físico y alteraciones en el patrón del sueño.

Descriptores: COVID-19; Personal da Salud; Enfermería; Sueño; Calidad del Sueño.

INTRODUCTION

Following the declaration of global emergency related to the COVID-19 pandemic, concerns intensified regarding psychosocial impacts on healthcare workers, particularly concerning sleep quality and emotional distress, prompting extensive discussions in scientific, political, and healthcare fields. While this group played a central role in effective actions and epidemiological control measures, including active case finding, surveillance, and monitoring, high exposure to suffering and stress contributed significantly to sleep disorders and mental health problems across various healthcare contexts and levels¹.

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Literature demonstrates that sleep disturbances intensified globally during the pandemic. A study of 1,563 healthcare workers in China found that 36.1% experienced insomnia symptoms, with higher prevalence among those directly involved in disease management, highlighting the direct impact of working conditions on sleep quality². These disturbances were associated with elevated morbidity and mortality rates across countries of different income levels³⁻⁴. Such evidence reinforces growing concerns about reduced functional capacity, absenteeism, productivity loss, work leave, poorer quality of life, and increased risk of suicidal ideation among these professionals.

Sleep, as a vital human need, plays a restorative role and is intimately related to physical, emotional, cognitive, and social well-being. Its quality directly affects immune response, memory consolidation, maintenance of cognitive and mental functions, and physiological balance. A meta-analysis revealed significant sleep alterations in healthcare workers during the pandemic, including reduction in deeper, restorative sleep phases, insomnia, and prolonged daytime sleepiness, with relevant repercussions on mental health⁵.

Individual, occupational, and institutional factors can influence the prevalence of sleep disorders. Work overload, abrupt increases in care demands, and continuous exposure to stressful situations were identified as relevant etiological factors for compromised sleep quality during the pandemic. Nursing teams were frequently most affected, as they spend more time in direct patient contact under intense physical and emotional demands⁴⁻⁶. This vulnerability was demonstrated in a Brazilian study revealing greater sleep quality impairment among these professionals compared to other healthcare categories when facing adversities imposed by the health crisis³.

Significant efforts have been directed toward describing, analyzing, and understanding the pandemic's occupational repercussions among healthcare workers, particularly regarding mental health, sleep quality, and working conditions⁷. In this context, identifying predictors of poor sleep quality can support public policies and institutional strategies aimed at promoting occupational health and mitigating workplace risks.

Although scientific production on COVID-19 pandemic impacts on healthcare workers' health has advanced significantly, systematic investigations analyzing predictive factors of poor sleep quality in specific hospital contexts remain scarce, especially in socially and economically vulnerable regions like Northeast Brazil. This gap compromises understanding of multiple dimensions involved in these professionals' illness and hinders formulation of coping strategies sensitive to regional inequalities and organizational specificities of health services. A national survey conducted by the Oswaldo Cruz Foundation (Fiocruz) revealed important disparities among Brazilian regions regarding working conditions, overload, resource access, and psychosocial support during the pandemic, reinforcing the need for regionally focused studies⁸.

Given this landscape, it becomes essential to deepen understanding of determinants of poor sleep quality among healthcare workers who served on the pandemic frontline, especially in public reference hospital institutions located in regions historically marked by health access inequalities and precarious working conditions. Identifying these factors can support development of more effective and equitable public policies, while guiding institutional interventions aimed at promoting occupational health and psychological protection of these workers in crisis contexts.

Thus, considering that sleep is a complex, multifactorial process whose alteration can significantly affect healthcare professionals' quality of life and physical and mental health, this study addresses the following question: What are the predictors of poor sleep quality among hospital healthcare workers during the COVID-19 pandemic?

The objective was to analyze predictors of poor sleep quality among hospital healthcare workers during the COVID-19 pandemic.

METHOD

This observational, cross-sectional, analytical study was conducted following Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) recommendations and developed at a reference center for managing moderate and severe COVID-19 cases in Teresina, Piauí, comprising inpatient and intensive care units in two public health network hospitals, references in clinical, surgical, and critical adult care.

Sample calculation considered information provided by Human Resources departments of participating institutions. The first institution had 248 healthcare professionals, while the second had 413, totaling 661

professionals during 2020-2021. The finite population formula was used with a 5% margin of error and 95% confidence level, resulting in a final sample of 244 healthcare professionals.

Inclusion criteria encompassed physicians, nurses, physiotherapists, and nursing technicians of both sexes, with weekly workloads of 24 hours or more, permanent or temporary contracts, and providing direct care in COVID-19 units for at least three months. Exclusion criteria included professionals on temporary leave for illness, personal or family reasons, or maternity leave with expected return to service, or permanent leave due to role changes, as well as incompletely filled questionnaires.

Data collection occurred between September 2022 and May 2023, following institutional approval, through in-person administration of self-administered questionnaires at pre-scheduled times via telephone or WhatsApp®, during morning, afternoon, or evening periods. The questionnaire titled "Sociodemographic, occupational, clinical, and sleep pattern questionnaire" was developed by researchers and validated by seven specialists in the study's thematic area, selected through the Research Groups Directory of the National Council for Scientific and Technological Development (CNPq).

The questionnaire comprised 52 closed and open questions addressing sociodemographic variables (sex, race, marital status, children, individual and family income), occupational variables (professional category, sector, workload, shift, work burden, availability/provision of personal protective equipment) clinical data (including self-reported symptoms, feelings and/or emotions such as anxiety, fear, depression, stress, powerlessness, sadness, fatigue, frustration, distress, specialized mental health support, and seeking psychological support) and sleep patterns.

A pre-test with 30 healthcare professionals, including nurses, physiotherapists, physicians, and nursing technicians, was conducted to assess clarity, comprehension, completion time, and question adequacy to proposed objectives; these participants were not included in the study sample. Application occurred in each participant's work sector. Results indicated no difficulties regarding aspects and understanding of investigation questions, requiring no readjustment of questionnaire items.

Sleep assessment was performed using the Pittsburgh Sleep Quality Index (PSQI), an instrument translated and validated for Brazil that evaluates sleep quality over the previous 30 days⁹. The PSQI contains 19 self-administered items distributed across seven domains: subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleep medications, and daytime dysfunction. Items are scored from 0 to 3, with a global score of 21 points. Scores above 5 indicate poor sleep quality¹⁰. Variables related to stress and anxiety were self-reported by participants.

Data collection was performed by members of the Mental Health and Work Studies and Research Group of the Federal University of Piauí (GEPSAMT/UFPI), previously trained by responsible researchers regarding research objectives, ethical procedures, appropriate approach methods, and clarification of instrument-related questions. Training involved in-person meetings, instrument simulations, and discussion of standardized procedures to clarify doubts without inducing responses. This strategy aimed to reduce comprehension bias, ensure adequate questionnaire completion, minimize losses, and promote data collection standardization.

Data were double-entered in Microsoft Excel® and analyzed using Statistical Package for the Social Sciences (SPSS®), version 22.0. Descriptive analyses (means, medians, standard deviations, absolute and relative frequencies) were performed, and Chi-square test (X^2) was applied to verify association or independence between categorical variables. Binary logistic regression was used to identify predictors of poor sleep quality, with simultaneous variable inclusion using the enter method, adopting a significance level of $p < 0.05$. Association strength was expressed as Odds Ratio (OR) with 95% confidence interval.

The study derives from a doctoral dissertation, with protocol approved by a Research Ethics Committee, in accordance with current national regulations. Ethical principles of Resolutions 466/2012 and 510/2016 of the National Health Council (CNS) were respected, as well as guidelines of the General Data Protection Law (LGPD). Study participation was voluntary and conditional upon written signing of the Informed Consent Form (ICF).

RESULTS

Of the 244 healthcare professionals in the study location, 44.7% were nursing technicians, 33.6% nurses, 11.1% physiotherapists, and 10.7% physicians. There was a predominance of females (79.5%), married professionals (45.5%), and those with at least one child (55.8%).

Work settings were COVID-19 wards (47.5%) and COVID-19 Intensive Care Units (52.5%). Regarding workload, 30.7% had 36-hour weekly schedules. More than half of participants (56%) classified workload in the COVID-19 sector as high, associated with intense physical (72.1%), mental/intellectual (73.8%), and emotional (78.7%) demands. Quality and availability of Personal Protective Equipment (PPE) was considered fair by 48.4%, and rest conditions were similarly considered fair by 51.6%.

Self-reported health status was predominantly "good" currently (54%) and before working in the COVID-19 sector (60.2%). Main self-reported psychoemotional symptoms included: physical fatigue (80.3%), stress (69.7%), anxiety (68.9%), fear (62.3%), exhaustion (61.9%), feelings of powerlessness (57.0%), mental fatigue (54.5%), altered sleep patterns (45.9%), and daytime sleepiness (32.8%).

Data related to the association analysis between sociodemographic and occupational characteristics and sleep quality classification of healthcare professionals participating in the study are presented in Table 1.

Table 1: Association between sociodemographic and occupational characteristics and sleep quality classification among healthcare workers on the COVID-19 frontline (n=244) Teresina, PI, Brazil, 2023.

		Sleep quality – Global score		P-value*	OR-95%†
		≤5 good quality N(%)	>5 poor quality N(%)		
Sociodemographic variables	Marital status			0.022	
	Married	56(56.6)	55(37.9)		-
	Divorced	3(3.0)	11(7.6)		-
	Single	30(30.3)	67(46.2)		-
	Stable union	10(10.1)	11(7.6)		-
	Widowed	0(0.0)	1(0.7)		b
Occupational variables	Regarding the supply/availability and quality of PPE?			0.036	
	Sufficient and good quality	57(57.6)	60(41.4)		0.301(0.060-1.509)
	Low and fair quality	40(40.4)	78(53.8)		0.557(0.111-2.807)
	Insufficient and poor quality	2(2.0)	7(4.8)		b
	Regarding the rest/break area?			0.021	
	Adequate	31(31.3)	27(18.6)		0.344(0.161-0.738)
	Fair	51(51.5)	75(51.7)		0.581(0.299-1.130)
	Inadequate	17(17.2)	43(29.7)		b
Psychoemotional variables	Anxiety			<0.001	
	Yes	51(51.5)	117(80.7)		3.933(2.223-6.957)
	No	48(48.5)	28(19.3)		b
	Sleep difficulties			<0.001	
	Yes	14(14.1)	81(55.9)		7.684(3.99-14.771)
	No	85(85.9)	64(44.1)		b
	Sadness			0.028	
	Yes	46(46.5)	88(60.7)		1.779(1.061-2.982)
	No	53(53.5)	57(39.3)		b
	Mental fatigue			<0.001	
	Yes	46(46.5)	101(69.7)		2.645(1.556-4.495)
	No	53(53.5)	44(30.3)		b
	Physical fatigue			0.032	
	Yes	73(73.7)	123(84.8)		1.991(1.053-3.766)
	No	26(26.3)	22(15.2)		b
Stress			0.011		
Yes	60(60.6)	110(75.9)		2.043(1.174-3.554)	
No	39(39.4)	35(24.1)		b	
Anguish			0.017		
Yes	32(32.3)	69(47.6)		1.901(1.116-3.238)	
No	67(67.7)	76(52.4)		b	
Frustration			0.033		
Yes	21(21.2)	49(33.8)		1.896(1.049-3.427)	
No	78(78.8)	96(66.2)		b	
Altered sleep pattern			<0.001		
Yes	22(22.2)	90(62.1)		5.727(3.205-10.235)	
No	77(77.8)	55(37.9)		b	
Daytime sleepiness			0.004		
Yes	22(22.2)	58(40.0)		2.333(1.308-4.162)	
No	77(77.8)	87(60.0)		b	

Key: *Chi-square test, at 5% level; †OR (CI-95%) - Odds ratio at 5% level.

Bivariate analysis identified statistically significant associations between sleep quality (PSQI>5) and the following variables: marital status ($p=0.022$), PPE quality ($p=0.036$), rest conditions ($p=0.021$), anxiety ($p<0.001$), sleep difficulties ($p<0.001$), sadness ($p=0.028$), mental fatigue ($p<0.001$), physical fatigue ($p=0.032$), constant negative thoughts about the pandemic ($p=0.011$), distress (0.017), frustration (0.033), altered sleep patterns ($p<0.001$), and daytime sleepiness ($p=0.004$).

Table 2 describes the results of the association analysis between clinical profile and sleep quality classification of healthcare workers who worked on the frontline combating the Covid-19 pandemic.

Table 2: Association between clinical profile and sleep quality classification among healthcare workers on the COVID-19 frontline (n=244) Teresina, PI, Brazil, 2023.

Clinical Variables	Sleep quality – Global score		P-value*	OR-95%†
	≤5 good quality N(%)	>5 poor quality N(%)		
Current health status			<0.001	
Very good	15(15.2)	15(10.4)		1.000(0.124-8.057)
Good	67(67.6)	65(44.8)		0.970(0.133-7.093)
Fair	15(15.2)	63(43.4)		4.200(0.547-32.276)
Bad	2(2.0)	2(1.4)		b
Health status before working in the Covid-19 sector			0.006	
Very good	39(39.4)	30(20.7)		0.364(0.144-0.919)
Good	51(51.5)	96(66.2)		0.892(0.376-2.113)
Fair	9(9.1)	19(13.1)		b

Notes: *Chi-square test, at 5% level; †OR (CI-95%) - Odds ratio at 5% level

Significant associations were observed between sleep quality and current health status ($p<0.001$), as well as health status before beginning activities in the COVID-19 sector ($p=0.006$). Tables 3 and 4 show the results of binary logistic regression analysis for predictors of poor sleep quality among participants.

Table 3: Predictors of poor sleep quality among healthcare professionals on the COVID-19 frontline according to sociodemographic and occupational variables (n=244). Teresina, PI, Brazil, 2023.

Sociodemographic Variables	>5 poor sleep quality*		
	B	p-value	OR-95%
Marital status			
Married	-21.221	1.000	-
Divorced	-19.904	1.000	-
Single	-20.399	1.000	-
Stable union	-21.108	1.000	b
Widowed			
Occupational Variables			
Regarding the supply/availability and quality of Personal Protective Equipment?			
Sufficient and good quality	-1.201	0.144	0.301(0.060-1.509)
Low and fair quality	-0.585	0.478	0.557(0.111-2.807)
Insufficient and poor quality			b
Regarding the rest/break area for workers?			
Adequate	-1.066	0.344	0.344(0.161-0.738)
Fair	-0.542	0.581	0.581(0.299-1.130)
Inadequate			b

Notes: *> 5 poor sleep quality (Sleep quality – global score); Wald test

Table 4: Predictors of poor sleep quality among healthcare professionals on the COVID-19 frontline according to psychoemotional and clinical variables (n=244). Teresina, PI, Brazil, 2023.

	>5 poor sleep quality*		
	B	p-value	OR-95%
Psychoemotional variables			
Anxiety			
Yes	1.369	<0.001	3.933(2.223-6.957)
No			b
Sleep difficulties			
Yes	2.039	<0.001	7.684(3.998-14.771)
No			b
Sadness			
Yes	0.576	0.029	1.779(1.061-2.982)
No			b
Mental fatigue			
Yes	0.973	<0.001	2.645(1.556-4.495)
No			b
Physical fatigue			
Yes	0.689	0.034	1.991(1.053-3.766)
No			b
Stress			
Yes	0.714	0.012	2.043(1.174-3.554)
No			b
Anguish			
Yes	0.642	0.018	1.901(1.116-3.238)
No			b
Frustration			
Yes	0.640	0.034	1.896(1.049-3.427)
No			b
Altered sleep pattern			
Yes	1.745	<0.001	5.727(3.205-10.235)
No			b
Daytime sleepiness			
Yes	0.847	0.004	2.333(1.308-4.162)
No			b
Clinical Variables			
How do you rate your current health status today?			
Very good	0.000	1.000	1.000(0.124-8.057)
Good	-0.030	0.976	0.970(0.133-7.093)
Fair	1.435	0.168	4.200(0.547-32.276)
Bad			b
How do you rate your health status before working in the COVID-19 sector?			
Very good	-1.010	0.032	0.364(0.144-0.919)
Good	-0.115	0.794	0.892(0.376-2.113)
Fair			b

Notes: * > 5 poor sleep quality (Sleep quality – global score); Wald test

Main predictors of poor sleep quality were: anxiety (OR: 3.934; CI95%: 2.223-6.957, p<0.001); sleep difficulties (OR: 7.684; CI95%: 3.998-14.771, p<0.001); sadness (OR: 1.779; CI95%: 1.061-2.982, p=0.028); mental fatigue (OR: 2.645; CI95%: 1.556-4.495, p<0.001); physical fatigue (OR: 1.991; CI95%: 1.053-3.766, p=0.034); stress (OR: 2.043; CI95%: 1.174-3.554, p=0.012); distress (OR: 1.900; CI95%: 1.116-3.238, p=0.018); frustration (OR: 1.896; CI95%: 1.049-3.427, p=0.034); altered sleep patterns (OR: 5.727; CI95%: 3.205-10.235, p<0.001); and daytime sleepiness (OR: 2.334; CI95%: 1.308-4.162, p=0.004). Conversely, "very good" health status before working in the COVID-19 sector was identified as a protective factor against poor sleep quality (OR: 0.364; CI95%: 0.144-0.919, p=0.032).

DISCUSSION

This study aimed to analyze predictors of poor sleep quality among hospital healthcare workers during the COVID-19 pandemic. Findings demonstrate that mental health variables such as anxiety, sadness, stress, distress, and frustration, as well as physiological and behavioral factors including physical and mental fatigue, sleep difficulties, daytime sleepiness, and altered sleep patterns, were significantly associated with poor sleep quality in this population. These results reinforce the multifactorial impact of the pandemic on healthcare workers' well-being, consistent with

previous studies identifying psychological distress and care overload as important determinants of sleep disorders in health crisis contexts.

Such evidence gains greater relevance when analyzed in light of the sample's sociodemographic and professional profile, composed mainly of married women with at least one child, belonging to nursing teams, reflecting the predominant workforce profile in Brazilian hospital services, especially in critical units¹¹. In Turkey, for example, use of the PSQI, also adopted in this study, indicated higher prevalence of sleep disorders among nurses, attributed to constant exposure to suffering, long working hours, and close contact with severely ill patients, making them more vulnerable to consequences of sleep alterations¹².

Working during the COVID-19 pandemic contributed to exhaustive routines among healthcare professionals, intensified by high patient morbidity and mortality, further aggravating the relationship between clinical severity of cases, workload, and team physical and mental exhaustion. This situation highlighted these professionals' vulnerability to continuous exposure to stressors, directly impacting their health¹³. Our data reinforce this reality, demonstrating the correlation between physical and mental fatigue and poor sleep quality, which may compromise performance, care safety, and these professionals' overall well-being.

Fear of the virus was constant among participants. Among healthcare workers, this fear was intensified by factors such as psychological distress from disease uncertainties, family losses, and isolation imposed as a global reality during the pandemic¹⁴. In this context, the need for psychosocial protection for healthcare workers emerges prominently, as many presented symptoms of depression, anxiety, and insomnia.

Consistent with available literature, participants in this study reported psychological distress manifested through symptoms such as anxiety, stress, and distress, frequently coexisting with sleep disorders. Meta-analyses conducted with the general population also indicated high prevalence of these disorders during the pandemic period, though at lower levels than those observed among healthcare workers^{2,15}. These symptoms reflect the emotional and psychological impact faced by these workers given challenging workplace conditions, especially during the pandemic.

Among identified predictors, anxiety showed the strongest association with poor sleep quality. In Oman, professionals with high anxiety levels also reported worse sleep quality according to PSQI^{14,16}. In Brazil, a survey of physicians showed that 73.4% presented anxiety symptoms and 73.1% poor sleep quality, confirming a significant association between the phenomena¹⁷. This overlap demonstrates a bidirectional relationship: anxiety impairs sleep, and compromised sleep feeds back into anxious states.

Additionally, anxiety was identified as an adaptive response to situations perceived as threatening, becoming pathological when disproportionate to context or generating physiological, behavioral, and cognitive impairments^{5,12}. This condition was strongly present among pandemic frontline professionals, being associated with stress and burnout, as evidenced by studies conducted in Singapore. Interestingly, after the pandemic peak, reductions were observed in anxiety levels, perceived stress, and exhaustion¹⁸.

Another important predictor identified was stress, whose relationship with sleep was also noted in international studies. Being stressed qualitatively alters the biological sleep process, and conversely, sleeping less than eight hours daily tends to intensify stress. In China, more than 1,500 professionals reported insomnia, difficulty initiating sleep, and nocturnal interruptions, strongly associated with high stress levels². In the United Kingdom, meta-analysis indicated that chronic stress in high-demand environments, such as ICUs, intensely compromised sleep patterns and mental health¹⁹.

Among psychological distress components, distress also stood out as a predictor of poor sleep quality, being a recurrent emotion during the pandemic. Although rarely measured in isolation, it was present in reports of physical and emotional exhaustion among professionals in Singapore, negatively impacting sleep¹⁸. In Brazil, workers at other care levels, such as Primary Care, reported intense feelings of distress linked to overload and routine changes, findings also confirmed by literature review^{20,21}.

Depressive symptoms were another highlight among studied professionals. This includes manifestations such as sadness, frustration, loss of interest and pleasure, guilt feelings, low self-esteem, and sleep disturbances. Studies show that sleep-related problems may be associated with depressive symptoms, corroborating this study's findings^{19,22}. The relationship between sadness and frustration has proven relevant in understanding psychological distress experienced by healthcare workers during the COVID-19 pandemic. In scenarios of high demand,

emotional overload, and patient loss, these emotions tend to emerge simultaneously, worsening mental health status.

Frustration with institutional limitations, such as resource scarcity and feelings of powerlessness regarding case severity, combined with sadness over deaths and family separation, contributes to triggering symptoms such as insomnia, anxiety, and emotional exhaustion. These findings are corroborated by studies indicating the coexistence of these feelings as significant triggers of mental suffering and sleep disorders among frontline professionals^{18,19}.

Thus, psychological distress symptoms need to be understood in light of high workload, considered high by 56% of participants. A study conducted in Turkey confirmed how frontline professionals' sleep quality was affected, indicating increased work burden during the pandemic²³. Additionally, night shifts, already associated with poor sleep quality, worsen the situation, as indicated by research with intensivists in Ethiopia²⁴.

The Oswaldo Cruz Foundation (Fiocruz) also found that 95% of healthcare professionals experienced life changes during the pandemic, and almost 50% reported excessive work with schedules exceeding 40 weekly hours. Related variables included institutional links and service environmental conditions⁸. This reality, associated with insufficient resources and PPE scarcity, accentuated stress and contributed to sleep disorders²⁵.

Among predictors with strongest association, altered sleep patterns and daytime sleepiness stood out. These manifestations directly affect functional performance, favoring absenteeism and increasing care activity failures^{26,27}. National research shows that sleepiness impairs clinical vigilance and reasoning, increasing error risk, while compromising circadian rhythm, memory, and emotional stability^{21,28}.

Thus, restorative sleep should be recognized and valued as a protective mechanism for healthcare professionals' physical, emotional, cognitive, and social health. Professionals who enjoy adequate rest typically perform their functions more efficiently, while sleep deprivation is associated with adverse events in health services^{6,16}. Furthermore, this approach should consider patient safety as a direct outcome of caring for workers' well-being and health, reinforcing the importance of policies and practices promoting working conditions that favor professional rest.

As a protective factor, this study highlighted self-perception of very good health status before working in the COVID-19 sector. Conversely, poor sleep quality can harm overall health²⁹. A study with COVID-19 frontline nurses found that occupational stress and sleep disorders were significantly more prevalent among those reporting worse health perception, suggesting that negative perception may indicate greater psychophysical vulnerability³⁰.

Given the presented results and dialogue with national and international evidence, this study raises the need for individual and collective investments in promoting resources that enable sleep quality for healthcare professionals subjected to unexpected and stressful situations. Identifying predictors can guide future interventions aimed at improving this situation. Such interventions may include improving working conditions, ensuring adequate remuneration, and providing quality protective equipment in sufficient quantity for use. Beyond institutional interventions, individual strategies can contribute to sleep quality improvements. Thus, such evidence suggests means for cultural, individual, and collective changes that prove necessary for the studied population.

Study limitations

The study presented limitations inherent to cross-sectional design, which does not allow precise evaluation of temporal relationships between exposure and outcome, as factors were measured at a single time point. Additionally, the possibility of recall bias is noted, especially regarding sleep quality assessment through the Pittsburgh Sleep Quality Index (PSQI), which relies on participants' subjective recall of the previous 30 days. However, data were collected at a critical pandemic moment, allowing identification of relevant predictive factors of poor sleep quality among healthcare professionals.

CONCLUSION

Predictors of poor sleep quality among healthcare professionals working during the COVID-19 pandemic were anxiety, sleep difficulties, sadness, mental fatigue, physical fatigue, stress, distress, frustration, altered sleep patterns, and daytime sleepiness. Additionally, "very good" health status before working in the COVID-19 sector

constituted a protective factor. Thus, implementing actions for managing poor sleep quality among healthcare professionals working in pandemic scenarios like that experienced during COVID-19 is necessary.

Research of this nature can facilitate understanding of occupational impacts the pandemic caused for professionals involved in response efforts, awakening in managers, health leaders, and care practice the need for developing public policies and care strategies focused on occupational health, quality of work life, prevention and adequate management of risk states, to improve professionals' sleep quality, as well as workers' mental and occupational health and quality of life.

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Use of artificial intelligence tools

Authors declare that no artificial intelligence tools were used in the composition of the manuscript “*Predictors of poor sleep quality among hospital healthcare workers during the COVID-19 pandemic*”.