Fatigue and sleep in intensive care nursing workers in the COVID-19 pandemic

Fadiga e sono em trabalhadores de enfermagem intensivistas na pandemia COVID-19

Fatiga y sueño en trabajadores de enfermería intensivistas durante la pandemia de COVID-19

Elisa Gomes Nazario[1] https://orcid.org/0000-0001-6129-5218
Rosângela Marion da Silva[1] https://orcid.org/0000-0003-3978-9654
Carmem Lúcia Colomé Beck[1] https://orcid.org/0000-0001-9060-1923
Alexa Pupiara Flores Coelho Centenaro[2] https://orcid.org/0000-0002-9117-5847
Etiane de Oliveira Freitas[1] https://orcid.org/0000-0002-8589-2524
Fernanda Moura D' Almeida Miranda[3] https://orcid.org/0000-0001-7140-9557
Getúlio Simões Nicoletti[4] https://orcid.org/0000-0001-8123-4535

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Corresponding author
Elisa Gomes Nazario
E-mail: nazario.elisa@gmail.com

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Alexandre Pazetto Balsanelli (https://orcid.org/0000-0003-3757-1061)
Escola Paulista de Enfermagem, Universidade Federal de São Paulo, São Paulo, SP, Brazil

Abstract

Objective: To analyze the relationship between fatigue, sleep quality, variables of health and work in intensive care nursing workers during the COVID-19 pandemic.

Methods: Cross-sectional, correlational study conducted from July 2020 to February 2021 with a random and probabilistic sample of nurses and nursing technicians from university hospitals in Rio Grande do Sul, Brazil. A sociodemographic/occupational questionnaire, the Fatigue Assessment Scale and the Pittsburgh Sleep Quality Index were used in data collection. The chi-square test, Mann-Whitney U test and the Spearman correlation coefficient were used in the analyzes, adopting a significance level of 5%. Binary logistic regression analysis was performed.

Results: Participation of 114 workers. There was prevalence of low fatigue and poor sleep quality. High fatigue was associated with the variables going to work sick and perceiving noise/vibrations as a cause of discomfort. Nursing technicians were associated with poor sleep quality and concern about exposure to chemical substances. Fatigue and sleep quality were moderately and directly correlated. Adjusted analyzes showed that nurses and nursing technicians with high fatigue were four times more likely to have poor sleep quality (OR = 4.86; CI = 1.50-15.75).

Conclusion: Fatigue and sleep quality were directly correlated and are associated with individual and work factors. High fatigue increased the chances of having worse sleep quality assessment. Institutional and organizational strategies should be reviewed in order to prioritize the health protection of these nursing workers.

Resumo

Objetivo: Analisar a relação entre fadiga, qualidade do sono, variáveis de saúde e laborais em trabalhadores de enfermagem de terapias intensivas, na pandemia COVID-19.

Métodos: Estudo transversal, correlacional, realizado de julho de 2020 a fevereiro de 2021, com amostra aleatória e probabilística de enfermeiros e técnicos de enfermagem de hospitais universitários do Rio Grande do Sul, Brasil. Para a coleta de dados foi utilizado questionário sociodemográfico/ocupacional, Escala de Avaliação da Fadiga e Índice de Qualidade do Sono de Pittsburgh. Nas análises utilizaram-se teste Qui-Quadrado, teste U Mann-Whitney e coeficiente de correlação de Spearman, com nível de significância de 5%. Foi realizada análise de regressão binária logística.

Resultados: Participaram 114 trabalhadores, com prevalência de fadiga baixa e qualidade do sono ruim. A fadiga alta associou-se às variáveis ir trabalhar doente e perceber ruídos/vibrações como causa de

[1]Universidade Federal de Santa Maria, Santa Maria, RS, Brazil.
[2]Universidade Federal de Santa Maria, Palmeira das Missões, RS, Brazil.
[3]Universidade Federal do Paraná, Curitiba, PR, Brazil.
[4]Universidade Franciscana, Santa Maria, RS, Brazil.
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desconforto. Técnicos de enfermagem associaram-se a qualidade do sono ruim e preocupação com a exposição a substâncias químicas. Fadiga e Qualidade do sono correlacionaram-se de forma moderada e direta. As análises ajustadas evidenciaram que enfermeiros e técnicos de enfermagem com fadiga alta apresentaram quatro vezes mais chances de terem qualidade do sono ruim (OR = 4,86; IC = 1,50-15,75).

Conclusão: A fadiga e qualidade do sono se correlacionaram de forma direta, e estão associados a fatores individuais e do trabalho. A fadiga alta aumentou as chances de ter pior avaliação da qualidade do sono. Estratégias institucionais e organizacionais devem ser revistas a fim de priorizar a proteção da saúde destes trabalhadores de enfermagem.

Resumen

Objetivo: Analizar la relación entre fatiga, calidad del sueño, variables de salud y laborales en trabajadores de enfermería de terapias intensivas, durante la pandemia de COVID-19.

Métodos: Estudio transversal, correlacional, realizado de julio de 2020 a febrero de 2021, con muestreo aleatorio y probabilístico de enfermeros y técnicos de enfermería de hospitales universitarios de Rio Grande do Sul, Brasil. Para la recopilación de datos se utilizó un cuestionario sociodemográfico/laboral, la Escala de Evaluación de Fatiga y el Índice de Calidad del Sueño de Pittsburgh. Para los análisis se utilizó la prueba χ^2 de Pearson, la prueba U de Mann-Whitney y el coeficiente de correlación de Spearman, con un nivel de significación de 5 %. Se realizó el análisis de regresión binaria logística.

Resultados: Participaron 114 trabajadores, con prevalencia de fatiga baja y sueño de mala calidad. Se relacionó la fatiga con las variables ir a trabajar enfermo y percibir ruidos/vibraciones como causa de malestar. Se relacionó a los técnicos de enfermería con el sueño de mala calidad y la preocupación por la exposición a sustancias químicas. La fatiga y la calidad del sueño se correlacionaron de forma moderada y directa. Los análisis realizados evidenciaron que enfermeros y técnicos de enfermería con fatiga alta presentaron cuatro veces más probabilidades de tener sueño de mala calidad (OR = 4,86; IC = 1,50-15,75).

Conclusión: La fatiga y la calidad del sueño se correlacionan de forma directa y están relacionadas con factores individuales y del trabajo. La fatiga alta aumentó las probabilidades de tener una peor evaluación de la calidad del sueño. Las estrategias institucionales y organizacionales deben ser revisadas a fin de priorizar la protección de la salud de los trabajadores de enfermería.

Introduction

The intensive care unit (ICU) is intended for the hospitalization of patients with unstable health status requiring systematic and specialized care. Workers in this unit live daily situations of clinical severity, sometimes with loss of patients. Their exposure to intense suffering with repercussions for their mental and emotional health[1] can result in fatigue and changes in sleep quality.

The new coronavirus (COVID-19) pandemic increased nursing work stressors in ICUs, with emphasis on prolonged contact with patients compared to other health professionals, exhaustive use of personal protective equipment, concerns about their health and night shift work. This scenario may have resulted in the worsening of nursing workers' sleep quality.[2] Shift work causes sleep impairment[3] and increases the likelihood of severe COVID-19[4] because it interrupts the circadian rhythm. Changes in sleep are significantly related to fatigue.[5,6]

Fatigue is subjective and can be understood as a feeling of exhaustion or tiredness and reduced willingness to perform daily activities, even after resting.[7] It is related to higher workload and psychological pressure and in the pandemic, these elements contributed to the worsening of fatigue among health professionals.[2]

There is evidence of impaired sleep quality and decreased productivity at work, attention deficit, excessive daytime sleepiness[8] and high levels of fatigue in nursing workers in the pre-pandemic period.[5,6,9] The health of nursing workers may have worsened in the pandemic period, especially among those working in the ICU, which increases the need for studies to identify these effects.

Thus, the following question emerged: is there a relationship between fatigue, sleep quality, variables of health and work in nursing professionals who work in intensive care units of university hospitals in Rio Grande do Sul during the COVID-19 pandemic? The aim was to analyze the relationship between fatigue, sleep quality, variables of health and work in nursing workers from intensive care units of university hospitals in the COVID-19 pandemic.

Methods

Multicenter, cross-sectional, analytical and correlational study developed with nurses and nursing technicians in adult and child ICUs of three federal university hospitals (HUs) in Rio Grande do Sul.

These three institutions are reference in intensive care in their regions and will be presented as UH-A, UH-B and UH-C in this study. Note that institutions have similar conformation of units and work routines. In all units, the work of the nursing team is organized in morning (7 am-1 pm), afternoon (1 pm-7 pm) and night shifts (7 pm-7 am of the following day), and day shifts of six or 12 hours, and night shifts of 12 hours. Rotation between shifts is common according to needs of the sectors, that is, workers can work mixed shifts, alternating between day and night shifts.

During the data collection period, the UH-A had 34 intensive care beds and 154 nurses and nursing technicians; the UH-B had 26 beds and 115 workers; and the UH-C had 15 beds and 85 workers, totaling a population of 354 people. The inclusion criterion was having at least six months of experience in the work unit.

From sample size calculation for the prevalence survey, was determined the adequate number of participants. The sample was random and probabilistic and by considering a sampling error of 8% and a confidence interval of 95%, was estimated the need for 106 participants (https://pt.surveymonkey.com/mp /sample-size-calculator/). All workers who met the participation criteria were invited.

The data collection period was between July 2020 and February 2021. It was operationalized virtually by one of the authors through the use of online Google Forms. The invitation was sent by email every two weeks. Participants completed the questionnaires after reading the Informed Consent form indicating agreement with the exposed terms and if they had at least six months in the work unit. Data collection was controlled every week, when the number of respondents was observed and the e-mail address of those who had already responded was excluded.

A sociodemographic and occupational questionnaire containing the variables of age, sex, children, professional category, training time, working time in the unit, and shift (day or night/mixed) was used in the characterization of participants.

The Pittsburgh Sleep Quality Index (PSQI) with 19 items, adapted and validated for the Brazilian context was used to assess sleep quality.[10] The sum of the values generates a global score ranging from zero to 21 points. For this study, the variable was dichotomized into "good" (≤ 5 points) and "poor" (> 5 points) sleep quality, as previously identified.[11]

The Fatigue Assessment Scale (FAS) with ten items, validated and adapted for health workers in the Brazilian context in 2015, was used to assess fatigue.[12] For its analysis, the sum of the total score varies between 10 and 50 points. The midpoint was considered as the cutoff point; the higher the score in relation to this midpoint the higher the fatigue score obtained, or the lower the score in relation to the midpoint the lower the fatigue score obtained.[13] The average score in the present study was 27; values equal to or above 28 points were considered as high fatigue, and values below 28 as low fatigue.

Data were organized in a spreadsheet using the Microsoft Office Excel program and later analyzed with use of the PASW Statistics (Predictive Analytics Software, from SPSS Inc., Chicago, USA), version 18.0, statistical program.

Categorical variables were described using absolute and relative frequency. Depending on the normality of data distribution, quantitative variables were described by mean and standard deviation, or median and interquartile range. In the analysis of relationships between numerical variables and the scales, the U Mann-Whitney test was used. For associations between categorical variables, the Chi-Square test was used, and in cases of global association, the adjusted residuals were calculated. The significance level for all analyzes was 5% ($p<0.05$).

In order to verify the associated factors between variables, binary logistic regression was used (by the Enter method) to identify the adjusted association between the poor sleep quality variable (dependent variable) and the other variables. The association measure used was Odds Ratio (OR) and the respective confidence intervals (95%CI). Logistic regression models were run with the variables, which were removed from the models as p was greater than 25%. In the regression model adopted, an evaluation of multicollinearity was performed, by calculating the variance inflation factor (VIF), which in

this study had a cutoff point of less than five for the absence of multicollinearity.

The Hosmer-Lemeshow test was used to verify the best fit model. For binary regression, variables with p<0.25 in bivariate analysis were included in the adjusted model 1; and those with p<0.15 and statistical significance (p<0.05) in adjusted model 2.

The reliability of the scales was evaluated by performing the internal consistency analysis using Cronbach's alpha coefficient ($\alpha \geq 0.70$). The Spearman correlation coefficient was used to assess the correlation between variables.

Institutional authorization was requested from each of the hospitals. Subsequently, the project was submitted to the Research Ethics Committee through registration on the Plataforma Brasil, obtaining approval from the three institutions, UH-A (CAAE 29627820.2.0000.5346), UH-B (CAAE 29627820.2.3001.5317) and UH-C (CAAE 29627820.2.3002.5324). The ethical aspects that govern research with human beings were respected.

Results

Participation of 114 nursing workers; 41.22% (n=47) were nurses and 58.78% (n=67) nursing technicians. The age range was 20-57 years, median of 35 years for nurses and 39 years for nursing technicians. On average, nurses had 11 years (minimum 4 and maximum 34.6 years) of time since graduation and had worked in the ICU for 3.9 years; nursing technicians had 14 years since graduation (minimum 2 and maximum 22 years) and three years of experience. Work in the night/mixed shift predominated both for nurses (55.3%, n=26) and for nursing technicians (53.7%, n=36). Nurses have worked in the unit for a longer time (p=0.036) (minimum of 1 year and maximum of 30 years). Prevalence of low fatigue was found among nurses (51.1%, n=24) and nursing technicians (52.2%, n=35) (p>0.05). In adult ICUs, high fatigue predominated (54.16%, n=13), and in infant ICU, low fatigue (81.4%, n=48) predominated. High fatigue was identified among workers in the night/mixed shift. The FAS was consistent with regard to data reliability (α=0.723). Regarding sleep assessment, poor sleep quality predominated among nurses (72.3%, n=34) and nursing technicians (88.1%, n=59), with a significant association in the category of nursing technicians (p=0.033). When analyzing the work shift, a significant relationship was observed between the day shift and good sleep quality, and between the night/mixed shift and poor sleep quality (p<0.05). The PSQI showed adequate internal consistency (α=0.704). Table 1 presents the health and work environment variables and the relationship with fatigue and sleep quality.

High fatigue was significantly associated with the variables: working sick and perceiving discomfort due to noise and vibrations; and poor sleep quality was associated with the variable concern about exposure to chemical substances (p<0.05). High fatigue and poor sleep quality showed a significant relationship with the variables use of medication due to work and perception of work as a cause of health problems (p<0.05). When the variables were analyzed by professional category, an association was identified between high fatigue in nurses who underwent health care due to work and nursing technicians without children (p<0.05). There was a significant relationship between poor sleep quality and nurses who went to work sick (p=0.028) and between nursing technicians who had a work accident (p=0.048). The results of the Spearman correlation test revealed that the fatigue score had a moderate and direct significant correlation with the sleep quality variable (r=0.503, p<0.001), so that the increase in fatigue led to a worse evaluation of sleep quality of nurses and nursing technicians. The results of the Mann-Whitney U test showed that quantitative variables and the fatigue and sleep quality scales were not significantly correlated (p>0.05). Table 2 presents the crude Odds Ratio and adjusted by the logistic regression model of the fatigue variable and health and work variables and sleep quality. Regression analysis confirmed the statistically significant association between high fatigue and poor sleep quality.

Adjusted analyzes showed that nurses and nursing technicians with high fatigue were four times more likely to have poor sleep quality (OR = 4.86; CI = 1.50-15.75).

Table 1. Health and work environment variables and the relationship with fatigue and sleep quality of nursing workers at university hospitals

Variables of health and work environment	Fatigue Assessment Scale			Sleep Quality Index		
	Low n(%)	High fatigue n(%)	p-value	Good quality n(%)	Poor quality n(%)	p-value
Had a work accident						
Yes	16(27.1)	17(30.9)	0.656	5(23.8)	28(30.1)	0.565
No	43(72.9)	38(69.1)		16(76.2)	65(69.9)	
On leave due to illness or work accident						
Yes	23(39.0)	21(38.2)	0.930	6(28.6)	38(40.9)	0.296
No	36(61.0)	34(61.8)		15(71.4)	55(59.1)	
Work as a cause of health problems						
Yes	27(45.8)	37(67.3)	0.021*	7(33.3)	57(61.3)	0.020*
No	32(54.2)	18(32.7)		14(66.7)	36(38.7)	
Health treatment due to work						
Yes	14(23.7)	21(38.2)	0.095	3(14.3)	32(34.4)	0.071
No	45(76.3)	34(61.8)		18(85.7)	61(65.6)	
Medication due to work						
Yes	15(25.4)	26(47.3)	0.015*	3(14.3)	38(40.9)	0.022*
No	44(74.6)	29(52.7)		18(85.7)	55(59.1)	
Went to work sick						
Yes	45(76.3)	51(92.7)	0.016*	15(71.4)	81(87.1)	0.079
No	14(23.7)	4(7.3)		6(28.6)	12(12.9)	
Searched the occupational health department						
Yes	28(47.5)	20(36.4)	0.231	9(42.9)	39(41.9)	0.938
No	31(52.5)	35(63.6)		12(57.1)	54(58.1)	
Temperatures that cause discomfort						
Yes	35(59.3)	37(67.3)	0.379	10(47.6)	62(66.7)	0.102
No	24(40.7)	18(32.7)		11(52.4)	31(33.3)	
Lighting that causes discomfort						
Yes	26(44.1)	32(58.2)	0.132	10(47.6)	48(51.6)	0.741
No	33(55.9)	23(41.8)		11(52.4)	45(48.4)	
Noises/vibrations that cause discomfort						
Yes	38(64.4)	47(85.5)	0.010*	16(76.2)	69(74.2)	0.849
No	21(35.6)	8(14.5)		5(23.8)	24(25.8)	
Air ventilation that causes discomfort						
Yes	30(50.8)	30(54.5)	0.693	10(47.6)	50(53.8)	0.611
No	29(49.2)	25(45.5)		11(52.4)	43(46.2)	
Radiation exposure is worrisome						
Yes	36(61.0)	28(50.9)	0.277	12(57.1)	52(55.9)	0.918
No	23(39.0)	27(49.1)		9(42.9)	41(44.1)	
Exposure to chemicals is worrisome						
Yes	31(52.5)	35(63.6)	0.231	8(38.1)	58(62.4)	0.042*
No	28(47.5)	20(36.4)		13(61.9)	35(37.6)	
Exposure to infectious diseases is worrisome						
Yes	53(89.8)	51(92.7)	0.417	19(90,5)	85(91,4)	0,585
No	6(10.2)	4(7.3)		2(9,5)	8(8,6)	
Risk of accident is worrisome						
Yes	38(64.4)	36(65.5)	0.907	11(52.4)	63(67.7)	0.183
No	21(35.6)	19(34.5)		10(47.6)	30(32.3)	

* Pearson's Chi-Square Test.

Discussion

The results of this study indicate that nurses and nursing technicians who worked in the ICU during the COVID-19 pandemic with high fatigue had higher chances of worse sleep quality assessment. Working in an intensive care setting during the pandemic can be a source of illness for nursing workers. The ICU setting is characterized by the severity and instability of patients and the robust technological apparatus used[14] within a context that enhances unfavorable implications for the health. In this

Table 2. Crude and adjusted associations between sleep quality, fatigue and health and work environment variables of nursing workers at university hospitals (n=114)

	Sleep quality					
	Crude association OR (IC)	p-value	†BLRAdjus 1*	p-value	‡BLRAdjust 2**	p-value
Fatigue						
High	5.16 (1.61-16.51)	0.006	3.86 (1.14-13.01)	0.029	4.86 (1.50-15.75)	0.008
Low	1.00		1.00		1.00	
Work as a cause of health problems						
Yes	3.16(1.17-8.59)	0.024	1.84(0.54-6.20)	0.322		
No	1.00		1.00			
Health care due to work						
Yes	3.14 (0.86-11.49)	0.083	0.85(0.10-6.77)	0.886		
No	1.00		1.00			
Medication due to work						
Yes	4.14(1.14-15.06)	0.031	2.29(0.32-16.34	0.407		
No	1.00		1.00			
Went to work sick						
Yes	2.70(0.87-8.31)	0.083	1.19(0.33-4.20)	0.791		
No	1.00		1.00			
Exposure to chemicals is worrisome						
Yes	2.69(1.01-7.14)	0.047	2.02(0.70-8.82)	0.189		
No	1.00		1.00			

†BLRAdjus 1 (p<0.25): Adjusted binary logistic regression 1: sleep quality+fatigue+work as a cause of health problems+medication due to work+went to work sick. *Hosmer and Lemeshow test = 0.386 ‡BLRAdjust 2 (p<0.15): Adjusted binary logistic regression 2. Model: sleep quality+fatigue. ** Hosmer and Lemeshow test = 0.676

study, a significant relationship was identified between fatigue and sleep quality in the COVID-19 pandemic, which is suggestive of affecting workers' health.

The limitations of this study are the memory bias related to self-report in the questionnaire, which can compromise the answers to questions, and the cross-sectional design that does not allow inferences about exposure and outcome, as both are collected in a single moment. Therefore, the interpretation of associations requires caution. Furthermore, the high amplitude of confidence intervals may be overestimating the odds ratio value. In addition, the fact that workers on leave for health treatment were not included may influence the results through the bias of the healthy worker effect. However, the results can contribute to plan actions aimed at the health of nursing workers in intensive care units and to expand knowledge about the relationship between fatigue and sleep quality in times of a pandemic.

Another data identified was the prevalence of low fatigue, a divergent result of a study conducted with Korean hospital nurses.[15] This result can be considered positive/satisfactory, because the higher the level of fatigue the greater the rationing of care and the lower the satisfaction with work.[16]

Among workers with high fatigue, it was identified that 30.9% were involved in work accidents. In a study of nursing professionals working in closed units, such as intensive care units, these professionals showed greater mental and physical fatigue compared to those working in open units (p<0.001).[15] Fatigue in nursing workers can harm the ability to work[17] and beyond the harm to workers themselves, it can weaken the quality of care with implications for patient safety.[15]

In bivariate analysis, there were significant associations between fatigue, sleep and some variables. However, when placed in the multivariate analysis model, the variable that remained significantly (p<0.05) related to sleep quality was fatigue. High fatigue compromises sleep quality.

High fatigue was significantly related to the perception of noise as a cause of discomfort. According to a study in ICUs in Switzerland, the noise in these environments can harm the wellbeing and performance at work, inducing fatigue and irritation in health professionals.[18] In addition, prolonged exposure to noise can reflect on risks that affect the hearing ability of the intensive care nursing team.[19] Noise contributes to fatigue and alarm fatigue,[20] and nurses are the most exposed professionals due

to the longer contact time with patients by monitoring their health status 24 hours.[19,21]

Sensory overload caused by too many alarms can lead to delayed reactions to alarms or to their complete disregard.[22] Studies that evaluated excessive noise levels in intensive care environments identified the technological apparatus as one of the main sources of this type of sound stimulus.[18,19,23]

Regarding the variable children, an association between nursing technicians with no children and high fatigue (p=0.033) was identified, a result in line with a study of Turkish nurses who did not have a partner nor children.[5] In another study, the effects of work on the health of nursing professionals working in the Post-Anesthetic Recovery Unit were evaluated, and a critical evaluation in the physical damage factor (p=0.013) was identified in those who did not have children, which produced suffering at work.[24] The family context can favor positive ways of maintaining affective relationships and a support network, functioning as an embracement factor for workers beyond the work setting.

Participants who considered work as a cause of health problem were significantly associated with high fatigue (p=0.021) and poor sleep quality (p=0.020). A study of North American nurses identified that high fatigue was significantly associated with more hours worked and less hours of sleep; and less fatigue was associated with better skill, leadership and support from the nursing manager.[25]

There was a prevalence of poor sleep quality (PSQI>5 points) among participants, a result in line with a study of intensive care nurses in Taiwan.[3] This datum suggests serious damage to health in its physical and mental aspects, such as increased symptoms of fatigue, anxiety, depression,[5] stress, emotional exhaustion and cognitive difficulties.[9]

The significant relationship identified between the category of nursing technicians with poor sleep quality and involvement with work accidents (33.9%, n=20) (p=0.048) is cause for concern. Impaired sleep quality is related to difficulties of attention and memorization of ICU nursing workers,[9] which can increase the chance of accidents.

Poor sleep quality was associated with working on night/mixed shifts, a result similar to that found in a study of ICU nursing professionals working on shift rotation, in which greater sleep impairment and worsening fatigue were observed after the night shift compared to daytime shifts (p<0.05).[9]

A significant and direct correlation was identified between fatigue and sleep quality, showing a relationship between workers with high fatigue and a worse assessment of sleep quality, and between workers with low fatigue and a better assessment of sleep quality. This result converges with a study developed in Turkey with intensive care nurses; it was identified that the greater the fatigue the lower the quality of sleep.[5]

Nurses' fatigue can be reduced with organizational and individual strategies.[25] In this regard, it is it is important that nursing workers implement sleep management and seek effective strategies to reduce fatigue, such as avoiding interruptions in the sleep-wake cycle and improving the sleep quality.[26] A study identified that a nap time longer than two hours during the night shift had a significant impact on the reduction of some cumulative symptoms of fatigue in nurses,[27] and the muscle relaxation technique combined with music reduced fatigue scores in ICU nurses (p<0.05).[28]

Finally, we suggest that strategies to mitigate harm and protect health are implemented in health institutions for nursing professionals working in ICUs during the COVID-19 pandemic.

Conclusion

The results allow us to conclude that fatigue and the sleep quality of nurses and nursing technicians who worked in ICUs during the COVID-19 pandemic are directly correlated and associated with individual and work factors. High fatigue increases the chances of having worse sleep quality.

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