





# Occurrence of musculoskeletal disorders, burnout, and psychological suffering in Brazilian nursing workers: A cross-sectional study

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## Abstract

**Background:** Musculoskeletal disorders (MSDs) pose a pervasive concern among nursing professionals due to the high physical workload. Simultaneously, the complex relationship between MSDs and mental health outcomes in this population remains an area of significant interest and importance.

**Objective:** This study aimed to investigate the occurrence of MSDs and their relationships with burnout and psychological suffering within the nursing workforce.

**Methods:** A cross-sectional study was conducted in 2020 involving 291 nursing professionals in Brazil. Standardized questionnaires were employed to gather information on MSDs, mental health outcomes, and pertinent work-related factors. Robust statistical analyses were conducted to ascertain the prevalence of MSDs, establish associations between MSDs and mental health outcomes, and delineate the influence of work-related factors on these associations. Statistical analysis was performed using the R software.

**Results:** The study revealed a significant prevalence of musculoskeletal injuries (MSIs) among nursing workers, focusing on regions that include the lower back, upper back, neck, and shoulders. Individuals with MSIs in the lower back showed a marked increase in emotional exhaustion ( $p = 0.02$ ), as did those with MSIs in the upper back ( $p < 0.01$ ) and depersonalization ( $p = 0.07$ ). On the other hand, nursing professionals who reported MSIs in the neck and shoulders had considerably higher scores in emotional exhaustion ( $p < 0.01$  and  $p = 0.01$ , respectively) and depersonalization ( $p = 0.05$  and  $p = 0.05$ , respectively). However, no significant correlations emerged between MSIs and depression or work-related factors.

**Conclusions:** This study highlights the urgency of implementing proactive measures to prevent and manage MSDs within the nursing profession. Moreover, it emphasizes the critical need to enhance working conditions and provide robust support mechanisms to safeguard the mental health of nursing professionals.

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## Keywords

Brazil; musculoskeletal disorder; mental health; burnout; depression; depersonalization; workload; emotional exhaustion; nurses

## Background

Work is a determining factor for biopsychosocial well-being, making it a source of pleasure or suffering. For this reason, its relationship with individuals has been widely discussed, as workloads are associated with occupational risks that directly

interfere with the mental and physical conditions of workers (Al-Sabbah et al., 2021). There is robust research suggesting a strong relationship between psychosocial disorders and the occurrence of musculoskeletal disorders in healthcare workers (Vargas-Prada & Coggon, 2015). Healthcare professionals often face physical demands such as heavy lifting, improper

postures, and repetitive movements, which can increase the risk of musculoskeletal disorders. When combined with psychosocial stressors such as high workloads, inadequate support, and low job satisfaction, the risk of developing musculoskeletal disorders can further increase. However, the impact of these disorders may vary across professions (Krishnan et al., 2021; Soares et al., 2019).

In 2020, the Bureau of Labor Statistics of the United States reported that the incidence rate of musculoskeletal disorders (MSDs) in hospitals was 68.6 cases per 10,000 workers, in contrast to 31.9 cases per 10,000 workers in all other combined sectors (Dressner & Kissinger, 2018). However, musculoskeletal disorders are more commonly reported in nursing workers compared to other healthcare professionals. This is likely due to the unique physical demands of nursing work, such as patient handling, lifting and transferring, prolonged standing, and repetitive and constant movements (Krishnan et al., 2021; Yasobant & Rajkumar, 2014). Moreover, nursing work often involves high levels of psychosocial stressors such as double or triple shifts, high workloads, inadequate support, and emotional demands, which can contribute to the development of psychosocial disorders. These psychosocial disorders can favor the development of musculoskeletal disorders due to their impact on physical symptoms such as muscle tension and fatigue (Davey et al., 2019; Pousa & Lucca, 2021).

In both nursing and other healthcare professions, there are correlations between psychosocial and musculoskeletal disorders. However, nursing workers are often identified as high risk for such injuries. This increased risk is attributed to physical and psychosocial demands inherent in their work. Therefore, it is crucial to consider physical and psychosocial factors when addressing the prevention and management of musculoskeletal disorders in nursing workers (Magnago et al., 2010; Petersen & Marziale, 2018).

In this context, musculoskeletal disorders emerge as a significant public health issue and are considered one of the major occupational problems worldwide, leading to varying levels of functional disability (Santos et al., 2018). Furthermore, the relationship between mental disorders and work also raises concerns, considering stressors related to routine, especially when working in hospital environments, associated with excessive work and the insecurity brought about by new work relationships and conditions, are risk factors that can lead to exhaustion, illness, presenteeism, early retirement, absenteeism, and Burnout Syndrome (BS). The exponential growth of workers affected by common mental disorders (CMD) and BS is alarming and can be observed in official statistics (Petersen & Marziale, 2018).

The repercussions of these disorders extend beyond the individual, impacting the broader context through factors such as productivity loss, risks to patient safety, and financial burdens on employers, thereby characterizing it as a public health problem. Epidemiological research focused on musculoskeletal diseases (MSD) among healthcare professionals in hospitals has revealed that the regions of the body most frequently affected include the back, neck, and upper extremities, with prevalence rates varying from 17% to 92%, contingent on the study population and the definition of MSD employed. Notably, among hospital nurses, recent studies have reported MSD prevalence rates surpassing 80%,

with the lower back, shoulders, and neck emerging as the consistently most affected body regions (Jacquier-Bret & Gorce, 2023).

Recent studies conducted in Brazil reinforce the relationship between psychosocial disorders and the occurrence of musculoskeletal disorders in nursing workers, with a prevalence of musculoskeletal disorders around 84.3%. However, despite the importance of the topic, there is a scarcity of published research specifically focused on nursing workers in municipal hospitals and emergency departments in the Central-West region of Brazil, lacking evidence regarding their prevalence and possible interventions that could be implemented to improve the health and well-being of nurses (Mateos-González et al., 2023). However, identifying psychosocial stressors in the workplace and implementing timely interventions to promote a positive work environment can help reduce the risk of musculoskeletal disorders in this population. Therefore, the objective of this study was to investigate the occurrence of MSDs within the nursing workforce and identify their relationships with burnout and psychological suffering.

## Methods

### Study Design

This study employed a cross-sectional design conducted at the municipal hospital and emergency department in the capital of Mato Grosso, located in the Central-West region of Brazil. The choice of this location considered the types of services provided and the number of available beds.

### Samples/Participants

For the study, 458 eligible professionals who were active and had been affiliated with the institution for more than six months were included. These professionals were approached during the previously scheduled shifts at the time of data collection as long as they had been employed in the unit for at least six months. Due to not meeting the inclusion criteria, 152 workers who were absent for any reason or refused to participate in the study after three attempts and those who had incomplete instrument completion even after two attempts ( $n = 15$ ) were excluded from the research. A simple proportion calculation was done to calculate the sample power using the G\*Power software (version 3.1.9.7). The total population of the study was considered, with a presumed prevalence of 50% (aiming to maximize the sample since there are no consolidated prevalence data for this phenomenon), a tolerable standard error of 3%, and a confidence level of 95%.

### Instruments

During the data collection process, a total of five self-administered instruments were used, which addressed Sociodemographic variables and Working Conditions and Health (QSCTS), Maslach Burnout Inventory - Human Services Survey (MBI-HSS), Self-Reporting Questionnaire (SRQ-20), and the Nordic Musculoskeletal Questionnaire (QNSO) (Borges et al., 2013; Carlotto & Câmara, 2007; Pinheiro et al., 2002; Santos et al., 2010).

The QSCTS is a semi-structured questionnaire specific to the research, consisting of 64 nominal and eight numerical variables to elucidate the sociodemographic profile of the

participants, including items related to economic, social, work, professional training, and health conditions. It has been validated for face and content, with a validation agreement index of 0.90 among expert judges (Borges et al., 2013).

The Maslach Burnout Inventory - Human Services Survey (MBI-HSS) is a Likert-type scale, three-dimensional, used in the validated Brazilian version (Carlotto & Câmara, 2007), specific for healthcare professionals. It consists of 22 items with five response alternatives ranging from "never" to "daily" to assess the risks for Burnout Syndrome (BS). The dimensions include nine items for emotional exhaustion (EE), five for depersonalization (DE), and eight for personal accomplishment (PA), with the PA score being reverse-coded. Scores were estimated based on quartiles and classified into levels. Workers with a high risk for burnout were those presenting high levels of EE and DE and low levels of PA. Workers with altered scores in at least two of the three dimensions indicating burnout tendencies were classified as moderate risk for burnout. The copyrights for using the instrument were duly obtained from the Mind Garden publisher.

The Self-Reporting Questionnaire (SRQ-20) is a Likert-type instrument validated for Brazil (Santos et al., 2010), consisting of 20 dichotomous (yes/no) questions aimed at investigating non-psychotic morbidity. It is divided into four dimensions: 4 items for depressive mood, 6 for somatic symptoms, 6 for decreased vital energy, and 4 for depressive thoughts. It is measured by counting the number of positive responses, where six or fewer positive responses correspond to a non-case and seven or more positive responses correspond to a case. The scale was authorized for use in this study on 06/05/2019 by Dr. Kionna Bernardes.

The QNSO is an instrument consisting of an anatomical map with dichotomous alternatives. The worker reports the occurrence of musculoskeletal symptoms according to the affected regions during different periods, investigated in the last 12 months and the last seven days, and reports any absences in the last year (Pinheiro et al., 2002).

During its validation for the Portuguese language in Brazil, the instrument in question showed satisfactory concurrent validity and reliability indices. This supports its use as recommended by Pinheiro et al. (2002), particularly in epidemiological studies where its application is feasible with large samples. This is due to its ease of completion and ability to measure musculoskeletal symptoms effectively.

The authorization for using this instrument is documented in the literature as being in the public domain (Angeloni et al., 2024; Pinheiro et al., 2002). Nonetheless, we decided to inform the authors responsible for its validation in Brazilian Portuguese about its use in the current study. Therefore, we sent an email providing details of this study and emphasizing the instrument's significance in gathering data related to the measured construct.

### Data Collection

Data collection occurred from October to January 2020. The administration provided the nursing professionals' schedules to the researchers for control and reference, and the health education room in the unit was made available for participants who wished to use it for questionnaire completion. However, it is essential to clarify that there was no participation, funding, or involvement from the institution or its representatives. This

research was conducted completely independently. During their work shifts, the nursing professionals were individually approached by the researchers and personally invited to participate in the study. The objectives, instruments, informed consent, and potential contributions were adequately explained; self-administered questionnaires were made available to participants who met the pre-established criteria, agreed to participate in this investigation, and signed the Free and Informed Consent Form. The return of the envelope was arranged according to the worker's preference to avoid disrupting their work routine. According to the work schedule, participants who chose to respond at another time had their envelopes collected by the responsible researchers during the next shift. Each participant had up to three attempts as the limit for both the approach and collection of materials.

### Data Analysis

The data were organized into spreadsheets and imported into the R software (R Core Team, 2021) for statistical analysis. The independent variables of the QSCTS were described using frequencies, standard deviations, medians, means, minimums, and maximums. The dependent variables were SCI (QNSO), burnout (SRQ-20), and non-psychotic mental health conditions (MBI-HSS), all of which were used to test associations. For the MBI-HSS, descriptive statistics were calculated for the scores, dimensions distribution, and burnout risk. Regression models were estimated for the dimensions and burnout in relation to variables associated with working conditions, health, and diagnosis of presenteeism. The medians of the global scores and dimensions of the MBI-HSS were compared using the Mann-Whitney or Kruskal-Wallis tests for the independent variables in the multinomial models. Additionally, Cronbach's alpha coefficient was calculated to evaluate the instrument's internal consistency for the total score and dimensions.

Descriptive statistics and distribution of the SRQ-20 dimensions were also calculated. Associations with the QSCTS variables were verified using regression models and comparative analysis of medians with the Mann-Whitney test. The same analysis was performed to evaluate the relationship with the WLQ instrument. Furthermore, the medians were compared with those of the MBI-HSS instrument using the Kruskal-Wallis test.

### Ethical Consideration

This study rigorously adhered to ethical and legal principles in accordance with the standards and guidelines governing research involving human subjects, as outlined in Resolution 466/2012 of the National Health Council. Approval for the project was granted by the Human Research Ethics Committee (CEP) at the Federal University of Mato Grosso, Rondonópolis University Campus (UFMT/CUR), with the assigned approval number 3.217.476 and CAEE: 08945519.6.0000.8088. Additionally, all instruments used in the study underwent proper validation and were obtained with prior authorization from their respective owners for inclusion in the research.

## Results

This study obtained a total sample of 291 professionals, predominantly composed of 210 (72.16%) nursing

assistants/technicians, 247 (84.88%) women, and 255 (87.63%) in the age range of 17 to 49 years. Regarding the type of employment contract with the institution, 174 (59.79%) reported Consolidation of Labor Laws (CLT) contracts, 106 (36.43%) were permanent employees, and 11 (3.78%) were outsourced or commissioned, with varying working hours. A history of absence in the last year due to sick leave was reported by 43 (14.78%) professionals, with an average duration of 39 days (min = 1, max = 210, and SD = 50.8). The presence of a leisure routine was reported by 176 (60.48%)

workers, with an average frequency of 1.6 times per week. In the past year, 24 (8.25%) workers experienced work-related incidents, with an average of 1.30, predominantly involving 15 (65.2%) incidents related to potentially contaminated sharp materials, with or without biological residues, followed by 6 (26.1%) incidents of falls from their own height and sprains. **Table 1** shows the frequency of responses provided by workers in the QNSO instrument regarding the occurrence of musculoskeletal symptoms, with the lower back being the most affected area in both investigated periods.

**Table 1** Distribution of musculoskeletal symptoms by body regions in nursing workers (n = 291)

Body Region	In the last 12 months, have you experienced any issues such as pain, tingling/numbness?	In the last 7 days, have you experienced any problems with it?
	%	%
Neck	20.62	9.62
Shoulders	19.93	6.53
Upper back	25.09	11.00
Elbows	3.44	1.37
Wrists/hands	11.68	3.09
Lower back	27.49	12.37
Hips/thighs	14.43	5.84
Knees	15.81	6.87
Ankles/feet	17.53	8.25

Regarding the results obtained in the MBI-HSS, there was a predominance of workers at moderate levels in all three dimensions, as follows: 137 (47.24%) in EE (Emotional Exhaustion), 137 (47.08%) in DE (Depersonalization), and 132 (45.36%) in RP (Reduced Personal Accomplishment). In accordance with the classification adopted in this study, 229 (78.69%) professionals presented a low risk for Burnout Syndrome (BS), while 53 (18.21%) had a moderate risk - due to the presence of two altered dimensions of the triad - thus indicating a tendency to develop the mentioned syndrome. The prevalence of BS was identified in 9 (3.09%) nursing workers who had high EE, high DE, and low RP simultaneously.

Furthermore, a total of 68 (23.37%) workers responded positively to seven or more questions in the SRQ-20, a score that suggests the presence of CMDs. The internal consistency assessed by Cronbach's Alpha coefficient for the overall scores and the specific domains of the SRQ-20 and MBI-HSS instruments was considered adequate and is described in **Table 2**, along with summary measures (mean and standard deviation), shape (skewness and kurtosis), minimum and maximum scores, and interquartile range. The obtained mean scores indicated the presence of common mental disorders, such as depressive/anxious mood, somatic symptoms, and depressive thoughts. Additionally, the results of the MBI-HSS revealed high levels of emotional exhaustion.

**Table 2** Distribution of scores for nursing professionals (n = 291) and Cronbach's alpha for MBI-HSS and SRQ-20 with their respective dimensions

Domain	Score	Mean	SD	Skewness	Kurtosis	Minimum	Maximum	Median	IQR	Cronbach's $\alpha$
<b>SRQ-20</b>										
All domains (Overall score)	0-20	3.88	4.00	1.12	3.87	0	19	3	6	0.86
Depressive/anxious mood	0-4	1.00	1.21	1.01	2.93	0	4	1	2	0.66
Somatic symptoms	0-6	1.45	1.46	0.76	2.73	0	6	1	2	0.62
Decreased vital energy	0-6	1.05	1.50	1.42	4.18	0	6	0	2	0.74
Depressive thoughts	0-4	0.37	0.76	2.41	9.27	0	4	0	1	0.55
<b>MBI-HSS</b>										
<b>Emotional Exhaustion</b>		23.05	7.74	0.15	2.42	9	45	22	12	0.83
Low	17									
Moderate	18-28									
High	29									
<b>Depersonalization</b>		9.95	4.15	0.68	2.80	5	24	9	7	0.63
Low	6									
Moderate	7-12									
High	13									
<b>Professional Accomplishment</b>		27.56	7.74	-0.52	2.94	8	40	28	10	0.82
Low	23									
Moderate	24-32									
High	33									

**Table 3** presents logistic regression analyses on the likelihood of workers with the described conditions having CMD or falling into the levels of the dimensions of EE, DE, RP, and BS compared to those who denied or did not experience the mentioned context. The main findings highlight that the presence of children, depression, migraines, anxiety, anxiety and depression, gastritis, medical leave in the past 12 months, night shift (12/36h), secondary employment, smoking, and alcohol consumption are significantly associated with a higher occurrence of CMD. Furthermore, high levels of emotional exhaustion and depersonalization are associated with the presence of anxiety and depression. Medical leave in the past

12 months is also associated with higher levels of emotional exhaustion and burnout syndrome. The presence of gastritis is associated with higher levels of emotional exhaustion and depersonalization. Being a smoker is associated with higher levels of burnout syndrome. Finally, having secondary employment is associated with higher levels of emotional exhaustion.

However, the medians of these sociodemographic, work, and health variables were also compared to those presented in the MBI-HSS and SRQ-20 instruments, and the findings supported those identified through logistic regression, as well as demonstrated other relationships, as shown in **Table 4**.

**Table 3** Odds Ratios (OR) for the occurrence of CMD, dimensions of MBI-HSS and BS according to sociodemographic, work, and health characteristics (*n* = 291)

Variable	Category	<i>p</i>	OR	95%CI
<b>Common Mental Disorders (CMD)</b>				
Children	Yes x No	<0.01	2.79	1.43; 5.89
Depression	Yes x No	<0.01	4.63	1.75; 12.65
Migraine	Yes x No	<0.01	7.29	2.85; 20.23
Anxiety	Yes x No	<0.01	9.34	3.32; 30.38
Anxiety and depression	Yes x No	<0.01	5.78	2.82; 12.09
Gastritis	Yes x No	<0.01	6.35	2.55; 16.77
Medical leave in the last 12 months	Yes x No	<0.01	4.6	2.34; 9.13
Night shift (12/36h)	Yes x No	0.01	2.35	1.28; 4.27
Night shift (12/60h)	Yes x No	0.89	0.94	0.4; 2.03
Night shift (12/36h and 12/60h)	Yes and No	0.02	1.94	1.11; 3.37
Secondary employment	Yes x No	<0.01	2.53	1.41; 4.54
Smokers	Yes x No	<0.01	3.04	1.43; 6.37
Alcohol drinkers	Yes x No	<0.01	2.76	1.56; 4.88
Engagement in leisure activities	Yes x No	0.80	0.93	0.53; 1.62
<b>MBI-HSS</b>				
<b>With anxiety and depression</b>				
Emotional Exhaustion	Low x Moderate	0.17	2.07	0.73; 5.84
	Low x High	0.02	3.59	1.23; 10.44
	Moderate x High	0.15	1.74	0.81; 3.71
Depersonalization	Low x Moderate	0.24	1.88	0.66; 5.34
	Low x High	0.02	3.66	1.27; 10.58
	Moderate x High	0.08	1.95	0.91; 4.16
<b>Engages in leisure activities</b>				
Professional Accomplishment	Low x Moderate	0.35	0.76	0.42; 1.36
	Low x High	0.12	1.65	0.88; 3.09
	Moderate x High	0.01	2.17	1.23; 3.83
<b>Medical leave in the last 12 months</b>				
Emotional Exhaustion	Low x Moderate	0.65	1.25	0.49; 3.2
	Low x High	<0.01	3.87	1.54; 9.77
	Moderate x High	<0.01	3.11	1.49; 6.48
Burnout Syndrome	Low x Moderate	0.42	2.32	0.3; 18.18
	Low x High	0.05	11.2	1; 125.64
	Moderate x High	0.02	4.82	1.24; 18.76
<b>With gastritis</b>				
Emotional Exhaustion	Low x Moderate	0.25	3.53	0.42; 29.84
	Low x High	0.01	17.4	2.23; 135.86
	Moderate x High	<0.01	4.93	1.81; 13.44
Depersonalization	Low x Moderate	0.15	4.65	0.57; 37.9
	Low x High	0.01	13.6	1.73; 107.65
	Moderate x High	0.03	2.93	1.14; 7.52
<b>Smoker</b>				
Burnout Syndrome	Low x Moderate	0.01	0.21	0.07; 0.65
	Low x High	0.59	1.6	0.29; 8.74
	Moderate x High	<0.01	7.74	1.95; 30.71
<b>Has secondary employment</b>				
Emotional Exhaustion	Low x Moderate	0.04	2.06	1.02; 4.15
	Low x High	0.15	1.79	0.81; 3.91
	Moderate x High	0.65	0.87	0.46; 1.63

**Table 4** Comparative analysis between the medians of the MBI-HSS and the SRQ-20 regarding the work and health conditions of nursing professionals ( $n = 291$ )

MBI-HSS – SRQ-20 Variables Work and Health Conditions	Positive Responses	Negative Responses	$p$
	Median (SD)	Median (SD)	
<b>MBI-HSS</b>			
<b>Emotional Exhaustion</b>	30(7.14)	22 (7.61)	<0.01
Diagnosis of gastritis	27 (8.26)	22 (7.54)	0.01
Diagnosis of GAD‡ and depression	27 (8.65)	22 (7.34)	<0.01
Sick leave in the past 12 months			
<b>Depersonalization</b>	14 (4.76)	9 (4.01)	0.03
Diagnosis of gastritis	11 (4.51)	9 (4.03)	<0.01
Diagnosis of GAD‡ and depression	11 (4.60)	9 (3.90)	0.03
Self-reported alcohol consumption	13 (5.11)	9 (4.03)	0.02
Diagnosis of GAD‡	11 (4.35)	9 (4.11)	0.04
Diagnosis of depression	12 (5.04)	9 (4.04)	0.05
Diagnosis of migraine			
<b>Professional Accomplishment</b>	27 (7.99)	30 (7.21)	0.02
Temporary employment under CLT§	30 (8.25)	27 (7.33)	0.03
Leisure routine			
<b>SRQ-20</b>			
Children	3(4.18)	1(3.3)	<0.01
Second job	5(4.63)	2(3.62)	<0.01
Smokers	5(5.45)	3(3.68)	0.01
Alcohol consumption	5(4.84)	2(3.4)	<0.01
Diagnosis of GAD‡	9(5.67)	3(3.64)	<0.01
Diagnosis of depression	7.5(5.48)	3(3.74)	<0.01
Diagnosis of migraine	9(5.44)	3(3.66)	<0.01
Diagnosis of gastritis	8(4.62)	2(3.65)	<0.01
Use of psychotropic medication	5(4.52)	2(3.75)	<0.01
Work-related accidents	5.5(4.66)	3(3.91)	0.03
	5.5(4.66)	3(3.91)	0.03

Note: ‡GAD = Generalized Anxiety Disorder; §CLT = Consolidation of Labor Laws

**Table 5** presents the risks of occurrence of musculoskeletal symptoms related to levels of EE, DE, RP, and SB. Regarding musculoskeletal symptoms, workers with a history of pain/tingling in the neck in the past 12 months ( $p < 0.01$  and OR = 3.79), shoulders ( $p < 0.01$  and OR = 2.75), upper back ( $p < 0.01$  and OR = 4.31), and lower back ( $p < 0.01$  and OR = 3.53) were associated with the occurrence of CMD.

When evaluating the history of problems in the past seven days prior to the survey, all the relationships as mentioned above were also significant with the mentioned disorder, as shown by the scores for the neck ( $p < 0.01$  and OR = 5.41), shoulders ( $p = 0.01$  and OR = 3.25), upper back ( $p < 0.01$  and OR = 5.37), and lower back ( $p = 0.01$  and OR = 2.72).

**Table 5** Odds ratio (OR) between the occurrence of musculoskeletal symptoms according to the dimensions of MBI-HSS and BS ( $n = 291$ )

Body Region MBI-HSS and BS	Pain/tingling in the last year						Issues in the last 7 days					
	High x Low			Moderate x Low			High x Low			Moderate x Low		
	OR	95%CI	$p$	OR	95%CI	$p$	OR	95%CI	$p$	OR	95%CI	$p$
<b>Neck</b>												
EE	2.54	1.16-5.55	0.02	1.17	0.55-2.49	0.69	3.01	1.02-8.92	0.05	1.15	0.38-3.49	0.81
DE	2.13	0.92-4.94	0.08	1.93	0.89-4.19	0.1	2.78	0.71-10.91	0.14	3.45	0.98-12.17	0.05
RP	1.42	0.63-3.2	0.4	1.66	0.8-3.47	0.18	0.51	0.14-1.83	0.3	1.48	0.58-3.74	0.41
BS	1.24	0.25-6.16	0.8	1.71	0.86-3.38	0.12	1.38	0.16-11.64	0.77	1.96	0.81-4.77	0.14
<b>Shoulders</b>												
EE	2.64	1.18-5.9	0.02	1.29	0.6-2.81	0.51	2.18	0.63-7.56	0.22	1	0.28-3.52	1.00
DE	2.37	0.95-5.88	0.06	2.7	1.18-6.19	0.02	2.03	0.49-8.42	0.33	1.92	0.51-7.19	0.34
RP	2.78	1.14-6.77	0.02	2.54	1.1-5.86	0.03	1.6	0.37-6.94	0.53	2.24	0.61-8.3	0.23
BS	1.2	0.24-5.98	0.82	1.23	0.6-2.53	0.57	1.66	0.2-14.14	0.64	0.52	0.12-2.34	0.4
<b>Upper back</b>												
EE	2.67	1.27-5.6	0.01	1.34	0.66-2.7	0.42	3.72	1.39-9.99	0.01	0.74	0.25-2.23	0.6
DE	2.1	0.95-4.61	0.07	2.12	1.03-4.36	0.04	5.32	1.46-19.36	0.01	2.99	0.84-10.69	0.09
RP	2.51	1.16-5.44	0.02	1.95	0.94-4.04	0.07	1.48	0.57-3.84	0.42	0.86	0.34-2.21	0.76
BS	1.66	0.4-6.87	0.48	1.57	0.82-3.01	0.18	5.86	1.35-25.42	0.02	3.07	1.35-6.97	0.01
<b>Lower back</b>												
EE	1.98	0.93-4.23	0.08	2.09	1.06-4.13	0.03	3.01	1.02-8.92	0.05	2.21	0.79-6.2	0.13
DE	1.9	0.88-4.13	0.1	2.37	1.18-4.75	0.01	2.33	0.84-6.5	0.11	1.65	0.62-4.39	0.31
RP	1.83	0.9-3.71	0.09	1.27	0.66-2.47	0.47	1.69	0.69-4.13	0.25	0.76	0.3-1.88	0.55
BS	3.29	0.86-12.66	0.08	0.77	0.38-1.56	0.47	3.9	0.92-16.56	0.06	1.19	0.49-2.9	0.71

The results from **Table 6** indicate statistically significant associations between the presence of musculoskeletal symptoms, measures of mental health, and professional burnout. Concerning the neck region, individuals who reported pain or tingling in the last year showed higher medians in both the SRQ-20 (Mdn = 6.00) and the EE dimension of the MBI-HSS (Mdn = 27.00;  $p < 0.01$ ). The same applies to the shoulder region, where the median for SRQ-20 was 5.50, MBI-HSS was 6.50, and DE was 11.00 for those with pain or tingling ( $p < 0.01$ ,

0.01, and 0.05, respectively). This same pattern was observed for the upper back, with significant associations in the medians of SRQ-20 (Mdn = 6.00) and the dimensions of EE (Mdn = 26.00) and DE (Mdn = 10.00) of MBI-HSS ( $p < 0.01$ ,  $< 0.01$ , and 0.07, respectively). Concerning the lower back, it is noted that those professionals who reported pain or tingling had much higher medians in SRQ-20 (Mdn = 5.00) and the EE dimension of MBI-HSS (Mdn = 25.50) ( $p < 0.01$  and 0.02, respectively).

**Table 6** Comparative analysis between the medians of the SRQ-20 and the MBI-HSS according to the presence of musculoskeletal symptoms by body region and investigated periods ( $n = 291$ )

Body Region	Pain/tingling in the last year			Issues in the last 7 days		
	Yes	No	<i>p</i>	Yes	No	<i>p</i>
SRQ-20	Mdn (SD)	Mdn (SD)		Mdn (SD)	Mdn (SD)	
<b>Neck</b>						
SRQ-20	6.00(4.46)	2.00(3.55)	<0.01	7.00(4.22)	3.00(3.87)	<0.01
MBI: Emotional Exhaustion	27.00(8.19)	22.00(7.47)	<0.01	28.00(7.76)	22.00(7.61)	<0.01
MBI: Depersonalization	10.50(4.08)	9.00(4.15)	0.05	10.50(4.05)	9.00(4.15)	0.08
MBI: Personal Accomplishment	28.00(7.11)	28.00(7.91)	0.68	25.50(6.15)	28.00(7.89)	0.16
<b>Shoulders</b>						
SRQ-20	5.50(4.55)	2.00(3.65)	<0.01	6.00(5.21)	3.00(3.81)	<0.01
MBI: Emotional Exhaustion	26.50(8.18)	22.00(7.52)	0.01	28.00(8.79)	22.00(7.63)	0.08
MBI: Depersonalization	11.00(4.01)	9.00(4.16)	0.05	11.00(3.99)	9.00(4.15)	0.13
MBI: Personal Accomplishment	31.00(7.04)	27.00(7.86)	0.02	28.00(6.70)	28.00(7.82)	0.77
<b>Upper Back</b>						
SRQ-20	6.00(4.50)	2.00(3.39)	<0.01	7.00(4.30)	2.00(3.71)	<0.01
MBI: Emotional Exhaustion	26.00(7.71)	22.00(7.59)	<0.01	29.00(7.97)	22.00(7.52)	<0.01
MBI: Depersonalization	10.00(4.04)	9.00(4.17)	0.07	11.00(4.24)	9.00(4.08)	0.01
MBI: Personal Accomplishment	30.00(6.98)	27.00(7.89)	0.01	30.00(6.95)	28.00(7.84)	0.48
<b>Lower Back</b>						
SRQ-20	5.00(4.63)	2.00(3.39)	<0.01	6.00(4.65)	3.00(3.81)	<0.01
MBI: Emotional Exhaustion	25.50(8.32)	22.00(7.40)	0.02	26.50(7.66)	22.00(7.66)	0.01
MBI: Depersonalization	10.00(4.01)	9.00(4.19)	0.08	11.00(4.47)	9.00(4.08)	0.05
MBI: Personal Accomplishment	30.00(7.56)	27.00(7.74)	0.02	31.00(7.53)	28.00(7.77)	0.25

## Discussion

In this study, the occurrence of musculoskeletal disorders among nursing professionals was investigated, focusing on the lumbar region, upper back, neck, and shoulders. The research found that problems in these areas are present among the analyzed professionals, significantly increasing the risk of high emotional exhaustion and doubling the risk of burnout syndrome in workers with moderate risk.

The effect of work stress and its association with physical changes, such as musculoskeletal disorders, or mental disorders, such as depression, has been studied in the nursing team, but it is not yet well-established in the literature regarding the prevalence of these comorbidities. It is worth noting that studies evaluating the association between musculoskeletal disorders and mental disorders, along with physical and psychosocial work conditions, are rare (Zhang et al., 2020). Contrary to the authors' expectations, the study did not find any association between comorbidities related to musculoskeletal disorders and depression with the tested work conditions. This includes factors such as psychological and physical outcomes, support, and control at work. Nevertheless, the research revealed that half of the nurses reported experiencing musculoskeletal disorders in at least one of the six evaluated body regions in this study (Zhang et al., 2020).

A review study carried out with 132 articles with the aim of estimating the prevalence of musculoskeletal pain identified in

its results that the lumbar, shoulder, and neck regions reached the highest percentages (Davis & Kotowski, 2015). A study carried out in Iran to identify the influence of work on musculoskeletal injuries among nursing professionals highlights in its results other problems such as pain, tingling, and numbness, most recurrent in the lower and upper part of the back and neck, and reinforces that the most common regions affected are the upper and lower back, knees, shoulders and neck (Bazazan et al., 2019). The literature consistently highlights a negative correlation between the prevalence of musculoskeletal disorders (MSDs) in all body regions, except the hips and thighs, and the job satisfaction level of nurses (Bazazan et al., 2019). It is noteworthy that these researchers also observed that nursing professionals with a high or moderate level of job satisfaction have a lower frequency of musculoskeletal disorders when compared to those with lower job satisfaction.

In this context, it is crucial to highlight the findings of a study that revealed a correlation between work shifts (both day and night) and job satisfaction levels with the prevalence and severity of musculoskeletal symptoms among nurses (Bazazan et al., 2019). The prevalence of symptoms in the wrist/hands, hips/thighs, ankles/feet, upper back, and knees regions was significantly lower in daytime working nurses. Our study showed that professionals working night shifts had a significant association with MSDs, with no risks for the 30-hour night shift workers or in the combined analysis of those working

30 and 40 hours, demonstrating the impacts related to the workload associated with the night shift.

Regarding common mental disorders, it is observed that having children presented a relationship in both tests evaluated in this study. Researchers have demonstrated significant correlations between work and family. Associations between psychological demands, physical demands, work-family conflict, and job control are frequent (Zhang et al., 2020). In the same study, it was evidenced that younger age was significantly associated with more work-family conflict and higher depression scores but was not associated with musculoskeletal disorders. Another study also reports that nurses with children, in addition to their formal work hours, dedicate their time to family, which can cause more emotional and physical strain (Fernandes et al., 2018).

When evaluating depression, it showed a relationship with depersonalization and significant chances of MSDs that corroborated with the medians. A study highlighted a moderate positive correlation between the emotional exhaustion dimension and the total score of depressive symptomatology, and participants classified with high emotional exhaustion, high depersonalization, and low professional accomplishment had higher levels of depressive symptoms (Vasconcelos et al., 2018). It further reinforces that individuals with burnout were more frequent among groups with depressive symptomatology compared to those without it (Vasconcelos et al., 2018). The literature highlights that the higher the level of emotional exhaustion and depersonalization, the higher the frequency of depressive symptomatology, and the lower the professional accomplishment, the higher the depressive symptomatology, with these latter two being inversely proportional (Vasconcelos et al., 2018; Zhang et al., 2020).

Additionally, it was evidenced that smokers have a higher chance for MSDs, corroborated by the medians, and significant chances for burnout. Tobacco consumption also showed statistical significance in a study conducted with the nursing team in an intensive care unit (Fernandes et al., 2018). It can be inferred that emotional exhaustion, reduced professional accomplishment, and depersonalization may be associated with increased tobacco consumption as a form of escape.

### Implications for Nursing

The findings make a unique and significant contribution to the existing literature, setting itself apart from previous studies that separately investigated the impact of work-related stress on physical and mental health. Unlike prior research, this study delves into the prevalence of comorbidities. While earlier studies acknowledged the heightened prevalence of musculoskeletal pain among nurses, particularly in the lumbar, neck, and shoulder regions, this study goes further, revealing a substantial increase in emotional exhaustion and a twofold rise in the risk of burnout syndrome among workers with a moderate risk of disability due to musculoskeletal disorders. Thus, this study addresses gaps in the literature by comprehensively examining the interaction between musculoskeletal disorders, mental health outcomes, and various work-related factors within the nursing context.

### Limitations

The study design involved data collection at a single point in time, which limited our ability to establish causal relationships

between variables. Additionally, the samples were restricted to a specific caregiving population, which may limit the transfer of results to other medical settings and populations. Although efforts have been made to control for relevant variables, there may still be confounding factors that are not taken into account in the analyses, and reliance on self-reported data can lead to memory bias and subjective interpretation.

## Conclusion

The study's results highlight the prevalence and relevance of MSDs and their impact on the mental health of caregivers. The data emphasize the importance of addressing work-related factors and promoting caregiver well-being. They emphasize the need for MSD prevention and treatment, improved working conditions, and caregiver mental health support. It underlines the need for proactive measures. Implementing interventions based on these insights can improve overall caregiver well-being, resulting in better patient care, lower healthcare costs, increased job satisfaction, and improved caregiver retention. By doing so, the prevalence of MSDs and their impact on mental health and explored related work-related factors were identified, providing valuable insights to policymakers, healthcare organizations, and public health professionals.

### Declaration of Conflicting Interest

The authors declared no conflict of interest in this study.

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MSdA, AFLdS, IACM, & ARdS: Conception and design of the study; Analysis and interpretation of data; Provision of study material; Critical revision; Final approval of the study.

BRC, & AROS: Analysis and interpretation of data; Provision of study material; Critical revision; Final approval of the study.

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## Data Availability

Datasets for this study are available from the corresponding author.

## Declaration of Use of AI in Scientific Writing

The authors used Bard AI to review the quality of the English writing during the preparation of this work without content creation. After using the tool/service, the authors carefully reviewed and edited the content as needed and took full responsibility for the publication's content.

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