Musculoskeletal pain in healthcare professionals working in COVID-19 Intensive Care Units: multicenter and cross-sectional study

Dor musculoesquelética em profissionais de saúde que atuaram em Unidades de Terapia Intensiva de COVID-19: estudo multicêntrico e transversal

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ABSTRACT

BACKGROUND AND OBJECTIVES: During the COVID-19 pandemic, health professionals have experienced a work overload that may be associated with increased pain intensity. The aim of this study was to analyze the frequency and intensity of musculoskeletal pain in the different anatomical regions reported by health professionals who worked in Intensive Care Units (ICU) during the pandemic and to investigate associations between clinical variables.

METHODS: This is a cross-sectional, analytical, quantitative and multicenter study carried out in six ICU between July 2021 and February 2022. The Nordic Questionnaire of Musculoskeletal Symptoms (QNSO) was used for data collection, as well as a questionnaire prepared by the researchers on sociodemographic, work and clinical data, and the visual numeric scale (VNS) for pain assessment. Analyses were carried out using descriptive and inferential statistics.

HIGHLIGHTS
• 79.5% of health professionals working in ICU say they experience musculoskeletal pain
• The presence of pain is associated with regular or poor general health and the length of time healthcare professionals have worked in the ICU
• The musculoskeletal disorders reported in the last 12 months by healthcare professionals working in the ICU were: pain, tingling or numbness, mostly in the neck and upper back.

RESULTS: The sample consisted of 205 health professionals. With regard to pain intensity, according to the visual analog scale (VAS), an average of 3.76 was observed. The analysis of the association between the variables indicated a greater intensity of pain in females, with a higher frequency of mild and moderate pain, age over 40, in the professional categories of nursing technicians and doctors. The presence of severe pain was associated with poor general health and shorter time in professional practice.
CONCLUSION: Most of the professionals reported pain of varying intensity and in different anatomical regions, the most frequently cited being the upper back and neck. Musculoskeletal disorders are directly related to work activity, age, gender and lack of leisure time.
Keywords: Nursing, Occupational health, Work activity.

RESUMO

JUSTIFICATIVA E OBJETIVOS: Durante a pandemia da COVID-19, os profissionais de saúde passaram por uma sobrecarga de trabalho que pode estar associada com o aumento da intensidade da dor. O objetivo deste estudo foi analisar a frequência e intensidade da dor musculoesquelética nas diferentes regiões anatômicas referidas por profissionais de saúde que atuaram em Unidades de Terapia Intensiva (UTI) durante a pandemia e investigar associações entre as variáveis clínicas.
MÉTODOS: Trata-se de um estudo transversal, analítico, quantitativo e multicêntrico, realizado em seis UTI, entre julho de 2021 e fevereiro de 2022. Para coleta de dados foi utilizado o Questionário Nórdico de Sintomas Osteomusculares (QNSO), bem como um questionário elaborado pelas pesquisadoras acerca de dados sociodemográficos, laborais e clínicos, e a escala visual numérica (EVN) de avaliação da dor. As análises foram feitas por meio de estatística descritiva e inferencial.
RESULTADOS: A amostra foi de 205 profissionais de saúde. No que se refere à intensidade da dor, segundo a escala analógica visual (EAV), observou-se uma média de 3,76. A análise da associação entre as variáveis indicou maior intensidade de dor no sexo feminino, com maior frequência de dor leve e moderada, idade maior que 40 anos, nas categorias profissionais de técnicos de enfermagem e médicos. A presença de dor intensa está associada ao estado de saúde geral ruim e ao menor tempo de atuação profissional.

CONCLUSÃO: A maioria dos profissionais referiu dor de intensidade variada e em diferentes regiões anatômicas, sendo as mais citadas: parte superior das costas e pescoço. Os distúrbios musculoesqueléticos estão diretamente relacionados à atividade laboral exercida, à idade, ao sexo e à falta de tempo disponível para lazer.
Descritores: Atividade laboral, Enfermagem, Saúde ocupacional.

INTRODUCTION

During the COVID-19 pandemic, health professionals have been subjected to a workload not experienced in a long time[1]. Those who worked on the front line were more exposed to the virus during this period, with a higher risk of contamination compared to other areas of work, due to direct contact with contaminated individuals. The long working hours experienced, as well as the physical and psychological stress, represented an additional risk to the health of these workers[2]. The combination of these factors can trigger the development of musculoskeletal symptoms, such as pain[3].

Among musculoskeletal disorders (MSD), pain is the symptom with the highest frequency rate among health professionals[4]. The work environment of these professionals is permeated by risk factors that predispose to the onset of pain, especially when combined with an unsuitable environment, an increased demand for services and insecurity, as occurred during the COVID-19[5] pandemic. The occupational risks of developing symptoms of pain, fatigue, discomfort, limitation of movement, among others, occur in different types of work and are often responsible for temporary or permanent disabilities[6].

National and international studies on pain among health professionals in hospital care indicate that most of those surveyed complained of pain while working during the pandemic, as well as psychological symptoms. Therefore, in times of health crisis, complaints of pain can be increased due to the changes brought about by the new scenario[2,7,8]. Health professionals working in a wide variety of fields have shown that pain is a consequence of their work activities. The presence of musculoskeletal symptoms is directly related to their work and consequently impairs their physical functions, which reflects on their work performance[9-11]. Given that the work carried out in Intensive Care Units (ICU) plays a fundamental role in restoring the health of critically ill patients, it is important that the team is prepared to provide quality care. For this to happen, the professionals on the team must also receive care. Knowing that pain can be prevented and treated early, avoiding harmful injuries, it is important to know and identify these factors, in order to avoid further damage to workers' health. In view of the above, this study sought to analyze the frequency and intensity of musculoskeletal pain in the different anatomical regions reported by health professionals who worked in ICU treating COVID-19 and to associate them with clinical variables.

METHODS

This is a cross-sectional, analytical, quantitative and multicenter study carried out in the ICU of cities in the *Missioneira* region, Rio Grande do Sul state, Brazil.

Of the 46 municipalities in the delimited area, those without a medium or large general hospital, and consequently those without an ICU, were excluded. The municipalities included were Ijuí, Santa Rosa, Santo Ângelo, Três de Maio and São Borja.

There were a total of eight eligible hospitals, including three in the city of Ijuí, two in the city of Santo Ângelo, one in Três de Maio, one in São Borja and one in Santa Rosa. Of these, two hospitals did not agree to take part in this research, making a total of six hospitals with 265 health professionals working in these locations who were eligible to take part in this study.

Population and selection criteria

This research was conducted on a population of 265 ICU health professionals, including doctors, nurses, nursing technicians, physiotherapists and nutritionists.

Eligibility criteria were met by health professionals who provided care in these units during the pandemic, who were assigned to the unit during the data collection period, regardless of how long they had been there. Those who, during data collection, were on vacation or on leave were excluded, as were health professionals who, after six attempts to contact them, did not return their calls to participate in the survey, as well as those who were no longer assigned to the unit during the data collection period.

Instruments used for data collection

Data was collected using a self-administered online instrument built in Google Forms, containing a sociodemographic, work and clinical questionnaire, the Nordic Musculoskeletal Symptom Questionnaire (QNSO), and the Visual Numerical Scale (VNS) for assessing pain. The participant was sent a link to access the questionnaire online, allowing them to answer it at the time and place they considered most appropriate. The questionnaire was sent via email or Whatsapp®, depending on the means of contact the participant provided. Data collection took place between July 2021 and February 2022.

Regarding the data collection period, according to the Brazilian Ministry of Health, in the overview of ICU bed occupancy, published on September 22, 2021, the occupancy rate, until April 29, 2021, was around 80% in the state of Rio Grande do Sul[12].

A sociodemographic, work and clinical questionnaire developed by the researchers was used, which included questions about the participants' sociodemographic characterization, personal data, work, health conditions, health at work, physical activities and leisure. This instrument was developed for this research and validated through an unpublished pilot study. QNSO[13] consists of dichotomous choices (yes or no) regarding the occurrence of MSDs in the last 12 months in nine anatomical regions: neck, shoulders, upper back, elbows, wrists/hands, lower back, hips/thighs, knees and ankles/feet[13]. Pain intensity was assessed using VNS. It is a simple and effective instrument, with a score from zero to 10, where zero represents "no pain" and 10 "maximum pain". Pain levels are

classified as follows: no pain = 0; mild pain = 1 to 4; moderate pain = 5 to 6; and severe pain = 7 to 10[14].

Statistical analysis

The data from this study was entered into a database, with independent double entry, in Microsoft Office Excel. Possible errors and/or inconsistencies were corrected and the data transferred to the Statistical Package for Social Science (SPSS) software, version 22.0, for descriptive and inferential statistical analysis.

Descriptive statistics were used to characterize the data. Descriptive data was presented as frequencies, and quantitative data as means and standard deviations, according to the normal distribution of the data (Kolmogorov-Smirnov test). Chi-Square or Fisher's Exact association tests were used to infer the data; a p-value of less than 0.05 was assumed to be significant.

The project was approved by the Brazilian National Research Ethics Committee (*Comissão Nacional de Ética em Pesquisa - CNPQ*), under opinion number 30792920.5.1001.5350.

RESULTS

265 professionals were recruited according to the inclusion criteria, of whom 205 actually took part, representing 77.3% of the study population. Of these, 76.6% were female and 46.3% were under the age of 30. With regard to pain intensity, a mean of 3.76 (standard deviation 2.77) was observed using EVN, of which 35.60% rated their pain as mild, 21.46% reported mode-

rate pain, 22.43% reported severe pain, and 20.48% said they had no pain.

Considering the association between sociodemographic and work-related characteristics and pain, there was a statistically significant difference between musculoskeletal pain and gender (p=0.022), with greater pain intensity among female health professionals. There was a significant difference between age groups (p=0.014), with greater pain intensity in those over 40. With regard to professional category, there was a significant difference (p=0.044), with nursing technicians and doctors having the highest pain intensity.

Those who considered their state of health to be fair or poor, and those who had no leisure time, reported severe pain more often (p<0.001). With regard to length of professional experience, those who had been working for between 5 and 10 years reported more severe pain (p<0.001).

The other variables were not associated with pain intensity; the data are shown in table 1.

When evaluating the frequency of MSD by anatomical region, health professionals mentioned pain, tingling or numbness in the neck (43.9%) and upper back (88%) in the last 12 months before answering the survey. When asked about their limitations in carrying out daily activities in the last 12 months, the majority said that pain in the lower back was the biggest impediment (8.8%), and was responsible for seeking a consultation with a health professional in the same period (table 2).

Table 1. Evaluation of pain intensity in health professionals (n=205) working in COVID Intensive Care Units in six hospitals, RS, Brazil, 2021/2022

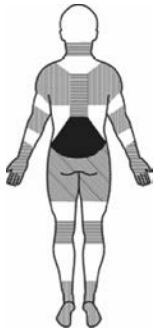| Features		Pain assessment					
		n (%)	No pain	Mild pain	Moderate pain	Severe pain	p-value
Gender	Female	157 (76.6)	27 (17.2)	53 (33.8)	40 (25.5)	37 (23.6)	**0.022***
	Male	48 (23.4)	15 (31.3)	20 (41.7)	4 (8.3)	9 (18.8)	
Age (years)	18 to 30	95 (46.3)	16 (16.8)	38 (40.0)	22 (23.2)	19 (20)	*0.014***
	31 to 40	75 (36.6)	20 (26.7)	29 (38.7)	11 (14.7)	15 (20)	
	> 40	35 (16.9)	6 (17.14)	6 (17.14)	11 (31.42)	12 (34.28)	
Marital status	With a partner	105 (51.2)	23 (21.9)	37 (35.2)	26 (24.8)	19 (18.1)	*0.206
	No partner	100 (48.8)	19 (19)	36 (36)	18 (18)	27 (27)	
Profession	Nurse	71 (34.6)	17 (23.9)	27 (38)	16 (22.5)	11 (15.5)	**0.044***
	Physiotherapist	34 (16.6)	4 (11.8)	18 (52.9)	9 (26.5)	3 (8.8)	
	Doctor	25 (12.2)	4 (16)	8 (32)	5 (20)	8 (32)	
	Nutritionist	2 (1)	0 (0)	0 (0)	0 (0)	2 (100)	
	Nursing technician	73 (35.6)	17 (23.3)	20 (27.4)	14 (19.2)	22 (30.1)	
Length of professional career	1 month to 1 year	88 (42.9)	16 (18.2)	31 (35.2)	23 (26.1)	18 (20.5)	*0.010***
	1 year to 5 years	57 (27.8)	16 (28.07)	27 (47.36)	5 (8.8)	9 (15.78)	
	5 to 10 years	36 (17.6)	5 (13.9)	7 (19.4)	9 (25)	15 (41.7)	
	> 10 years	24 (11.7)	5 (20.80)	8 (33.3)	7 (29.20)	4 (16.7)	
Work shift	Morning	38 (18.5)	9 (23.7)	14 (36.8)	10 (26.3)	5 (13.2)	**0.795
	Morning/afternoon	35 (17.1)	7 (20)	11 (31.4)	9 (25.7)	8 (22.9)	
	Mixed/change of time off	42 (20.5)	7 (16.7)	17 (40.5)	8 (19)	10 (23.8)	
	Afternoon	25 (12.2)	17 (26.2)	21 (32.3)	12 (18.5)	15 (23.1)	
	Night	65 (31.7)	2 (8)	10 (40)	5 (20)	8 (3.9)	

Table 1. Evaluation of pain intensity in health professionals (n=205) working in COVID Intensive Care Units in six hospitals, RS, Brazil, 2021/2022 – continued

Features			Pain assessment				
		n (%)	No pain	Mild pain	Moderate pain	Severe pain	p-value
Weekly workload	30 hours	41 (20)	8 (19.5)	19 (46.3)	10 (24.4)	4 (9.8)	**0.255
	36 hours	111 (54.1)	28 (25.2)	38 (34.2)	21 (18.9)	24 (21.6)	
	40 to 44 hours	27 (13.2)	2 (7.4)	10 (37.03)	6 (22.22)	9 (33.33)	
	Other	26 (12.7)	4 (15.4)	6 (23.1)	7 (26.9)	9 (34.6)	
Health condition	Excellent	21 (10.3)	6 (28.6)	10 (47.62)	2 (9.5)	3 (14.28)	**0.001***
	Good	126 (61.5)	31 (24.6)	49 (38.9)	27 (21.4)	19 (15.1)	
	Fair	53 (25.9)	5 (9.4)	13 (24.5)	15 (28.3)	20 (37.7)	
	Poor	5 (2.4)	0 (0)	1 (20)	0 (0)	4 (80)	
Physical activity	Yes	135 (65.9)	31 (22.96)	51 (44.51)	21 (17.62)	32 (23.70)	*0.091
	No	70 (34.1)	11 (15.7)	22 (31.4)	23 (32.9)	14 (20)	
Leisure time	Yes	90 (43.9)	28 (31.1)	38 (42.2)	17 (18.9)	7 (7.8)	*0.000***
	No	115 (56.1)	14 (12.2)	35 (30.4)	27 (23.5)	39 (33.9)	
Have a health problem	Yes	45 (22)	6 (13.3)	16 (35.6)	9 (20)	14 (31.1)	*0.330
	No	160 (78)	36 (22.5)	57(35.6)	35 (21.9)	32(20)	

*Chi-Squared test; ** Fisher's Exact Test, significant for p<0.05; *** significant, p<0.05.

Table 2. Frequency of musculoskeletal disorders by anatomical region in the last 12 months, by health professionals (n = 205) who worked in COVID Intensive Care Units in six hospitals, RS, Brazil, 2021/2022

Musculoskeletal symptoms		PTP	UPDA	CHP	RP
Body division		n (%)	n (%)	n (%)	n (%)
	Neck	90 (43.9)	9 (4.4)	18 (8.8)	31 (15.1)
	Shoulders	77 (37.6)	14 (6.8)	18 (8.8)	28 (13.7)
	Upper back	78 (88)	15 (7.3)	23 (11.2)	30 (14.6)
	Elbows	9 (4.4)	0 (0)	1 (0.5)	2 (1)
	Fists or hands	41 (20)	5 (2.4)	6 (2.9)	15 (7.3)
	Lower back	76 (37.1)	18 (8.8)	26 (12.7)	30 (14.6)
	Hips/thighs	20 (9.8)	3 (1.5)	9 (4.4)	10 (4.9)
	Knees	41 (20)	7 (3.4)	5 (2.4)	8 (3.9)
	Ankles/feet	57 (27.8)	6 (2.9)	7 (3.4)	19 (9.3)

PTP = problems such as pain and tingling/numbness; UPDA = unable to perform daily activities; CHP = consulted a health professional; RP = problem such as pain and tingling/numbness in the last seven days.

With regard to the assessment of pain, tingling or numbness in the last 7 days, the highest frequency was in the neck (15.1%), upper back (14.6%) and lower back (14.6%).

DISCUSSION

The COVID-19 pandemic has brought new work scenarios to health professionals, especially those on the front line of combating the disease, which has required a high workload with a consequent increase in complaints of physical symptoms, such as musculoskeletal pain. This is borne out by the results found in this study, in which the majority of interviewees said they had pain in one or more anatomical regions, with varying intensities, related to the work process during the pandemic.

Pain can be related to postural issues and the increased demands of caring for critically ill patients, requiring health professionals to make a greater effort than they are used to, which can lead to physical and mental exhaustion, as well as causing limitations in the activities carried out in their routine and increasing the rates of leave and absenteeism from work[15]. Given that physical symptoms are associated with risk factors inherent to the work process, in times of crisis, such as a pandemic, the percentage of complaints of these symptoms tends to increase, as demonstrated in this study. Among the participants, 79.52% mentioned work-related pain of varying intensity in some anatomical region. This has also been a frequent result in other studies, as shown by a survey carried out during the COVID-19 pandemic, which found that musculoskeletal symptoms were present in the majority of health professionals who worked directly with infected patients (95.23%), who reported symptoms such as pain, tingling or numbness in some region of the body in

the previous 12 months, and half of the participants required specialized care to relieve the symptoms[16].

Pain can be disabling, depending on its intensity and the anatomical region affected[17]. Of the different anatomical regions, the most affected in the previous 12 months was the upper back, followed by the neck. A study of 260 hospital nurses found similar results, with the main complaint being pain in the lumbar spine, followed by the cervical and thoracic regions[18]. Studies have considered that the multifactorial causes of musculoskeletal alterations are related to occupational factors, such as: incapacity for work, absenteeism from activities, heavy or repetitive physical work, inadequate postures, heavy lifting, and external bending and twisting of the neck or back[10].

Physical factors at work are responsible for the appearance of pain symptoms, especially in the lumbar region, neck and shoulders. These are chronic and gradual changes that affect tendons, muscles, joints, nerves and intervertebral discs, related to micro-traumas from repetitive strain. These alterations are observed when the person's physical demands and the overload of work in extraordinary situations do not coincide[2]. Such situations were high in the workplace during the pandemic, which meant that health professionals faced unusual situations, increasing physical and psychological demands, with greater chances of developing health problems. These data corroborate and justify that the work overload that occurred during the pandemic was an important factor in causing pain in health professionals and demonstrates the need for measures to protect the health of these workers.

Regarding the impossibility to carry out daily activities in the previous 12 months due to pain, tingling or numbness, the most frequently mentioned areas were the lower and upper back. Also, in the previous seven days, most professionals mentioned the neck region, followed by the upper and lower back. These findings are compatible with the results of a study in which half of the sample reported back pain as the predominant musculoskeletal discomfort, followed by discomfort in the lower body[19].

Also, in a study comparing health professionals who worked on the front line to combat COVID-19 with professionals who did not, there was a predominance of limitations in normal activities due to pain in the lower back and neck, both with the same percentage. The increase in musculoskeletal complaints by health professionals during the COVID-19 pandemic is related to changes in the work context, such as work overload, inadequate rest time and irregular work shifts[2]. Regarding the need for professional help to treat pain in the previous 12 months, the majority of participants mentioned having had to seek professional help to deal with pain symptoms. This result was also observed in a study of nursing professionals at a nephrology center[20]. Seeking treatment and pain relief is necessary to improve work performance, given that the MSD reported are work-related. It can be seen that occupational illnesses are responsible for a high rate of sick leave, generating a negative impact on patient care and institutions[20]. The data found here demonstrates the need to develop strategies to improve the quality of the work of ICU health professionals, with the aim of reducing their illnesses. These findings should guide the development of strategies to prevent these important health problems among healthcare workers.

In the evaluation of MSD among health professionals who reported severe pain, the majority were female. These data corroborate the study that evaluated 1,290 health professionals working on the front line of the fight against COVID-19 in the United Arab Emirates and identified a predominance of pain for females and in nursing. This data may be justified by the fact that there is a predominance of women in the health field, especially in nursing[19]. In addition, pain may be associated with the role performed by the professional, and in this sense, nursing professionals are the group that experiences the most changes related to the work environment and its organization[21]. It should be noted that nursing technicians seem to be more subject to ergonomic changes which can cause greater pain intensity[22]. No studies were found on doctors and pain assessment for comparison purposes.

As for the age variable, the highest percentage of professionals with severe pain was found among those over 40 years old and those who had worked for between 5 and 10 years. A study carried out with nurses to assess musculoskeletal pain corroborates the findings of this study, as the highest rates of pain were found among those who had been working between 5 and 10 years[23]. Another study found that musculoskeletal pain increased with age, especially in the elbows and ankles; on the other hand, back pain decreased[18]. Professionals who are able to work productively have a high frequency of musculoskeletal pain related to their work activities, which can compromise their performance and impair care[24].

Regarding leisure time, those who reported not having enough leisure time reported severe pain (33.9%), which was also identified in a study that showed that leisure activity improves quality of life and reduces stress, both of which are related to pain. The decrease in leisure activities may be related to social isolation during the pandemic, which has left people more reclusive and with increased workloads in the workplace, due to the increase in activities[20]. This data draws attention to the importance of practicing leisure activities, even in times of crisis, given that the lack of them has a negative influence on the individual's quality of health, favoring the symptoms of pain, as evidenced in this study.

Most of the participants in this survey rated their state of health as good. Among the participants who rated their state of health as fair, 37.7% reported severe pain, which suggests that workers who already had a health problem were more prone to pain than others. Similar findings were found in a study which found that 74.7% of participants rated their state of health as good, however this was carried out before the COVID-19 pandemic and this variable was not associated with the intensity of pain[25]. In the pandemic scenario, health workers are exposed to various risk factors that can affect their state of health, both physical and mental. Among these, mus-

culoskeletal alterations stand out, as they have increased the reports of pain symptoms[16].

The pandemic has worsened the physical health of workers in various fields, with an increase in the prevalence of pain complaints[1]. Given all the changes brought about by the pandemic and the increased workload, health professionals have had to exert a great deal of physical and psychological effort to carry out their work activities, which has left them more vulnerable to developing pain symptoms. Considering that such symptoms can be prevented and avoided, it is essential that managers work to ensure that strategies are put in place to avoid worsening workers' health, minimizing the damage to health and the quality of care provided caused by unfavorable working conditions.

Limitations of the present study include the fact that the data was collected after the peak of the overload in the health system, and therefore the overload of health professionals working in ICU. Despite the ease of collecting data online, certain limits apply to the method used, such as not having access to professionals who worked in the ICU at other times, due to the relationship between the collection and the peak of the pandemic. The strengths of this study lie in its multicentric nature, with the participation of professionals from five municipalities, accessing important results that help to understand the needs of these professionals within the ICU, as well as stimulating other research that seeks to better characterize the relationship between work and health.

CONCLUSION

Working in ICU during the COVID-19 pandemic has had an impact on the lives and health of professionals, with a high demand for activities, and increased complaints of pain. Most of the professionals surveyed reported pain of varying intensity and in different anatomical regions, the most commonly cited being the upper back and neck. MSD are directly related to work activity, age, gender and lack of leisure time.

The data presented here makes it easier to identify the main factors that favored pain symptoms among ICU workers during the period in question. This makes it possible to create education strategies and actions geared to the needs of the service in which these professionals work, as well as the creation of public policies aimed at the care and prevention of workers' health, avoiding negative factors in the quality of life and work of health professionals.

AUTHORS' CONTRIBUTIONS

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Data Collection, Resource Management, Project Management, Methodology, Writing - Preparation of the original, Writing - Review and Editing
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