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Work-related musculoskeletal pain and its association with common mental disorders among employees of a poultry producing company in Southern Brazil

Dor musculoesquelética relacionada ao trabalho e sua associação com transtornos mentais comuns em trabalhadores de um frigorífico do Sul do Brasil

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ABSTRACT | Background: Musculoskeletal pain is one of the most common occupational problems in the industrial society and its prevalence is potentially associated with mental disorders. **Objective:** To estimate the prevalence of work-related musculoskeletal pain and its association with occurrence of common mental disorders among employees of a poultry processing company in Southern Brazil. **Methods:** Cross-sectional study conducted in 2010 with 1,103 employees aged 18 to 52 years old. Musculoskeletal pain was investigated based on a human figure adapted from the Standardized Nordic Questionnaire. We considered reported work-related pain in any part of the body in the past 12 months. Occurrence of common mental disorders was assessed- by the Self-Reporting Questionnaire (SRQ-20). Crude and adjusted prevalence ratios (PR) and corresponding 95% confidence interval (95%CI) were obtained by Poisson regression with robust variance. **Results:** The prevalence of work-related musculoskeletal pain was 40.3% (95%CI 37.4–43.2) for the total sample, 46.8% (95%CI 43.2–50.5) for women and 27.8% (95%CI 23.2–32.3) for men. The prevalence of musculoskeletal pain was twice higher for the participants with common mental disorders compared to those without this condition (PR=2.27; 95%CI 1.99–2.58). This effect remained significant after adjustment for sociodemographic, behavioral, health-related and occupational variables. **Conclusion:** The results of the present study point to the relevance of preventive measures to promote the mental and physical health of workers in order to reduce or minimize the occurrence of pain.

Keywords | mental health; musculoskeletal pain; occupational health.

RESUMO | Contexto: A dor musculoesquelética é um dos problemas ocupacionais mais comuns nas sociedades industrializadas, e sua prevalência é potencialmente associada à presença de transtornos mentais. **Objetivo:** Estimar a prevalência de dor musculoesquelética relacionada ao trabalho e sua associação com a presença de transtornos mentais comuns em trabalhadores de um frigorífico do Sul do Brasil. **Métodos:** Realizou-se um estudo transversal com o total de 1.103 trabalhadores, de 18 a 52 anos de idade, em 2010. A dor musculoesquelética foi avaliada por meio de uma figura humana adaptada do Questionário Nórdico de Sintomas Osteomusculares. Considerou-se o relato da presença de dor relacionada ao trabalho em qualquer região do corpo nos últimos 12 meses. A presença de transtornos mentais comuns foi determinada pelo *Self-Reporting Questionnaire* (SRQ-20). Razões de prevalências (RP) brutas e ajustadas, com seus respectivos intervalos de confiança de 95% (IC95%), foram obtidas mediante a regressão de Poisson. **Resultados:** A prevalência de dor musculoesquelética relacionada ao trabalho foi de 40,3% (IC95% 37,4–43,2) na amostra geral, 46,8% (IC95% 43,2–50,5) nas mulheres e 27,8% (IC95% 23,2–32,3) nos homens. Na análise bruta, trabalhadores com presença de transtornos mentais comuns apresentaram prevalência duas vezes maior de dor musculoesquelética relacionada ao trabalho quando comparados com aqueles sem transtornos (RP=2,27; IC95% 1,99–2,58). Esse efeito manteve-se significativo após o ajuste para variáveis sociodemográficas, comportamentais, de saúde e ocupacionais. **Conclusão:** Os resultados deste estudo alertam para a importância de medidas visando à promoção da saúde física e mental dos trabalhadores em ações para reduzir a dor.

Palavras-chave | saúde mental; dor musculoesquelética; saúde do trabalhador.

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INTRODUCTION

Musculoskeletal disorders are considered a considerable health problem in present-day society for representing the main cause of functional incapacity[1,2]. These are the conditions that most contribute to occurrence of daily pain among workers, which in addition to biological and psychological harm, is also a cause of incapacity for work[3].

Musculoskeletal pain is characterized by the occurrence of several concomitant symptoms, such as paresthesia, heaviness and physical fatigue, which characteristics vary as a function of the location, etiology, intensity and frequency of pain[4]. However, the presence of these symptoms only does not necessarily imply occurrence of some musculoskeletal disease[5].

When related to work, musculoskeletal pain tends to vary as a function of the job characteristics[6], and occurrence is potentially associated with mechanical or psychosocial factors[7]. Biomechanical factors mainly include repetitive movements, remaining in the same position over a long period of time and trunk rotation[8]. In turn, psychosocial factors mainly comprise high job demands, lack of autonomy and accelerated rhythm of production[9,10]. In addition to limitations and incapacity for work, pain might also influence and impair the activities of daily living and quality of life of workers[3].

Common mental disorders are a set of symptoms that includes irritability, fatigue, insomnia, difficult concentration, memory deficit, physical complaints and anxiety and depression symptoms[11]. Several studies reported higher frequency of musculoskeletal pain among individuals with minor mental disorders, which thus points to a possible relationship between pain and mental health[10,12,13]. While the causal pathways that link mental health and musculoskeletal pain together have not yet been fully elucidated, this relationship is probably due to biological mechanisms, such as action of neurotransmitters. The reason is that some individuals are more aware of their symptoms and more predisposed to report them, or that individuals with mental disorders tend to be more concerned with their health and thus pay more attention to pain[13].

Most studies on this subject were mainly conducted in developed countries[4,7,10]. Publications are fewer in Brazil and focused on aspects related to healthcare professionals' work[14].

Therefore, the aim of the present study was to investigate the prevalence of work-related musculoskeletal pain and its association with common mental disorders in a sample of employees of a poultry processing company in Southern Brazil.

METHODS

The present cross-sectional and epidemiological study was conducted with 1,103 employees aged 18 to 52 years of a poultry processing company in Southern Brazil. These data were collected within the context of a larger research project that investigated several health outcomes, including noncommunicable diseases, behavioral and mental health habits and work-related musculoskeletal disorders among employees of a poultry processing company.

The investigated company is located in a small town in Southern Brazil which operates 24/7. It comprises 2,645 employees from both sexes who live in this same or six other neighboring towns. The initial sample size was calculated based on outcomes excess weight and abdominal obesity. For the present study power was calculated *a posteriori* based on prevalence of work-related musculoskeletal pain of 70% in the exposed group (with common mental disorders) and ratio 3:1 of non-exposed to exposed. Therefore, the effective sample size (n=1,103) resulted in 80% of statistical power and 95% of confidence for analysis of associations with relative risk of 1.17 or higher.

To reach this number of participants and due to logistic reasons, we selected only the employees who lived in the town where the company is located and two neighboring towns and worked in the main three production line points: evisceration, cut-up and deboning and thermoprocessed products (n=1,278). The corresponding activities demand remaining in the same position and perform repetitive movements most of the time and impose work overload. Along the sampling process 103 workers were excluded, to wit: the ones on leave for any reason for more than 10 days, women in any stage of pregnancy and employees hired less than 12 months earlier. The number of participants lost along the study — including the ones laid off or who had moved to another town not considered in the study — was low (n=72). None of the selected employees refused participation.

Structured interviews were performed at the participants' homes by municipal community health agents in 2010. For this purpose the agents participated in a training program which emphasized standardization in the application of instruments and adequate interview techniques. The questionnaire included closed-ended questions and was standardized, pre-encoded and pretested. Quality control for investigation of the consistency of the data collected on fieldwork was based on a second interview with 10% of the sample selected by means of the lottery method. The quality control instrument was similar to the one used in the main study, with variables without temporal variation which showed satisfactory repeatability (Kappa>0,7).

Outcome work-related musculoskeletal pain was assessed using a validated human figure adapted from the Standardized Nordic Questionnaire (SNQ)[15]. This figure, divided in nine anatomical areas, was shown during interviews to the participants, who were requested to indicate the location of pain. This outcome was defined as self-reported occurrence of musculoskeletal pain in any part of the body often or all the time in the past 12 months. Association between self-reported pain and job activities was investigated through question: "Considering the answer you gave to the picture (SNQ figure) in which case(s) do you believe the symptom(s) is(are) related to work?"

Presence of common mental disorders, i.e., the main investigated exposure, was analyzed by means of the Self-Reporting Questionnaire (SRQ-20). This is a self-report instrument widely used for early detection of signs and symptoms of non-psychotic mental disorders. It comprises 20 close-ended questions with dichotomous response options (yes/no) meant for screening for depression, anxiety, insomnia, fatigue, irritability, forgetfulness, difficulty concentrating and physical complaints in the past 30 days. SRQ-20 was validated for the Brazilian Portuguese language[16]. Cutoff points per sex (men: 6; women: 7) were used to define presence or absence of common mental disorders. This instrument is also efficient to investigate mental health in the workplace[17].

Explanatory variables collected and analyzed as potential confounding factors were: demographic (sex, age, skin color and marital status), socioeconomic (educational level and family income), behavioral (alcohol consumption, smoking and physical activity), health related (nutritional status and self-perceived health) and occupational (temperature at job area and length of work in the company). Variables family income and educational level were self-reported and defined as times the equivalent of the minimum wage and completed years of formal education, respectively. Participants who performed physical activity, independently from its intensity, for a minimum of 150 minutes per week in leisure time or as means of transportation were categorized as physically active. Alcohol consumption was investigated as beverage type and amount and categorized based on daily intake (does not drink; mild to moderate: <15 d/day for women and <30 g/day for men; high: =15 g/day for women and =30 g/day for men). Nutritional status was assessed according to the body mass index (BMI) and cutoff points recommended by the World Health Organization (WHO): normal (BMI <25 kg/m^2), overweight (BMI 25 to 29 kg/m^2) and obesity (IMC=30 kg/m^2). BMI was calculated with the body weight and height through equation: weight (kg) divided by height (m) squared.

The data were entered in program EpiData version 3. The responses given to the questionnaire were entered twice and compared to identify and correct eventual errors. Data processing and statistical analysis were performed with software Statistical Package for the Social Sciences (SPSS) for Windows version 18.0 and Stata version 11.0.

Descriptive statistics was performed to investigate the general distribution of the sample and the outcome distribution, which were expressed as absolute and relative frequencies. Associations between independent variables and outcome work-related musculoskeletal pain were investigated by means of Pearson's χ^2 test. Poisson regression with robust variance was used to estimate crude and adjusted prevalence ratios (PR) with the corresponding 95% confidence interval (95%CI).

To investigate and demonstrate the consistency of the association between common mental disorders and work-related musculoskeletal pain we fit two models on adjusted (multivariate) analysis. The first involved backward analysis: demographic, socioeconomic, behavioral, health-related and occupational variables considered to be confounding factors were excluded one by one, and only the ones with less than 5% of statistical significance remained in the final model (sex, skin color, self-perceived health and alcohol consumption). In the second model, the effect of variable presence of common mental disorders on occurrence of

musculoskeletal pain was controlled for all the investigated demographic, socioeconomic, behavioral, health-related and occupational variables independently from their statistical significance. Analyses were performed for the total sample and stratified per sex.

The study was submitted to and approved by the research ethics committee of University of the Sinos River Valley (Universidade do Vale do Rio dos Sinos – UNISINOS) and registered in the National System of Information on Ethics in Research with Human Beings (Sistema Nacional de Informação sobre Ética em Pesquisa envolvendo Seres Humanos – SISNEP) identification number FR 266144 and Certificate of Presentation for Ethical Appraisal (Certificado de Apresentação para Apreciação Ética – CAAE) no. 2014.0.000.390-09. All the participants signed an informed consent form, at which time they were informed of the voluntary nature of participation and that anonymity was ensured.

RESULTS

All 1,103 employees were included for analysis. Their average age was 30 years old — standard deviation (SD)=2.4. About 65.7% of the participants were female, most were white (83.8%) and about 70% did not have a partner. The average income was 2.5 (SD=1.1) times the equivalent of the minimum wage. The participants had 6.7 years (SD=2.0) of formal education, on average. About 85% of the sample rated their health excellent/very good/good and 3.2% reported excessive alcohol consumption (Table 1).

The mean BMI was de 24.6 kg/m² (SD=11) and more than half of the sample (64.7%) exhibited normal weight. About 85% of the participants had never smoked and 63.8% were rated as physically inactive. About 84% of the participants worked at a temperature below 12ºC. More than half of the sample had worked up to 60 months in the company.

Table 1. Distribution of participants and prevalence of work-related musculoskeletal pain in the total sample and stratified per sex according to sociodemographic, behavioral, health-related and occupational characteristics relative to a population of employees of a poultry processing company in Southern Brazil, 2010 (n=1,103).

Variables	Total sample n=1,103		Women n=725		Men n=378	
	n (%)	% pain	n (%)	% pain	n (%)	% pain
Age range (years old)						
18 to 29	574 (52.0)	39.5	383 (52.8)	47.5	191 (50.5)	23.5
30 to 39	311 (28.2)	40.8	206 (28.4)	45.6	105 (27.8)	31.4
40 to 52	218 (19.8)	41.7	136 (18.8)	47.0	82 (21.7)	32.9
Skin color						
White	924 (83.8)	41.2	616 (84.9)	48.0*	308 (81.5)	27.6
Non-white	179 (16.2)	35.7	109 (15.1)	40.3*	70 (18.5)	28.5
Marital status						
With partner	340 (30.8)	38.5	217 (29.9)	48.4	123 (32.5)	21.4
Without partner	763 (69.2)	41.1	508 (70.1)	46.2	255 (67.5)	30.9
Years of formal education (n=1,102)**						
12 or more	530 (48.1)	38.6	363 (50.1)	45.7	167 (44.2)	23.3
9 to 11	93 (8.4)	40.8	55 (7.6)	50.9	38 (10.1)	26.3
5 to 8	289 (26.2)	42.2	196 (27.1)	46.4	93 (24.5)	33.3
1 to 4	190 (17.2)	41.5	110 (15.2)	49.0	80 (21.2)	31.2

Continue...

Tabela 1. Continuation.

Variables	Total sample n=1,103		Women n=725		Men n=378	
	n (%)	% pain	n (%)	% pain	n (%)	% pain
Family income (BRL) (n=1,090)**						
1st quartile (>1,600)	271 (24.9)	43.9	190 (26.5)	51.5	81 (21.7)	25.9
2nd quartile	288 (26.4)	38.8	202 (28.2)	46.0	86 (23.0)	22.0
3rd quartile	272 (24.9)	37.5	167 (23.3)	40.1	105 (28.1)	33.3
4th quartile	259 (23.8)	39.7	157 (22.0)	48.4	102 (27.2)	26.4
Self-perceived health (n=1,100)**						
Excellent/very good/good	911 (82.8)	35.3*	582 (80.4)	41.6*	329 (87.5)	24.3*
Reasonable/poor	189 (17.2)	64.0*	142 (19.6)	68.3*	47 (12.5)	51.1*
Nutritional status						
Normal	714 (64.7)	41.3	504 (69.5)	47.0	210 (55.6)	27.6
Overweight	284 (25.7)	39.4	147 (20.3)	48.2	137 (36.2)	29.9
Obesity	105 (9.6)	36.1	74 (10.2)	43.2	31 (8.2)	19.3
Smoking (n=1,102)**						
Never smoked	943 (85.6)	40.2	651 (89.7)	46.5	292 (77.5)	26.3
Ex-smoker	106 (9.6)	42.4	51 (7.1)	50.9	55 (14.6)	34.5
Smoker	53 (4.8)	37.7	23 (3.2)	47.8	30 (7.9)	30.0
Alcohol consumption						
None	404 (36.6)	39.8	322 (44.4)	43.1*	82 (21.7)	26.8
Moderate	664 (60.2)	40.6	384 (53.0)	48.9*	280 (74.1)	29.2
Excessive	35 (3.2)	40.0	19 (2.6)	68.4*	16 (4.2)	6.2
Physical activity						
Physically inactive	704 (63.8)	40.6	461 (63.6)	45.7	243 (64.3)	30.8
Physically active	399 (36.2)	39.8	264 (36.4)	48.8	135 (35.7)	22.2
Temperature in workplace						
Extreme (termoprocessed products)	178 (16.1)	40.4	111 (15.3)	49.5	67 (17.7)	25.3
10º/room temperature (cut-up/ evisceration)	925 (83.9)	40.3	614 (84.7)	46.4	311 (82.3)	28.3
Length of work in company (months)						
12 to 36	312 (28.3)	41.9	218 (30.1)	48.6	94 (24.9)	26.5
37 to 60	255 (23.1)	41.5	175 (24.1)	46.8	80 (21.2)	30.0
61 to 96	261 (23.7)	40.9	171 (23.6)	45.6	90 (23.8)	32.2
97 or more	275 (24.9)	36.7	161 (22.2)	45.9	114 (30.1)	26.6
Common mental disorders (n=1,091)**						
No	828 (75.9)	30.7*	506 (70.5)	35.9*	322 (86.3)	22.6*
Yes	263 (24.1)	69.9*	212 (29.5)	72.6*	51 (13.7)	58.8*

*Difference with $p<0.05$ on Pearson's χ^2 test for heterogeneity of proportions (categorical variables) or linear trend estimation (ordinal variables);
**different total number of observations for some variables due to missing data.

The prevalence of work-related musculoskeletal pain was 40.3% (95%CI 37.4–43.2) for the total sample, 46.8% (95%CI 43.2–50.5) for the women and 27.8% (95%CI 23.2–32.3) for the men. The frequency of common mental disorders was 24.1% (95%CI 21.6–26.8) for the total sample and was higher for the women compared to the men (Table 1).

Table 1 describes the results relative to prevalence of work-related musculoskeletal pain for the total sample. The data are stratified according to sociodemographic, behavioral, health-related and occupational characteristics. The prevalence of musculoskeletal pain was significantly higher among the participants who rated their state of health reasonable or poor (negative perceived health) being similar between men and women. The prevalence of musculoskeletal pain was higher for white women and women who reported higher alcohol consumption.

In regard to the main association investigated in the present study, unadjusted analysis showed that the prevalence of musculoskeletal pain was twice higher among the participants with common mental disorders compared to the ones without this condition (PR=2.27; 95%CI 1.99–2.58). On analysis stratified per sex, the outcome prevalence was almost 2.6 times higher for the men (PR=2.59; 95%CI 1.91–3.52) and twice higher for the women (PR=2.01; 95CI 1.75–2.32) with common mental disorders compared to the ones without this condition (Table 2). Following adjustment for potential confounding factors, PR was about twice higher for employees with common mental disorders compared to the ones without this condition for the total sample and also on analysis stratified per sex. This effect remained independently from the adjustment model considered (Table 2). The effect of presence of common mental disorders on musculoskeletal pain was greater for the men.

DISCUSSION

In the present study, we detected high prevalence of musculoskeletal pain among the investigated sample, more particularly among the women. Following adjustment for confounding factors significant association was found between musculoskeletal pain and occurrence of common mental disorders. The prevalence of work-related musculoskeletal pain was about twice higher for the participants with common mental disorders compared to the ones without this condition.

The prevalence of work-related musculoskeletal pain found in the present study was similar to the one reported in previous research with the same category of workers (meat-packing industry employees)[18]. However, the rates found for other categories of workers, such as nursing professionals and plastics industry employees, were different[14,19]. This difference might be mainly attributed to the type and specificity of the respective job activities[20], including, e.g., ergonomic characteristics, body position, movements performed and taking rest breaks or not.

The prevalence of musculoskeletal pain was higher for the women compared to the men. This finding are consistent with the results of previous studies[19,21]. The literature

Table 2. Crude and adjusted prevalence ratio (PR) for the association between work-related musculoskeletal pain and common mental disorders in the total sample and stratified per sex relative to a population of employees of a poultry processing company in Southern Brazil, 2010 (n=1,103).

Variables	Crude analysis PR (95%CI)	Model 1 PR (95%CI)	Model 2 PR (95%CI)
Mental disorders			
Total sample			
No	1	1	1
Yes	2,27 (1,99-2,58)	1,95 (1,70-2,24)[a]	1,95 (1,69-2,25)[d]
Men			
No	1	1	1
Yes	2,59 (1,91-3,52)	2,45 (1,79-3,37)[b]	2,39 (1,70-3,37)[e]
Women			
No	1	1	1
Yes	2,01 (1,75-2,32)	1,88 (1,61-2,18)[c]	1,87 (1,60-2,18)[e]

Model 1: adjusted analysis by means of the backward method; variables were excluded one by one, the ones with com significance less than 5% (p<0.05) remained in the model; model 2: adjusted for all the analyzed demographic, socioeconomic, behavioral, health-related and occupational variables independently from their statistical significance; [a]adjusted for sex, skin color, self-perceived health and alcohol consumption; [b]adjusted for self-perceived health; [c]adjusted for skin color, marital status, educational level, family income, self-perceived health, nutritional status, smoking, alcohol consumption, physical activity, temperature in the workplace and length of work in the company; [e]adjusted for age range, skin color, marital status, educational level, family income, self-perceived health, nutritional status, smoking, alcohol consumption, physical activity, temperature in the workplace and length of work in the company; 95%CI: 95% confidence interval.

attributes this difference between sexes mainly to the characteristics of work. Several studies found that job activities performed by women are usually more repetitive, given less value and develop under more rigid control and more difficult conditions compared to the ones performed by men[22,23]. These characteristics are also constantly associated to suffering and mental illnesses[24,25]. In addition to occupational characteristics, previous studies pointed to other factors that might contribute to this difference between sexes, such as biomechanical characteristics of the body[26], adaptation to muscle pain[27,28], social differences and performance of household chores[29].

Among the main findings, we also detected higher prevalence of common mental disorders among the women compared to the men. This situation was also reported in other studies that applied the same measurement instrument, however, to other population groups[6,30]. The association between common mental disorders and work-related musculoskeletal pain was stronger for the men. This is to say, this association was more robust for the men compared to the women. However, it should be observed that the confidence interval was narrower for the women in all the measurements, which denotes less variability (i.e., measurements are more accurate as a function of the larger sample size). These findings allow hypothesizing that although the pain threshold is higher for men compared to women, the latter might be more tolerant and resilient. Resilience is the ability to perceive and adapt to adversities in life and control and cope with problems which might have negative impact on health[31].

The present is one of the first studies that investigated a possible relationship between common mental disorders and work-related musculoskeletal pain among poultry processing industry employees. We found significant association between common mental disorders and work-related musculoskeletal pain. Similar findings were reported in several previous studies[4,7,10,12,13]. This association might be explained by biological and mechanical factors. The biological factors that account for the occurrence of musculoskeletal pain among individuals with common mental disorders involve descending pathways of the central nervous system (CNS)[32]. Nociceptive neurons transmit pain signals from peripheral areas to the brain through the spinal cord. A modulatory system directly related to this transmission system seeks to protect the body from external threats by attenuating internal signals to the point of suppressing them, while the external signals are enhanced. However, as a function of the serotonin and norepinephrine depletion that occurs in individuals with mental disorders, this system tends to loss its modulatory effect, and the internal signals consequently increase[33,34].

In regard to the mechanical factors, repetitive movements performed by workers in their workstations lead to sensitization of the peripheral nociceptive neurons, which causes a feeling of pain known as hyperalgesia that usually ceases when inflammation disappears[32]. However, repeated injury might result in allodynia, which is characterized by a form of dysfunction of the brain activity that manifests as pain even though the underlying stimulus is not painful[35]. The reason might be that the message transmitted by the afferent nerve fibers is abnormal, and as a result they may trigger or worsen anxiety or depression symptoms, for instance.

The present study had cross-sectional design, which main advantages include fast execution and low cost, in addition to being useful for the formulation of research questions. However, it also behaved as a limitation, as the data were collected at a single time-point. As a result, the association found in the present study is pervaded by the temporal uncertainty of the analyzed variables, and we are not able to establish whether common mental disorders favor the occurrence of musculoskeletal pain or worsen it. Studies with prospective design might elucidate better the association investigated in the present study.

Occurrence of musculoskeletal pain and common mental disorders was self-reported and thus susceptible to information bias. In addition, the results should be interpreted in the light of the healthy worker effect, as employees on leave for more than 10 days were excluded from the study, thus possibly leading to underestimation of the analyzed prevalence rates. Among the strengths of the present study we might mention the sample size and low rate of refusals to participation. One further aspect that reinforces the internal validity of the present study is the application of instruments widely used in published scientific studies, translated to the Portuguese language and validated for use in Brazil. Finally, the results have satisfactory consistency given that two multivariate models were fit and the analyses were stratified per sex.

CONCLUSION

In the present study, we detected high prevalence of musculoskeletal pain among the analyzed sample, the women in particular. Following adjustment for potential confounding factors we found significant association between musculoskeletal pain and occurrence of common mental disorders. The results showed that the prevalence of work-related musculoskeletal pain was about twice higher among the participants with common mental disorders compared to the ones without this condition. Considering the setting within which the present study was conducted, the results point to the relevance of preventive measures to reduce the occurrence of musculoskeletal pain and improve the mental health of workers.

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