Work-related musculoskeletal disorders among schoolteachers

Distúrbios musculoesqueléticos relacionados ao trabalho de professores

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ABSTRACT | **Introduction:** Teachers belong to a risk group for the onset of musculoskeletal disorders, which may be justified by some work-related factors, with a direct impact on their lives. **Objectives:** To evaluate the occurrence of musculoskeletal disorders among elementary school teachers in Jequié, state of Bahia, Brazil, and to investigate the association of these disorders with sociodemographic, occupational, organizational and health variables. **Methods:** A cross-sectional epidemiological study with a sample of 304 elementary school teachers in Jequié. A standardized collection instrument was applied and the instrument data were analyzed using descriptive statistics procedures, with prevalence ratios and 95% confidence interval. **Results:** The prevalence of musculoskeletal disorders was 24.3% for any of the body segments, 15.5% for the back, 16.1% for the upper limbs and 12.5% for the lower limbs. There was a statistically significant association between musculoskeletal disorders and female sex, older age, black, brown and red skin, time working as a teacher of more than 14 years, presence of comorbidities, irregular sleeping pattern, consumption of alcohol and tobacco, and a regular lifestyle. **Conclusions:** Teachers presented a high prevalence of musculoskeletal disorders in upper limbs, back, and lower limbs. In addition, associations with the investigated factors demonstrate that inadequate teaching conditions contribute negatively to teachers' health.

Keywords | teachers; occupational health; musculoskeletal system; cumulative trauma disorders.

RESUMO | **Introdução:** Os professores constituem um grupo de risco para o aparecimento de distúrbios musculoesqueléticos, e alguns fatores relacionados ao trabalho podem justificar tal fato, repercutindo diretamente nas suas vidas. **Objetivos:** Avaliar a ocorrência de distúrbios musculoesqueléticos nos professores da rede de ensino básico de Jequié, estado da Bahia, Brasil, e verificar sua associação com variáveis sociodemográficas, ocupacionais, organizacionais e de saúde. **Métodos:** Um estudo epidemiológico de corte transversal, com uma amostra de 304 professores da rede de ensino básico de Jequié. Foi aplicado instrumento de coleta padronizado, e os dados do instrumento foram analisados por meio de procedimentos da estatística descritiva, com razões de prevalência e intervalo de confiança a 95%. **Resultados:** A prevalência de distúrbios musculoesqueléticos foi de 24,3% para qualquer um dos segmentos corporais, 15,5% para o dorso, 16,1% para os membros superiores e 12,5% para os membros inferiores. Foi encontrada associação estatisticamente significativa entre distúrbios musculoesqueléticos e sexo feminino, os mais longevos, negros, pardos e indígenas, trabalho por mais de 14 anos, presença de comorbidades, sono irregular, consumo de álcool e tabaco e estilo de vida regular. **Conclusões:** Identificou-se elevada prevalência de distúrbios musculoesqueléticos em membros inferiores e superiores e na região dorsal. Além disso, as associações com os fatores investigados demonstram que as condições de trabalho docente inadequadas contribuem negativamente para a saúde dos professores.

Palavras-chave | docentes; saúde do trabalhador; sistema musculoesquelético; transtornos traumáticos cumulativos.

INTRODUCTION

In contemporary times, work is intrinsically associated with capitalist relationships, in which workers need continuous update on their job skills and are constantly demanded to keep being successful in their position. Furthermore, the way work is organized may contribute to the onset of problems in worker's life, including health-related ones.[1,2] In this context, musculoskeletal disorders (MSDs) have gained prominence due to their impact on several domains of people's life and work.

The occurrence of MSDs in different working environments has been reported in the literature, showing the influence of working conditions on workers' health status. Conversely, studies have revealed the significant impact of MSDs on the economy of several countries caused by social security expenses arising from sick leave due to osteomuscular injuries.[3,4]

MSDs, such as tendinitis, low back pain, and myalgia, are caused by multifactorial pathophysiological mechanisms, have a close relationship with occupational stress and may be present in the most different types of occupation.[5] In the educational context, teachers belong to risk group for the development of MSDs, since poor working conditions in schools lead to reduced quality of life among these professionals and to the consequent onset of diseases involving their physical and psychological integrity.[6] This situation points to the need of developing strategic actions to improve teachers' workplace and to provide them with sufficient support to achieve the best possible work performance.[7]

Several factors contribute to the occurrence of MSDs, such as lack of appropriate school structure, teachers' life style, poor remuneration, and work overload.[8-10] In Brazil, some studies have shown the high prevalence of MSDs in teachers[9]; however, there is little information on the factors associated with the occurrence of this outcome at work, and the scarcity of elements that portray this situation makes it impossible to develop policies that bring more comfort to teachers' routine. Therefore, it is necessary to improve knowledge about work and health conditions that affect this worker category, especially about elements that may contribute to the onset of MSDs. In this study, we assessed the occurrence of MSDs among elementary school teachers in Jequié, state of Bahia, Brazil, and analyzed the association of these disorders with sociodemographic, occupational, organizational, and health variables.

METHODS

STUDY TYPE AND SITE

An epidemiological cross-sectional study was conducted to assess the occurrence of MSDs among elementary school teachers in the municipality of Jequié, Brazil. The above mentioned municipality, located in the southeastern region of the state of Bahia, had a population of 151,895 inhabitants in 2010, and its main economic activity is commerce. At the time of the study, the state school system was linked to the Regional Board of Education (DIREC 13) and, in the year of the study, comprised 716 teachers in permanent and temporary employment.

PARTICIPANT SAMPLE AND SELECTION

Initial sample consisted of 251 teachers; to reach this number, analysis considered an unknown prevalence for the outcome (equal to 50%), a tolerable error of 5%, a 95% confidence interval (IC95%), and a design effect of 1.0. Subsequently, 15% were added to compensate for possible losses and refusals, which resulted in a final sample of 289 teachers.

The inclusion of study participants was conducted according to school unit where the teacher worked and proportional to the size of the school (number of enrolled students and number of classes formed). For this purpose, 12 schools were randomly selected, considering, for each school unit, the minimum number of teachers who could participate in the study. Eligible teachers were those with an employment relationship with the institution through a temporary contract, service provision, or permanent employment. Teachers who had been laid off, who were at the disposal of other agencies of the state government, or who were on different types of leave of absence (bonus leave, maternity leave, or vacation) did not participate in the research.

COLLECTION INSTRUMENT

The instrument of data collection was a standardized self-administered questionnaire composed of blocks of questions related to sociodemographic information, in order to characterize teachers, their job, environmental working conditions at the school, self-reported diseases, lifestyle, mental health, physical work demands, domestic activities, and MSDs reported by the teacher. The collection instrument was delivered in an envelope and did not have an identification field. Research participants were free to refuse to answer study questions and/or to withdraw from the research at any time. Data collection was performed from September to December 2010.

VARIABLES

The outcome consisted of MSD, investigated using the Nordic Musculoskeletal Questionnaire (NMQ),[11] based on a question on feelings of pain or discomfort, over the last 12 months, in different body segments: neck, shoulder, elbow/forearm, hand/fist, fingers, upper back, lower back, thigh/knee, leg, and ankle/foot. The NMQ is an instrument internationally used to assess musculoskeletal symptoms in many worker categories, has good reliability with the test-retest method, and good validity with the contrast method with clinical history.[12] In Brazil, it was validated by Pinheiro et al.[13]

A case was considered when a teacher reported pain in the last 12 months, with a minimum duration of one week or with a minimum frequency of once a week. Furthermore, pain should not result from acute and was accompanied by some signs of severity: level of severity equal to or higher than 3 (considering a numerical scale ranging from 0 to 5); demand for medical assistance due to the problem; absence from work (official or not); and working changes caused by health limitations.[11] Subsequently, cases were grouped into three body regions: lower limbs (LLs) (thigh / knee, leg, and ankle/foot); upper limbs (ULs) (shoulder, elbow/forearm, hand/ fist); and back (neck, upper back, and lower back).

Independent variables included sociodemographic characteristics, occupation characteristics, organization variables, and health variables. Sociodemographic variables were divided into sex (female, male); age in complete years and categorized into ≤ 30 years, 31 to 45 years, and > 45 years; body mass index, obtained as weight in kilograms divided by square height in centimeters and categorized into underweight/normal and overweight/obesity; marital status (single, married/stable union, divorced/separated//widowed); educational level (high school, higher education); self-reported race/color categorized into white/yellow and black/brown/red; having children (yes, no); income in minimum wages (MWs) at the time of the study (≤ 10 MWs, 10 to 15 MW, > 15 MW).

Occupational variables included time working as a teacher in years, categorized into ≤ 14 years and > 14 years; time working at the school in years (≤ 7 years, > 7 years); work shift at the school (1 shift, 2 or more shifts), number of classes (≤ 3, 4 to 6, 7 or more); number of students (≤ 150, 151 to 240, > 240); workload (≤ 20 hours, > 20 hours); type of employment contract (permanent or temporary contract); and multiple employment contracts (yes, no). For organizational and health variables, the following aspects were investigated: satisfaction with the performance of work activities, good relationship with colleagues, interval between lessons long enough to rest, use of a computer to support school activities, presence of comorbidities, consumption of alcohol, and smoking. In all previously mentioned variables, answer options were yes and no. Finally, the lifestyle was assessed as positive, negative or regular.

DATA ANALYSIS

Descriptive statistics (frequency, mean, standard deviation) was used, considering sociodemographic, occupational, organizational, and health variables. Overall prevalence and prevalence specific for each MSD were calculated according to the variables of the previously presented groups. The association between these variables and MSD was assessed using prevalence ratio (PR) and its respective 95%CI.

For multivariable analysis, regression multiple logistic regression analysis was applied, with exploratory purposes. Initially, variables with $p \leq 0.20$ were included in the crude analysis. For the assessment of the model, only variables with lower Akaike information criterion

scores and theoretical importance were kept in the analysis. The Hosmer-Lemeshow test was used to assess goodness-of-fit of the model. Data analysis was performed with the Stata® software, version 12.0.

ETHICAL ISSUES

The research protocol was approved by the Research Ethics Committee of Universidade Estadual do Sudoeste da Bahia (UESB) under opinion n. 209/2009. Participants were informed on the research and signed an informed consent form.

RESULTS

A total of 300 teachers participated in the study. Among the investigated workers, 72.7% were women, and 51% were younger than 39 years. Time working as a teacher and at the school revealed that 50.8% of teachers had been working for more than 14 years. More than a half of participants taught seven classes or more (55.8%) and more than 150 students (64.7%) in the schools they worked. Nearly 87% of teachers had another employment contract.

The overall prevalence of MSD was 24.3%. According to body region, prevalence of MSD was 15.5% in the back, 16.1% in ULs, and 12.5% in LLs. The prevalence of MSD was found to be higher, simultaneously, in the three body segments, among teachers with the following characteristics: women; belonging to the older age groups; divorced, separated, or widowed; with children; and with income above 15 MWs (Table 1).

An association was observed between MSD and the following variables: female teachers [back (PR = 2.15; 95%CI 1.01-4.60) and ULs (PR = 3.31; 95%CI 1.36-8.05)]; age 30 to 45 years [ULs (PR = 3.38; 95%CI 1.01-11.3) and LLs (PR = 9.42; 95%CI 1.26-70.30)]; age older than 45 years [ULs (PR = 4.40; 95%CI 1.38-14.0) and LLs (PR = 10.2; 95%CI 1.40-7.60)]; marital status, divorced, separated, or widowed [back (PR = 3.25; 95%CI 1.39-7.59), ULs (PR = 2.28; 95%CI 1.08-4.79) and LLs (PR = 5.22; 95%CI 1.78-15.31)]; skin color [back (PR = 0.45; 95%CI 0.27-0.75)]; having children [LLs (PR = 2.60; 95%CI 1.12-6.02)];

and income > 15 MWs [ULs (PR = 2.19; 95%CI 1.05-4.55)] (Table 1).

The identification of MSDs in body segments according to occupational variables is presented in Table 2. Participants who had been working as a teacher for 14 years or longer, who worked two shifts or more, who had a workload greater than 20 hours, and who had multiple employment contracts showed a higher prevalence of MSD in the three body segments. The prevalence of MSDs increased as the number of classes and students increased. However, in this group, an association was observed only between time working as a teacher above 14 years and MSDs in the ULs (PR = 2.68; 95%CI 1.48-4.84) and in the LLs (PR = 2.37; 95%CI 1.22-4.61).

The prevalence of MSDs according to organization variables (Table 3) was higher among teachers who were not satisfied with the performance of work activities, who did not have a good relationship with their colleagues, who did not have intervals long enough to rest, and who did not use the computer to support school activities. With regard to health variables, the prevalence of MSDs was higher, in the three body segments, among teachers who had some comorbidity, who smoked, and who had a negative or regular lifestyle.

Organizational and health variables were found to be associated with MSDs among teachers who were not satisfied with the performance of work activities [back (PR = 2.00; 95%CI 1.18-3.40)]; did not have a good relationship with colleagues [LLs (PR = 3.62; 95%CI 1.72-7.61)]; did not have an interval sufficient enough to rest [back (PR = 2.06; 95%CI 1.06-3.99)]; did not use a computer in school activities [back (PR = 2.03; 95%CI 1.11-3.72)]; had some comorbidity [back (PR = 6.24; 95%CI 1.55-25.05), ULs (PR = 4.25; 95%CI 1.37-13.24) and LLs (PR = 1.99; 95%CI 1.23-20.19)]; had an irregular sleeping pattern [back (PR = 2.31; 95%CI 1.31-4.07) and ULs (PR = 2.17; 95%CI 1.26-3.75)]; consumed alcohol [ULs (PR = 0.46; 95%CI 0.23-0.93)]; smoked [LLs (PR = 3.49; 95%CI 1.91-6.36)]; and had a regular lifestyle [ULs (PR = 2.53; 95%CI 1.01-6.32)].

In the multivariate model (Table 4), the following variables remained associated with MSDs in the

back: skin color, comorbidities, and irregular sleeping pattern. With regard to MSDs in ULs, association was observed with time working as a teacher, good relationship with colleagues, and consumption of alcohol. In turn, MSD in LLs remained associated with marital status in the group that did not have a partner, skin color, time working as a teacher, and smoking. The assessment of goodness-of-fit showed that the models satisfactorily assessed the following data: back (p = 0.2328), ULs (p = 0.5597), and LLs (p = 0.1580).

DISCUSSION

This study made it possible to evaluate the prevalence of MSD in three different body segments, and its findings showed values similar to those observed in other studies,[14,15] which highlights the considerable presence of MSDs in the context of the teaching work. However, considering studies focused on the assessment of pain or of other musculoskeletal symptoms,[16,17] our results demonstrated a lower prevalence of the events, regardless of the investigated

Table 1. Prevalence and prevalence ratio of the musculoskeletal disorders according to sociodemographic variables. Jequié, Brazil, 2010

Variables	MSD in the back		MSD in the ULs		MSD in the LLs	
	P%	PR (95%CI)	P%	PR (95%CI)	P%	PR (95%CI)
Sex						
Male	8.5	1.00	6.1	1.00	8.5	1.00
Female	18.3	2.15 (1.01-4.60)	20.2	3.31 (1.36-8.05)	13.8	1.61 (0.74-3.52)
Age (years)						
≤ 30	7.6	1.00	4.5	1.00	1.5	1.00
31-45	18.7	2.46 (0.86-6.34)	15.4	3.38 (1.01-11.3)	14.3	9.42 (1.26-70.30)
> 45	17.8	2.35 (0.93-5.91)	20.0	4.40 (1.38-14.0)	15.5	10.2 (1.40-7.60)
BMI						
Underweight/normal weight	17.7	1.00	17.1	1.00	11.4	1.00
Overweight/obesity	13.7	0.77 (0.44-1.36)	14.5	0.85 (0.49-1.49)	13.7	1.20 (0.64-2.25)
Marital status						
Single	9.5	1.00	13.5	1.00	5.4	1.00
Married/stable union	14.5	1.53 (0.69-3.37)	14.5	1.07 (0.55-2.11)	11.8	2.19 (0.78-6.13)
Divorced/separated/widowed	30.8	3.25 (1.39-7.59)	30.8	2.28 (1.08-4.79)	28.2	5.22 (1.78-15.31)
Educational level						
Higher education	17.0	1.00	16.6	1.00	13.0	1.00
High school	9.3	0.55 (0.21-1.45)	16.3	0.98 (0.47-2.04)	9.3	0.71 (0.27-1.91)
Skin color						
White/yellow	27.4	1.00	23.3	1.00	17.8	1.00
Black/brown/red	12.3	0.45 (0.27-0.75)	14.5	0.62 (0.37-1.06)	10.9	0.61 (0.33-1.14)
Having children						
No	11.0	1.00	12.0	1.00	6.0	1.00
Yes	18.1	1.64 (0.87-3.09)	18.6	1.55 (0.85-2.84)	15.6	2.60 (1.12-6.02)
Income (MWs)						
≤10	13.1	1.00	10.7	1.00	9.5	1.00
10-15	12.3	0.94 (0.40- 2.20)	15.4	1.44 (0.62-3.33)	12.3	1.29 (0.51-3.26)
>15	18.5	1.41 (0.69-2.89)	23.5	2.19 (1.05-4.55)	17.3	1.81 (0.80-4.09)

95%CI = 95% confidence interval; BMI = body mass index; LLs = lower limbs; MSD = musculoskeletal disorders; MW = minimum wage; P% = prevalence; PR = prevalence ratio; ULs = upper limbs.

body region. This condition may be explained by the fact that, in order to identify cases of MSD through the NMQ, there is use of some indicators designed to improve the specificity of the investigated symptoms (severity, duration, and frequency).[11] Consequently, the prevalence observed in the present study was lower than that of studies which analyzed only pain or other musculoskeletal symptoms.

Nevertheless, the prevalence of MSD in the body segments was often similar to that observed in previous studies, which involved only some musculoskeletal symptoms.[16,18-20] Among primary school teachers in Mugla, Turkey, the regions most affected by musculoskeletal symptoms were the neck (39%) and the lower back (38%)[19]. In kindergarten teachers, it was pointed out that the greatest severity of pain was related to low back, cervical and shoulder pain[20] In Salvador, Brazil, the highest prevalence of musculoskeletal pain was observed in LLs and in the back/spine.[8] In all these cases, musculoskeletal symptoms are already a strong sign or indication for an in-depth investigation on the development of MSD. Finally, it is worth highlighting that the difference in the findings for MSD among teachers

Table 2. Prevalence and prevalence ratio of the musculoskeletal disorders according to occupational variables. Jequié, Brazil, 2010

Variables	MSD in the back		MSD in the ULs		MSD in the LLs	
	P%	PR (95%CI)	P%	PR (95%CI)	P%	PR (95%CI)
Time working as a teacher (years)						
≤ 14	12.1	1.00	8.7	1.00	7.4	1.00
> 14	18.8	1.56 (0.90-2.68)	23.4	2.68 (1.48-4.84)	17.5	2.37 (1.22-4.61)
Time working at the school (years)						
≤ 7	15.2	1.00	14.1	1.00	9.8	1.00
> 7	15.0	0.98 (0.56-1.73)	18.7	1.32 (0.78-2.25)	16.8	1.72 (0.94-3.16)
Work shifts at the school						
1	15.5	1.00	15.5	1.00	9.7	1.00
> 2	16.0	1.03 (0.59-1.79)	17.0	1.10 (0.63-1.89)	14.4	1.49 (0.75-2.94)
Number of classes						
≤ 3	5.9	1.00	11.8	1.00	5.9	1.00
4-6	14.3	2.43 (0.57-10.28)	14.3	1.21 (0.42-3.50)	9.5	1.62 (0.36-7.24)
> 7	19.5	3.31 (0.83-13.20)	18.8	1.60 (0.60-4.25)	16.8	2.85 (0.71-11.47)
Number of students						
≤ 150	12.8	1.00	14.9	1.00	8.5	1.00
151-240	14.9	1.17 (0.56-2.43)	16.1	1.08 (0.55-2.13)	17.2	2.03 (0.90-4.54)
> 240	21.2	1.66 (0.85-3.24)	18.8	1.26 (0.66-2.43)	14.1	1.66 (0.71-3.86)
Workload (hours)						
≤ 20	15.6	1.00	16.4	1.00	9.0	1.00
> 20	16.9	1.08 (0.63-1.85)	17.5	1.07 (0.63-1.80)	16.3	1.80 (0.93-3.50)
Type of employment contract						
Permanent	16.8	1.00	18.5	1.00	14.2	1.00
Temporary	11.6	0.69 (0.34-1.41)	8.7	0.47 (0.21-1.06)	7.2	0.51 (0.21-1.25)
Multiple employment contracts						
No	12.2	1.00	12.2	1.00	4.9	1.00
Yes	16.0	1.31 (0.55-3.12)	16.7	1.37 (0.58-3.26)	13.7	2.81 (0.70-11.21)

95%CI = 95% confidence interval; LLs = lower limbs; MSD = musculoskeletal disorders; P% = prevalence; PR = prevalence ratio; ULs = upper limbs.

with regard to body segments may be related to many aspects of work and lifestyle.[8,10,21] Studies conducted with elementary school teachers in Brazil have reported findings on MSDs similar to those of the present study,[6,14] thus confirming the high occurrence of this event when considering sociodemographic and occupational factors.

With regard to the predominance of MSDs in women, findings reveal that women's historical insertion into the work force, related to the educational sector, in which there is a great number of people in this category.[22] Increased age was also associated with MSD, which may have a direct relationship with the process of human body aging and with the natural deterioration of the osteoarticular system, favoring, in this case, the manifestation of symptoms in ULs, LLs, and back.[8] The association between marital status and occurrence of MSD, especially among people who have already had a partner, has not been explained in the literature. However, it is believed that the cohabitation of two people may increase demands of extra-school activities and overburden teachers.

Table 3. Prevalence and prevalence ratio of the musculoskeletal disorders according to organizational and health variables. Jequié, Brazil, 2010

Variables	MSD in the back		MSD in the ULs		MSD in the LLs	
	P%	PR (95%CI)	P%	PR (95%CI)	P%	PR (95%CI)
Satisfaction with the performance of work activities						
Yes	11.2	1.00	14.0	1.00	11.8	1.00
No	22.5	2.00 (1.18-3.40)	20.0	1.42 (0.85-2.37)	14.2	1.20 (0.66-2.18)
Good relationship with colleagues						
Yes	15.0	1.00	15.3	1.00	11.5	1.00
No	25.0	1.67 (0.60-4.62)	33.3	2.17 (0.93-5.06)	41.7	3.62 (1.72-7.61)
Interval between lessons long enough to rest						
Yes	9.1	1.00	10.9	1.00	10.9	1.00
No	18.7	2.06 (1.06-3.99)	18.7	1.72 (0.93-3.16)	13.9	1.27 (0.67-2.42)
Use of a computer to support school activities						
Yes	14.0	1.00	15.1	1.00	11.7	1.00
No	28.6	2.03 (1.11-3.72)	22.9	1.50 (0.77-2.95)	20.0	1.70 (0.81-3.57)
Comorbidities						
No	3.0	1.00	4.5	1.00	3.0	1.00
Yes	18.9	6.24 (1.55-25.05)	19.3	4.25 (1.37-13.24)	15.1	1.99 (1.23-20.19)
Irregular sleeping pattern						
No	9.6	1.00	10.2	1.00	9.6	1.00
Yes	22.2	2.31 (1.31-4.07)	22.2	2.17 (1.26-3.75)	15.9	1.65 (0.89-3.05)
Consumption of alcohol						
No	16.0	1.00	19.9	1.00	12.8	1.00
Yes	14.3	0.89 (0.49-1.63)	9.2	0.46 (0.23-0.93)	11.2	0.88 (0.44-1.75)
Smoking						
No	15.0	1.00	15.0	1.00	9.8	1.00
Yes	22.9	1.53 (0.77-3.02)	25.7	1.72 (0.91-3.26)	34.3	3.49 (1.91-6.36)
Lifestyle						
Positive	9.7	1.00	9.7	1.00	6.5	1.00
Negative	16.8	1.73 (0.76-3.95)	16.2	1.68 (0.73-3.84)	14.6	2.26 (0.82-6.21)
Regular	17.8	1.84 (0.69-4.93)	24.4	2.53 (1.01-6.32)	15.6	2.41 (0.75-7.75)

95%CI = 95% confidence interval; LLs = lower limbs; MSD = musculoskeletal disorders; P% = prevalence; PR = prevalence ratio; ULs = upper limbs.

People self-reported as black and brown showed an association with MSD in the back and LLs. With regard to this factor, literature reports present divergent results for the association with MSD[23,24]; however, it is believed that unfavorable conditions and tackling of difficulties by this population group may have effects on occupational stress and contribute to the onset of cases of MSD. The deepening of this topic deserves further attention in new studies.

Income was a factor associated with MSD in ULs. This finding may be related with the accumulation of teaching roles resulting from increased weekly workload in the same job or in other jobs, in order to increase monthly income. Conversely, progressive increase of income among teachers with a career path may be related with age.

The average time working as a teacher observed in the present study has been corroborated in others proposals,[8] which found a variation from 12.9 to 14.4 years. For time of working as a teacher above 14 years, the association with MSD in ULs and LLs may be combined with changes in more strict educational policies and the emergence and handling of school demands unfavorable to teaching and to work quality

Table 4. Multivariate analysis with prevalence ratio and confidence intervals for musculoskeletal disorders in back, upper, limbs and lower limbs. Jequié, Brazil, 2010

Variables*	MSD in the back	MSD in the ULs	MSD in the LLs
	PR (95%CI)	PR (95%CI)	PR (95%CI)
Sex			
Female	1.34 (0.62-2.90)	-	-
Age (years)		-	-
31-45	-	0.72 (0.13-3.93)	2.98 (0.33-26.50)
> 45	-	0.33 (0.05-2.16)	0.95 (0.09-10.53)
Marital status			
Married/stable union	-	-	3.11 (0.71-13.62)
Divorced/separated/widowed	-	-	5.74 (1.22-26.92)
Skin color			
Black/brown/red	0.41 (0.24-0.69)	-	0.52 (0.29-0.94)
Income (MWs)			
10-15	-	1.15 (0.40-3.32)	-
> 15	-	2.68 (0.93-4.65)	-
Time working as a teacher (years)			
> 14 years	1.37 (0.78-2.40)	6.04 (2.03-17.93)	3.64 (1.38-9.61)
Good relationship with colleagues			
No	-	2.21 (1.03-4.75)	-
Comorbidities			
Yes	4.20 (1.08-16.30)	-	-
Irregular sleeping pattern			
Yes	1.88 (1.07-3.33)	2.15 (1.16-3.98)	-
Consumption of alcohol			
Yes	-	0.23 (0.08-0.66)	-
Smoking			
Yes	-	-	4.13 (2.15-7.92)

95%CI = 95% confidence interval; LLs = lower limbs; MSD = musculoskeletal disorders; MW = minimum wage; PR = prevalence ratio; ULs = upper limbs.
* Reference category: sex (male); age (≤ 31 years); marital status (single); skin color (white/yellow); income (≤ 10 MWs); time working as a teacher (≤ 14 years); good relationship with colleagues (yes); comorbidities (no); irregular sleeping pattern (no); consumption of alcohol (no); smoking (no).

along the teaching career, which makes teachers vulnerable to the onset of MSDs.[25]

In the investigation of organization work aspects, satisfaction with the performance of teaching activities, insufficient interval between lessons and use of a computer were associated with MSD in the back. These conditions showed that teachers without the dully support to undertake their activities experience greater work-related exhaustion associated with the occurrence of this event.[26,27] Conversely, it is necessary to consider the roles that teachers assume, without realizing the burden imposed to them, which, despite being pleasant, overload their psychophysical capacities.[20,21] Furthermore, a work environment without the necessary conditions for its organization may contribute to the development of stress and the adoption of inappropriate life habits, causing the onset of MSDs.

The presence of comorbidities showed an important association with MSD in the back. However, among the several comorbidities that affect teachers, common mental disorders[16,20,21,28] and depression[20,28] are the events most frequently related with MSDs and may lead to a substantial impairment in wellbeing in the teaching work. Thus, in addition to acknowledging the prevalence of MSDs among workers, it is also necessary to understand that, along with MSDs, there may be other diseases capable of worsening disease symptoms and resulting in the consequent absence from work.

The significant relationship between irregular sleeping pattern and MSDs among teachers is corroborated in a study with state school teachers in Londrina, state of Paraná, Brazil, which revealed that pains in ULs and LLs were factors that hindered workers' sleep.[29] It is worth highlighting that this relationship may have a bimodal nature, since MSDs may have an influence on sleep and poor sleep quality may lead to the onset of MSDs.[30]

Alcohol consumption showed a protective association with MSD in the ULs. This finding was contrary to that expected, but was similar to that of the study conducted in the general population when considering the moderate consumption of alcohol.[24] This situation may be related with the use of alcohol as a source of pleasure and relief from suffering, but

it is important to highlight the scarcity of studies that explain this relationship. Smoking, in turn, was associated with MSDs in the LLs and may related with stressors of the teaching activity, although this activity has not been reported in the literature as an element associated with smoking.[31] It is believed that campaigns aimed at reducing smoking in Brazil may have decreased the expression of the results in other body regions.

Finally, study limitation should be considered, which result from the application of self-administered instruments to assess MSDs to the detriment of a direct investigation with interview and assessment. Furthermore, study design portrays a specific health condition, at a given moment, with no temporal follow-up. It is also worth mentioning the fact that only "healthy" workers were assessed, with the exclusion of those who were absent from work due to health problems or who withdrew from the profession due to MSDs. Thus, the results for MSDs among teachers obtained in this study may be underestimated.

Similarly, it was not possible to perform an ergonomic analysis at the teachers' workplace, which could have contributed for the assessment of the occurrence of MSDs. However, the obtained results are considered to be relevant, because they address a still incipient topic, especially in the scenario of the teaching work.

Therefore, with the purpose of preventing MSDs in teachers, some strategies have been successfully implemented[32] and may be adopted, such as improvements in the structure of school facilities; relocation of the teaching staff; reduction in the number of employment contracts; development of career, position and salary plan; and implementation of health education focused on occupational health and on ergonomic training. Moreover, changes in the organization of the teaching work, with the inclusion of resting intervals in the teachers' routine, stretching activities, and stress management, may contribute to the wellbeing of this population.

Given the presented data, it is possible to conclude that the interviewed teachers had a high prevalence of MSD in the body regions studied: ULs, LLs, and back. Overall, this condition was associated with

sociodemographic, occupational, organization, and health factors, supporting the hypothesis that, when not appropriately performed, teaching work has a negative impact on teachers' health and quality of life. It is worth emphasizing that knowledge on these factors is important both to teachers themselves, in the sense of warning and instructing this worker category about the causes of MSDs, and to higher authorities, which aim to create strategic policies

(both preventive and therapeutics) to promote health and occupational wellbeing. Therefore, the constant search for strategies to organize teachers' work in order to minimize MSDs and their associated factors represents the actual possibility of ensuring better quality of life and appropriate conditions to teachers' health, increasing the levels of work satisfaction and reducing the expenses resulting from absenteeism due to occupational diseases.

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