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Work absence due to musculoskeletal disorders among basic education teachers in Brazil

Afastamento do trabalho por distúrbios musculoesqueléticos entre os professores da educação básica no Brasil

Abstract

Objective: to investigate factors associated with work absence due to musculoskeletal disorders among teachers of Brazilian basic education. *Methods*: a cross-sectional study, which used a probabilistic and representative sample of the major regions of Brazil. Through telephone interviews, a questionnaire was applied to collect socio-demographic information on health status, work absences, and characteristics of teaching work. Poisson regression with robust variance was used to estimate prevalence ratios (PR) and 95% confidence intervals (95%CI). *Results*: among the 6,510 participating teachers (63.2% female), the prevalence of leave due to musculoskeletal disorders was 14.7% (16.5% among women and 11.7% among men). The results indicated an association between absence and indiscipline in the classroom (female = PR: 1.36; 95%CI: 1.11;1.67; male = PR: 1.35; 95%CI: 1.02;1.78), verbal violence committed by students (female = PR: 1.16; 95%CI: 1.01;1.35; male = PR: 1.54; 95%CI: 1.22;1.95) and high professional tasks demands (female = PR: 1.17; 95%CI: 1.01;1.36; male = PR: 1.27; 95%CI: 1.01;1.60). *Conclusion*: the factors associated with work absences due to musculoskeletal disorders are related to teachers' exposure to work overload and stressful school environments.

Keywords: school teachers; absenteeism; occupational health; sex distribution; cross-sectional studies.

Resumo

Objetivo*: investigar fatores associados ao afastamento do trabalho por distúrbios musculoesqueléticos entre professores e professoras da educação básica brasileira.* Métodos*: estudo transversal com amostra probabilística e representativa das grandes regiões do Brasil. Por meio de entrevistas realizadas por telefone, foi aplicado questionário para coleta de informações sociodemográficas, sobre estado de saúde, afastamentos do trabalho e características do trabalho docente. Empregou-se regressão de Poisson com variância robusta, para estimar razões de prevalência (RP) e intervalos de confiança de 95% (IC95%).* Resultados*: entre os 6.510 professores participantes (63,2% do sexo feminino), a prevalência de afastamento por distúrbios musculoesqueléticos foi de 14,7%, sendo 16,5% para o sexo feminino e 11,7% para o masculino. Os resultados indicaram associação entre afastamento e indisciplina em sala de aula (feminino = RP: 1,36; IC95%: 1,11;1,67; masculino = RP: 1,35; IC95%: 1,02;1,78), violência verbal praticada por estudantes (feminino = RP: 1,16; IC95%: 1,01;1,35; masculino = RP: 1,54; IC95%: 1,22;1,95) e alta exigência das tarefas profissionais (feminino = RP: 1,17; IC95%: 1,01;1,36; masculino = RP: 1,27; IC95%: 1,01;1,60).* Conclusão*: os fatores associados aos afastamentos do trabalho por distúrbios musculoesqueléticos estão relacionados à exposição dos professores, de ambos os sexos, à sobrecarga de trabalho e a ambientes escolares estressantes.*

Palavras-chave*: professores escolares; absenteísmo; saúde do trabalhador; distribuição por sexo; estudos transversais.*

Introduction

Conditions involving musculoskeletal morbidities are generally called musculoskeletal disorders (MSDs). These disorders are characterized by inflammatory or degenerative injuries or dysfunctions, which affect tendons, ligaments, muscles and joints in different body segments[1]. In addition to the association between MSD and occupational factors, relationships with individual characteristics (age, sex), lack of regular physical activity, and comorbidities are commonly identified[2,3].

Research records that certified absences and sick leaves from work due to MSDs are frequent in different occupational groups and, in general, are associated with sociodemographic aspects, behaviors, health status and work characteristics[1,4]. Teachers are included in the groups exposed to risk factors for such morbidities, which are among the main causes of illness in this occupational category[3,5,6].

The literature indicates that the transformations in the educational sector have required new competences and multiple skills. Reforms initiated in the 1990s changed the nature of teaching work, in addition to the schools' physical and psychosocial environment. New demands and management models led to work intensification[7,8]. Multiple and concurrent tasks, high number of students in the classroom, time pressure to deal with teaching-learning plans and schedules, among others, are aggravating factors for the occurrence of MSD in teachers[3]. Postural, sound, light and thermal discomforts in the school environment are also reported, as well as the presence of stressors related to threats perpetrated by the students themselves[5]. It should be noted that these factors are generally associated with MSD[2].

Sex/gender differences in the prevalence of MSD have been observed. In general, women[9] – including teachers[3,10,11] –, complain more often about negative characteristics at work. Study results identified differences in working conditions between women and men, which may be associated with a greater likelihood of physical and psychological illness[10,11]. Furthermore, the different roles in other spheres of social life, in which women assume double or even triple workdays when considering domestic work as well, have repercussions on health, and could help explain the higher prevalence of MSD observed among them[10].

In addition to the relevance of the teaching mission, this category is numerically expressive: in 2019, there were 2,615,390 teachers working in basic education[12]. In recent years, there has been an increase in the number of studies carried out in the country interested in investigating the relationship between work and health in this occupational category[5,6,8,13]. In general, these surveys focused on teachers from cities or groups of Brazilian cities, without, however, reaching national coverage and representativeness[14].

The objective of this study was to investigate, in a representative sample of the national territory, the factors associated with the prevalence of work absences due to MSD, among basic education teachers in Brazil.

Methods

Study design

This cross-sectional study used data from the Educatel Study, which examined the health situation of basic education schoolteachers in Brazil[14]. Brazilian basic education comprises early childhood education (children aged 0 to 5 years), the initial years (aged 6 to 10 years) and final years (aged 11 to 14 years) of primary education, as well as secondary education (aged 15 to 17 years)[15].

Participants and sampling

Teachers working in basic education, in public and private schools in urban and rural areas of Brazil, made up the target population of the research – in total, this amounts to 2,229,269 individuals[16]. For sample selection, we considered strata referring to the five major regions of the country, administrative dependency (state, municipal, private and others) and census area of schools (n = 2); teachers' age (≤ 34 years, between 35 and 44 years, between 45 and 54 years and ≥ 55 years) and sex; type of employment relationship (permanent/stable, temporary contract, private network, CLT contract and others); and teaching level in which the teacher worked (children, primary, secondary, youth and adult education, professional and others), totaling 28 strata. Subsequently, a simple random sampling was carried out in each of these strata and, in order to correct low coverage biases, a post-stratification weighting procedure was used.

Study size

The calculation of the sample number considered the following parameters: prevalence of absenteeism of 38%[13]; 95% confidence level; maximum predicted error of 1.2%; 20% to compensate refusal or non-response; 20% to compensate for the respondent's

possible ineligibility; and correction for finite populations. Teachers who were not working in the classroom at the time of the interview and those who could not be located after 15 telephone contact attempts were considered ineligible. In order to ensure the completion of the study, a sample size of 13,243 was estimated, to guarantee the minimum number of 6,500 teachers. Details on sample design are presented in Vieira et al.[17].

Data collection

Data collection took place between October 2015 and March 2016, through telephone and computer-assisted interviews. The team made up of 30 interviewers, two supervisors and a coordinator were trained and supervised by researchers from the Nucleus for Health and Work Studies at the Federal University of Minas Gerais (UFMG). After identifying the schools, telephone calls were made to the selected subjects. Further information about the procedures used is available in Assunção et al.[14].

Variables and measurement

The dependent variable for the study – work absence due to musculoskeletal disorders – was based on the answer about the health reason that led the teacher to miss work for at least one day in the last year (prior to the moment of the research). The investigation into the health reasons that caused work absence was carried out based on a list of the most prevalent morbidities in teachers[18]. The answer options were "no" or "yes" and referred to emotional (such as depression, stress and anxiety), voice (such as hoarseness and loss of voice), respiratory (such as asthma, bronchitis, rhinitis and sinusitis), upper limbs (such as bursitis and tendinitis) and dorsal region (such as low back pain, lumbago, sciatica, herniated disc) problems. The presence of the outcome 'leave due to MSD' was defined when the teacher self-reported problems in the upper limbs, in the dorsal region or both as the health reasons that caused work absence. On the other hand, the absence of the outcome was defined when teachers reported that they had not taken time off from work during the period, or that they had not attended school for another health reason.

Independent variables were classified into two distinct groups. The first group contained individual variables, which included sociodemographic information: sex (male, female), age (up to 34 years old; 35–44 years old; 45–54 years old; 55 years old or more), marital status (no partner; with partner), presence of children (no; yes), lifestyle and health situation: practice of frequent domestic activities (no; yes), practice of physical exercises in free time in the last 3 months (sufficiently active; insufficiently active) and self-rated health (good or very good; fair; poor or very poor).

The practice of physical exercises in free time and in the last 3 months was evaluated using the strategy adopted in the study Surveillance of Risk and Protective Factors for Chronic Diseases by Telephone Survey (VIGITEL)[19]. This variable was estimated from the combination between type/intensity, frequency and duration of exercise. Individuals who practiced at least 150 minutes of moderate-intensity physical activity per week were considered 'sufficiently active' (walking, walking on a treadmill, bodybuilding, water aerobics, gymnastics in general, swimming, martial arts and fighting, cycling, volleyball/footvolley and dancing) or at least 75 minutes a week of high-intensity physical activity (running, running on a treadmill, aerobics, soccer/five-a-side soccer, basketball and tennis)[19,20].

Self-rated health was investigated based on the answers to the question: "In general, would you say that your health is: very good; good; fair; poor; very poor?". The options were grouped into 'good or very good', 'fair' and 'poor or very poor'.

The second group of independent variables included those related to the characteristics of teaching work, which included working time in basic education (less than 10 years; from 10 to 20 years; more than 20 years), report of other paid activity outside teaching (no; yes), occupational overload (no; yes), loud noise in the classroom (no; yes), indiscipline (no; yes), verbal or physical violence committed by students (no; yes), high task demands (no; yes) and whether there was enough time to develop tasks (yes; no).

The variables referring to working time in basic education, as well as working in other remunerated activities outside teaching, were based on research by the Study Group on Educational Policy and Teaching Work (GESTRADO)[21].

The 'occupational overload' variable was created by combining the answers to the following questions (based on research by GESTRADO[21]): (1) "Do you work more than 40 hours a week?" (yes, no); and (2) "Do you work at more than one school?" (yes, no). The occupational overload variable was defined when the respondent answered 'yes' to both questions.

The 'loud noise' variable was evaluated based on responses to the following question, adapted from the Questionnaire for Fourth European Survey on Working Conditions[22]: "How often is the noise so loud that you would have to raise your voice to talk

to people?". The assessment of indiscipline in the classroom was carried out through answers to the question: "How often is your work environment agitated because of students' indiscipline?" – adapted from the Teaching and Learning International Survey[23]. For both questions, response options included 'often', 'sometimes', 'seldom' and 'never or almost never'. The variables were turned into dichotomous and the categories were grouped into the options 'no' (seldom, never or almost never) and 'yes' (often, sometimes).

Acts of verbal or physical violence, considering the student as the main actor in the working relations with the teacher[24], were assessed based on the answers to the following questions: "In the last 12 months, have you suffered verbal violence practiced by students?" and "In the past 12 months, have you experienced physical violence from students?". Again, the variables were turned into dichotomous and the response options were grouped into 'no' (never) and 'yes' (once, twice or more).

The variables 'high task demand' and 'sufficient time to complete work tasks' were assessed, respectively, based on the answers to the questions: "Does your work demand too much from you?"; and "Do you have enough time to complete all your work tasks?". The two questions were extracted from the short version and translated into Portuguese from the Job Stress Scale[25]. The answer options 'seldom' and 'never or almost never' were grouped into 'no'; and the options 'often' and 'sometimes' were grouped into 'yes'.

Bias

The Educatel questionnaire was built based on a wide literature review, in addition to the preparation of an explanatory manual of the questions and a validity test, in order to assess the internal consistency of the answers. Supervision and data quality monitoring procedures were also used, with training actions being carried out for interviewers[14].

Data analysis

The analyses were carried out using Stata statistical software version 13.0. First, a descriptive analysis was carried out by considering sample weights associated with each of the teachers interviewed through estimates of relative frequencies, according to the categories of variables referring to individual and teaching work characteristics. Then, the prevalence of work absence due to MSD, stratified by sex, was estimated according to the variables of interest.

For the analysis of factors associated with the prevalence of sick leave due to MSD, also considering data weighting, bivariate analyses were initially performed to verify the existence of crude associations with each of the categories of independent variables. Poisson regression with robust variance was used and, in this analysis, the variables that presented p value ≤ 0.20 were selected to compose the intermediate multiple models. The multiple models, also using this method, were adjusted manually. The multicollinearity test was performed to assess the correlation between the independent variables age and length of teaching experience. All those who presented $p \leq 0.20$ were included and removed, one by one, until only the factors associated with absences due to MSD at the level of $p \leq 0.05$ remained in the final multiple adjusted models, stratified by sex.

The goodness of fit of the final models was assessed by means of the residual test using Pearson's chi-square (χ^2). For this, the chi-square values must be interpreted in relation to their degrees of freedom (ratio χ^2/df). A model with good fit presents close chi-square values and degrees of freedom, that is, the χ^2/df ratio is approximately 1 ($\chi^2/df \approx 1$)[26].

Ethical considerations

The research was approved by the Research Ethics Committee (COEP) of the Federal University of Minas Gerais (CAAE: 48129115.0.0000.5149), on November 3, 2015. In the first contact, if the teachers agreed to participate, the interviewer provided them with information about the research website, where the respondent could watch an informative video that contained clarifications about the objectives, ethical care and institutional responsibility[14].

Results

A total of 119,378 phone calls identified 7,642 eligible teachers. At the end of data collection, 6,510 interviews were completed (85.2% response rate). Among the respondents, 4,116 (63.2%) were female. Half of the teachers reported having missed work for at least 1 day in the year prior to the survey, due to some health reason. Regarding the reasons, voice-related problems were the most prevalent (15.8%), followed by musculoskeletal problems (14.7%), respiratory problems (13.0%), and emotional problems (12.9%).

The prevalence of sick leave due to MSD was estimated at 16.5% in females and 11.7% in males. The percentage of absences due to problems in

the dorsal region (44.7%) stood out, followed by problems in more than one region of the body (28.9%) and located in the upper limbs (26.4%).

The mean age was higher in females (40.6 ± 10.5 years) than in males (39.8 ± 10.7 years). Most teachers reported living with a partner (59.8% female and 61.6% male) and having children (69.7% female and 61.7% male). Female participants reported more often being involved in domestic activities (72.9% compared to 45.8% in male participants), as well as practicing less regular physical exercise (35.5% compared to 48.8% in male participants). Most teachers self-rated their health as good or very good (78.3% in males and 72.4% in females) (**Table 1**).

Regarding the characteristics of teaching work, 34.4% of females and 41.2% of males worked in basic education for less than 10 years; the majority, regardless of sex, did not perform paid work outside the education sector. Occupational overload was confirmed in 33.6% of female teachers and 39.1% of male ones (**Table 1**).

As for the classroom environment, 63% of all teachers reported high noise; 70.1% of females and 66.9% of males dealt with student indiscipline. Among those who reported having suffered some type of violence perpetrated by students, 29.9% of female participants and 27.7% of males reported verbal violence, while physical violence was reported by 3.3% of females and 2% of the males. High task demands were reported by 55.7% of females and 52.7% of males; and insufficient time for the planned tasks was reported by 41% of the subjects (**Table 1**).

Crude analysis (**Table 2**) showed a higher prevalence of work absence due to MSD, in both sexes, in the of 45-54 years age group (female = PR: 1.86; 95%CI: 1.54;2.24 and male = PR: 1.38; 95%CI: 1.03;1.85). Similarly, a higher prevalence was observed in the following groups: male participants who lived with a partner (PR: 1.27; 95%CI: 1.01;1.61); female participants who had children (PR: 1.37; 95%CI: 1.17;1.62); teachers of both sexes who did not practice regular physical exercise (female = PR: 1.21; 95%CI: 1.04;1.40; male = PR: 1.61; 95%CI: 1.28;2.03); and teachers of both sexes who self-rated their health as fair (female = PR: 2.44; 95%CI: 2.12;2.81; male = PR: 2.19; 95%CI: 1.74;2.76) or 'poor or very poor' (female = PR: 3.81; 95%CI: 3.09;4.71; male = PR: 3.21; 95%CI: 2.10;4.91).

Among the characteristics of teaching work, the crude analysis indicated positive associations in both sexes for the group with longer time working in basic education (female = PR: 1.82; 95%CI: 1.53;2.17 and male = PR: 1.67; 95%CI: 1.27;2.20); and for those who reported exposure to occupational overload (female = PR: 1.28; 95%CI: 1.11;1.47 and male = PR: 1.33; 95%CI:1.07;1.66) and to loud noise (female = PR: 1.88; 95%CI: 1.59;2.22 and male = PR: 1.60; 95%CI: 1.24;2.06), who reported indiscipline in the classroom (female = PR: 1.90; 95%CI: 1.58;2.28 and male = PR: 1.74; 95%CI: 1.33;2.28), verbal violence committed by students (female = PR: 1.64; CI95%: 1.43;1.89 and male = PR: 2.02; CI95%: 1.62;2.51), high demand (female = PR: 1.56; CI95%: 1. 35;1.81 and male = PR: 1.59; CI95%: 1.26;2.00) and insufficient time for tasks (female = PR: 1.62; CI95%: 1.41;1.86 and male = PR: 1.53; 95%CI: 1.23;1.90). Among female participants, a positive association was also observed between absences due to MSD and having suffered physical violence perpetrated by students (PR: 1.87; 95%CI: 1.43;2.44) (**Table 2)**.

In the multiple analysis stratified by sex, for women, there is a higher prevalence of work absence due to MSD in the age group 45-54 years (PR: 1.46; 95%CI: 1.17;1.81); among participants who perceived their own health negatively (PR: 2.69; 95%CI: 2.16;3.36); who worked in basic education for more than 20 years (PR: 1.36; 95%CI: 1.11;1.66); and who reported the following occupational stressors: loud noise (PR: 1.32; 95%CI: 1.10;1.58) and indiscipline in the classroom (PR: 1.36; 95%CI: 1.11;1.67); verbal violence episodes (PR: 1.16; 95%CI: 1.01;1.35) or physical violence perpetrated by students (PR: 1.35; 95%CI: 1.03;1.77), high tasks demand (PR: 1.17; 95%CI: 1.01;1.36) and insufficient time to perform tasks (PR: 1.32; 95%CI: 1.15;1.51) (**Table 3**).

For males, the multiple analysis adjusted for age showed a higher prevalence of sick leave due to MSDs among teachers who did not practice regular physical exercise (PR: 1.32; 95%CI: 1.05;1.67); who negatively self-rated their own health (PR: 2.41; 95%CI: 1.56;3.74); worked for more than 20 years in basic education (PR: 1.79; 95%CI: 1.25;2.58); and among those who reported indiscipline in the classroom (PR: 1.35; 95%CI: 1.02;1.78), episodes of verbal violence committed by students (PR: 1.54; 95%CI: 1.22; 1.95) and high demand of the tasks to be performed (PR: 1.27; 95%CI: 1.01;1.60) (**Table 4**).

Table 1 Description of the study sample according to individual and work characteristics. Basic education teachers, Educatel Study, Brazil, 2016 (n = 6,510)

Variables	*Female*		*Male*	
	n	%	*n*	%
Total sample	4,116	63.2	2,394	36.8
Age				
Up to 34 years	1,356	32.9	862	36.0
Between 35 and 44 years old	1,214	29.5	730	30.5
Between 45 and 54 years old	1,082	26.3	522	21.8
55 years or older	464	11.3	280	11.7
Marital status				
No partner	1,656	40.2	919	38.4
With partner	2,460	59.8	1,475	61.6
Has children				
No	1,247	30.3	918	38.3
Yes	2,869	69.7	1,476	61.7
Frequent household activities (last 3 months)				
No	1,116	27.1	1,298	54.2
Yes	3,000	72.9	1,096	45.8
Practice of physical exercises (last 3 months)				
Sufficiently active	1,461	35.5	1,168	48.8
Insufficiently active	2,655	64.5	1,226	51.2
Self-assessment of health				
Good or very good	2,982	72.4	1875	78.3
Fair	989	24.0	461	19.3
Poor or very poor	145	3.5	58	2.4
Working time in Basic Education				
Less than 10 years	1,417	34.4	986	41.2
Between 10 and 20 years	1,330	32.3	804	33.6
More than 20 years	1,369	33.3	604	25.2
Other paid activity outside of Education				
No	3,803	92.4	1929	80.6
Yes	313	7.6	465	19.4
Occupational overload				
No	2,734	66.4	1,459	60.9
Yes	1,382	33.6	935	39.1
Refers to high noise in the classroom				
No	1,535	37.3	884	36.9
Yes	2,581	62.7	1,510	63.1
Refers to indiscipline in the classroom				
No	1,229	29.9	793	33.1
Yes	2,887	70.1	1,601	66.9
Suffered verbal violence practiced by students				
No	2,887	70.1	1731	72.3
Yes	1,229	29.9	663	27.7
Suffered physical violence perpetrated by students				
No	3,979	96.7	2,347	98.0
Yes	137	3.3	47	2.0
High task demands				
No	1823	44.3	1,132	47.3
Yes	2,293	55.7	1,262	52.7
Enough time for work tasks				
Yes	2,417	58.7	1,422	59.4
No	1,699	41.3	972	40.6

Table 2 Prevalence of work absences due to musculoskeletal disorders (MSD) and crude association with individual and working characteristics, stratified by sex. Basic education teachers, Educatel Study, Brazil, 2016 (n = 6,510)

Variables	*Female*		*Male*	
	P (%)	*Crude PR (95%CI)*	*P (%)*	*Crude PR (95%CI)*
Leave of absence due to DME	16.5	1.41 (1.24;1.60)[e]	11.7	1.00
Age				
Up to 34 years	11.4	1.00	9.9	1.00
Between 35 and 44 years old	17.1	1.50 (1.24;1.8)[e]	13.2	1.33 (1.01;1.76)[e]
Between 45 and 54 years old	21.1	1.86 (1.54;2.24)[e]	13.6	1.38 (1.03;1.85)[e]
55 years or older	19.2	1.69 (1.33;2.14)[e]	10.0	1.01 (0.68;1.52)
Marital status				
No partner	15.6	1.00	10.0	1.00
With partner	17.0	1.09 (0.94;1.26)	12.7	1.27 (1.01;1.61)[e]
Has children				
No	13.1	1.00	10.5	1.00
Yes	18.0	1.37 (1.17;1.62)[e]	12.5	1.19 (0.95;1.50)[e]
Frequent household activities (last 3 months)				
No	17.1	1.00	11.2	1.00
Yes	16.2	0.95 (0.81; 1.10)	12.3	1.10 (0.89;1.37)
Practice of physical exercises (last 3 months)				
Sufficiently active	14.5	1.00	8.9	1.00
Insufficiently active	17.6	1.21 (1.04;1.40)[e]	14.4	1.61 (1.28;2.03)[e]
Self-assessment of health				
Good or very good	11.4	1.00	9.1	1.00
Fair	27.8	2.44 (2.12;2.81)[e]	20.0	2.19 (1.74;2.76)[e]
Poor or very poor	43.4	3.81 (3.09;4.71)[e]	29.3	3.21 (2.10;4.91)[e]
Working time in basic education				
Less than 10 years	12.1	1.00	9.0	1.00
Between 10 and 20 years	15.5	1.28 (1.06;1.55)[e]	12.4	1.38 (1.05;1.81)[e]
More than 20 years	22.0	1.82 (1.53;2.17)[e]	15.1	1.67 (1.27;2.20)[e]
Other paid activity outside of Education				
No	16.3	1.00	11.6	1.00
Yes	18.2	1.11 (0.87;1.43)	12.3	1.06 (0.81;1.39)
Occupational overload				
No	15.1	1.00	10.3	1.00
Yes	19.2	1.28 (1.11;1.47)[e]	13.8	1.33 (1.07;1.66)[e]
Refers to high noise in the classroom				
No	10.6	1.00	8.5	1.00
Yes	20.0	1.88 (1.59;2.22)[e]	13.6	1.60 (1.24;2.06)[e]
Refers to indiscipline in the classroom				
No	10.1	1.00	7.8	1.00
Yes	19.2	1.90 (1.58;2.28)[e]	13.6	1.74 (1.33;2.28)[e]
Suffered verbal violence practiced by students				
No	13.8	1.00	9.1	1.00
Yes	22.7	1.64 (1.43;1.89)[e]	18.4	2.02 (1.62;2.51)[e]
Suffered physical violence perpetrated by students				
No	16.0	1.00	11.6	1.00
Yes	29.9	1.87 (1.43;2.44)[e]	17.0	1.47 (0.77;2.79)
High task demand				
No	12.6	1.00	8.9	1.00
Yes	19.6	1.56 (1.35;1.81)[e]	14.2	1.59 (1.26; 2.00)[e]
Enough time for work tasks				
Yes	13.1	1.00	9.6	1.00
No	21.2	1.62 (1.41;1.86)[e]	14.7	1.53 (1.23;1.90)[e]

P: prevalence; PR: prevalence ratio; 95%CI: 95% confidence interval; [e] $p < 0.20$.

Table 3 Prevalence ratios of work absences due to musculoskeletal disorders (MSD) and respective 95% confidence intervals for the variables of the final model of the multiple analysis – female sex. Basic education teachers, Educatel Study, Brazil, 2016 (n = 4,116)

Variables	*Adjusted PR (CI95%)*	*p**
Age		
Up to 34 years	1.00	
Between 35 and 44 years old	1.29 (1.06;1.59)	0.012
Between 45 and 54 years old	1.46 (1.17;1.81)	0.001
55 years or older	1.40 (1.07;1.83)	0.014
Self-assessment of health		
Good or very good	1.00	
Fair	2.07 (1.79;2.39)	< 0.001
Poor or very poor	2.69 (2.16;3.36)	< 0.001
Working time in basic education		
Less than 10 years	1.00	
Between 10 and 20 years	1.12 (0.92;1.35)	0.255
More than 20 years	1.36 (1.11;1.66)	0.003
Reports high noise in the classroom		
No	1.00	
Yes	1.32 (1.10;1.58)	0.003
Reports indiscipline in the classroom		
No	1.00	
Yes	1.36 (1.11;1.67)	0.004
Suffered verbal violence practiced by students		
No	1.00	
Yes	1.16 (1.01;1.35)	0.040
Suffered physical violence perpetrated by students		
No	1.00	
Yes	1.35 (1.03;1.77)	0.031
High task demand		
No	1.00	
Yes	1.17 (1.01;1.36)	0.033
Enough time for work tasks		
Yes	1.00	
No	1.32 (1.15;1.51)	< 0.001

PR: prevalence ratio; 95%IC: 95% confidence interval; $\chi^2/df = 0.82$.
*Obtained using Poisson regression with robust variance.

Table 4 Prevalence ratios of work absences due to musculoskeletal disorders (MSD) and respective 95% confidence intervals for the variables of the final model of the multiple analysis – male sex. Basic education teachers, Educatel Study, Brazil, 2016 (n = 2,394)

Variables[f]	*Adjusted PR (CI95%)*	*p*[*]
Practice of physical exercises (last 3 months)		
Sufficiently active	1.00	
Insufficiently active	1.32 (1.05;1.67)	0.019
Self-assessment of health		
Good or very good	1.00	
Fair	1.76 (1.38;2.24)	< 0.001
Poor or very poor	2.41 (1.56;3.74)	< 0.001
Working time in basic education		
Less than 10 years	1.00	
Between 10 and 20 years	1.30 (0.96;1.75)	0.089
More than 20 years	1.79 (1.25;2.58)	0.002
Reports indiscipline in the classroom		
No	1.00	
Yes	1.35 (1.02;1.78)	0.038
Suffered verbal violence practiced by students		
No	1.00	
Yes	1.54 (1.22;1.95)	< 0.001
High task demand		
No	1.00	
Yes	1.27 (1.01;1.60)	0.044

PR: prevalence ratio; CI: confidence interval; [f]Adjusted for age, $\chi^2/df = 0.88$.
[*]Obtained using Poisson regression with robust variance.

Discussion

The study showed, as expected, a higher prevalence of sick leave among females as compared to males[4], as well as differences in the factors that remained associated with the outcome between male and female teachers.

The prevalence of work absences due to MSD observed in this study (14.7%) is higher than that obtained in others. In the research by Gasparini et al.[18], carried out with teachers from Belo Horizonte (MG), it was observed, according to administrative data, that musculoskeletal system and connective tissue disorders was the third among the most common diagnoses leading to work absence. The prevalence found was 11% in the period 2001/2002 and 10% in the period 2002/2003. In Ireland, MSDs were the reason for disability retirement for 10% of teachers in primary and secondary schools, in the period between 2002 and 2005[27].

However, results from other authors are higher than those found in Educatel. In Spain, MSDs were the main cause of work absence (18%) in 2007[28]. The social and economic differences between Brazil and other countries, the way work is organized, the demands faced by workers and the protective factors involved can contribute to the observed differences. Alternatively, these could be explained by methodological differences across the studies, such as the duration of the problem parameter (other than 12 months, for example) or data source (administrative records instead of self-report, for example).

The results of this research showed, in addition to the sex difference in prevalence, discrepancies in the factors that remained associated with the outcome. For both sexes, a higher prevalence of work absence due to MSD was observed in those with negative self-rated health, longer working as a teacher, with reports of indiscipline and verbal violence by students, as well as high task demands. In females, the variables age, noise, physical violence and insufficient time for teaching tasks still held. Finally, in males, insufficient physical exercise was a factor associated with the outcome.

The association between work absence due to MSD and negative self-rated health is consistent. It is

an indicator that has been used in several studies because it is a reliable measure of the global health of individuals and population groups, including musculoskeletal aspects, in addition to adequate predictive power for sickness absenteeism[29]. It can be expected that the high workload, combining prolonged periods of sitting – when preparing classes and activities – and standing posture – when classes are taught in the classroom – harms teachers' musculoskeletal health[7,11,30], which may interfere with the way they perceive it.

The investigation of the relationship between working time and MSD occurrence in teachers is recurrent in the literature[11]. The results reinforce the hypothesized association between prolonged exposure to precarious environments and adverse health situations, including a higher occurrence of MSD[5,11]. Long hours, numerous activities and time pressure characterize teacher work overload. If lasting, such stressors can directly interfere with musculoskeletal health, aggravate pain processes, restrict time for extra-professional activities with decreased likelihood of recovery[3,30], thus increasing the chances of being absent from work.

The 'indiscipline in the classroom' variable remained associated with a higher prevalence of absences due to MSDs among the teachers in this study. Faced with the responsibility of controlling discipline and ensuring the student's concentration, the teacher moves around the classroom countless times, remains standing for a long time and practices vocal effort, which, as a whole, results in an intense request for their body, cognitive and affective functions[31], with probable effects on the musculoskeletal system.

The 'report of verbal violence perpetrated by students' was a variable that remained associated with a higher prevalence of absences due to MSD, regardless of sex. Exposure to violence and a stressful environment increases vulnerability to somatic pain syndromes and affects pain tolerance, thus contributing to the triggering and worsening of musculoskeletal symptoms[32,33]. A recent study carried out with elementary school teachers in a municipality in northeastern Brazil found a higher prevalence of MSD among those who reported having suffered verbal aggression[33].

'High task demand' continued to be associated with absence due to MSD. This result is also recurrent in other studies and reflects the conditions to which Brazilian teachers are submitted, in terms of multiple requirements[18,31]. The teaching work has been characterized by the combination of reconciling teaching activities, participating in school management, developing projects, achieving quality goals and dealing with the emotional overload of relationships with students, parents and the community, a situation that has consequences for the mental and physical health of this category of workers[5,7,8,18], including musculoskeletal disorders[3,11].

Teachers aged 35 years or older had a higher prevalence of work absence due to MSD. This result is not surprising, since increasing age is a risk factor for a number of morbidities, including MSD[2,3,11]. The trend of increased absence with longevity was not confirmed for the last age group. A possible effect of a healthy worker cannot be ruled out, since only active teachers were interviewed[34]. It is plausible to consider, also, the greater likelihood of the most vulnerable or those with the worst health status leaving permanently due to work overload.

It should be noted that, although a correlation was observed between the independent variables age and teaching experience, such correlation was not strong enough to detect multicollinearity ($r \geq 0.7$). Initially, the two variables were inserted in the multiple modeling. It was observed that, in females, both variables remained in the final model; in males, however, the age variable lost statistical significance along the adjustment of the multiple model.

'Exposure to noise produced in the classroom' remained associated with a higher prevalence of absenteeism due to MSD only among females. Irritation is a frequent response in populations exposed to this harmful agent[35] and, at work, it is usually accompanied by occupational stress-related feelings[18,31]. This condition particularly affects women during professional practice[36], in line with the results presented here. The discomfort generated by exposure to excessive noise would cause muscle responses and inflammatory processes responsible for pain complaints[37].

Regarding physical violence, musculoskeletal pain, a frequent symptom in MSDs, may represent a direct consequence of the violent act, or arise from the physiological response to stress, as a result of increased muscle tension[32]. Musculoskeletal pain originating from physical violence or from other causes may also be intensified or prolonged by impairment of tissue healing, as well as the physiological response to stress[32]. In this research, a higher prevalence of absence due to MSD was observed in female teachers who reported episodes of physical violence committed by students. This result is consistent with a cohort study carried out in Denmark, in which an association was found between exposure to violence at work and musculoskeletal pain in women, as compared to men[38].

As for the time available to perform professional tasks, a higher prevalence of leave due to MSDs was observed among female participants, who reported insufficient time to perform them. In this context, gender differences are observed. In the present study, women, more often than men, reported doing housework. Such double shift disturbs the regulation of time for recovery activities – for example, rest, leisure and physical activities[10] –, with likely effects on the triggering or worsening of musculoskeletal complaints.

Insufficient physical exercise continued to be associated with a higher prevalence of absences due to MSD in males. This regular practice brings many health benefits: it improves physical capacity, favors muscle tissue recovery[39], reduces disease risks[30], and improves quality of life and well-being[13]. The inverse relationship between habits and lifestyle, as well as work absences, in particular the effect of the regular practice of any type of physical activity, has been demonstrated in occupational contexts[39]. As for gender differentials, as mentioned[10], the distribution of extra-professional time is uneven when comparing men and women. The former would be more likely to spend their free time with leisure and sport. If true, would men be more susceptible to sick leave due to MSD when deprived of regular exercise for some reason? Future research would be desirable for further clarification.

The fact that the investigated outcome was based on self-report of musculoskeletal problems can be considered a limitation of this study, since the interviewees' answers could refer to the confirmed diagnosis or to their perception of the presence of such problems. Therefore, there is no information about the type of morbidity, symptomatology and/or use of pain control medication. Other possible limitations include: the impossibility of determining the temporality direction between the investigated factors, the recall bias, and the absence of direct contact between interviewee and interviewer – which makes it difficult to clarify respondents' doubts, if any, about interview questions. In addition, telephone surveys do have the limitation of excluding individuals without a telephone. However, it is worth remembering the strategy adopted by Educatel, of considering post-stratification to correct low coverage biases[17].

Nevertheless, the following advantages are worth highlighting. This is an original survey, nationwide, which, for the first time, involved a probabilistic, random and representative sample of all basic education teachers in Brazil. The study reached rural and urban areas, regardless of the size of the schools[14]. Low cost and agility are recognized advantages in surveillance systems based on telephone surveys; and the external validity of data obtained in this way has already been tested, with approximate estimates of what would be expected for the population[40]. The telephone survey allowed covering, relatively quickly, a representative sample of the universe of 2.2 million Brazilian teachers[14].

The analyses carried out in this research aimed to investigate sex differences in the factors associated with the prevalence of work absences due to MSD, between male and female teachers. It also sought to contribute to the discussion on gender differentials and the socially constructed roles assigned to women and men, without considering, however, people with gender diversity. Thus, future studies could include, in addition to biological sex, questions related to this concept.

Conclusions

This study made it possible to investigate the factors associated with work absence due to MSD among basic education teachers in Brazil. The results indicated that these factors are related to the exposure of teachers, of both sexes, to work overload and stressful school environments due to loud noise, indiscipline and violence acts committed by students. However, male and female teachers respond differently to these exposures and this scenario has influenced their way of working. Therefore, the need for policies and strategic actions is evident, with a view to transforming working conditions in Brazilian schools, which consider sex/gender differentials in relation to exposure to occupational risks.

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Authors' contributions

Barbosa REC, Alcantara MA and Fonseca GC participated in the survey, analysis and data interpretation. Assunção AA participated in the study conception and design, and data interpretation. All the authors participated in the manuscript writing and contributed to critical reviews and approval of the final version. The authors assume full responsibility for the study and published content.

Data availability

The authors declare that the entire study data set, despite the anonymity, is not publicly available, as it contains information about school services and work processes that allow identifying the places where the interviewees were working.

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