

Prevalence of low back pain and associated factors in adults from a middle-size Brazilian city

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Abstract *Objective: To determine the prevalence of low back pain and some related variables among adults of both genders. Methods: Was conducted a cross-sectional study of population-based in the urban area of Presidente Prudente, São Paulo. The sample consisted of 743 adult residents for over two years in this city. Low back pain, quality of sleep and physical activity were collected through face to face interview at the residence of respondents. Was used the chi-square test to analyze the association between variables, later was created tree multivariate models with hierarchical inclusion of confounding factors. Results: The prevalence of low back pain reported last year was 50.2% (95% CI: 46.6, 53.8), and the last week 32.3% (95% CI: 28.9, 35.6). Was association among low back pain and females (p-value = 0.031), older age, lower education, altered sleep and overweight, the adjusted model found that people over the age of 45 years (45 to 59.9 years, OR = 13.1 [1.72-98.5] and ≥ 60 years, OR = 9.10 [1.15-71.7]), with some alteration of sleep (OR = 3.21 [1.84-5.61]) and obese (OR = 2.33 [1:26 to 4:33]) seems to be a risk group for low back pain. Conclusion: The prevalence of low back pain is high and obese people aged over 45 years, with any sleep disturbance are a group at higher risk for low back pain.*

Key words *Low back pain, Exercise, Sleep, Body mass index*

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Introduction

Musculoskeletal disorders (MD) constitute an important health complication, significantly affecting the quality of life of people affected by it¹. Among all MD, low back pain is the most prevalent in the general population, of which 80% report at least one episode of low back pain during their lives². Low back pain occurs in both sexes, but it is more common in adults with ages ranging from 30 to 50 years and it has been associated with increased health care expenditures^{2,3}, being a relevant cause of medical attendance around the world⁴, less reported only than headaches².

In the United States of America, about 50% of all people have already had an episode of low back pain⁴. In the United Kingdom, the *Clinical Standards Advisory Group (CSAG)* of the British Ministry of Health found that 16.5 million people were affected by low back pain⁵. In Germany⁶, Turkey⁷ and France⁸ the occurrences of low back pain were 59%, 51% and 55.4%, respectively.

In Brazil there is a high rate of low back pain in adults (63%)¹, which is higher in the female sex⁹⁻¹¹ and caused mainly by idiopathic origins linked to lifestyle and occupational activity¹².

The identification of not only the prevalence of MD, but also its determinants is a relevant action, because it offers support to the elaboration of more effective actions targeting preventing and combatting MD. Research has previously identified that in the Brazilian population MD is significantly associated with sex, age, occupational activity, overweight and sleep quality⁹⁻¹¹. Regarding preventive actions, physical activity practice has been highlighted by the scientific literature^{13,14}, because its relationship with low back pain is unclear. Thus, the aim of this study was to determinate the prevalence of low back pain and associated factors among adults of both sexes from Presidente Prudente, a middle-size Brazilian city located in Sao Paulo State.

Methods

Design of the study

The study was initiated after its approbation by the Committee for Ethics in Research of the School of Sciences and Technology of the São Paulo State University, Presidente Prudente, Brazil. Adults (age ≥ 18 years-old) of both sexes who had been living in Presidente Prudente for at least two years (a city is located in western Sao Paulo

State with 208,000 inhabitants and a high human development index of 0.846) were interviewed.

Sample size estimation was based on rates of low back pain previously reported by two epidemiological studies^{1,10}. Mean prevalence (57.9%) and standard-error (5%) of both studies were calculated and, additionally, a population of 208,000 inhabitants, a 95% confidence interval ($z = 1.96$) and effect design of 30% were considered. Using the above mentioned parameters, the minimum sample size was estimated as 486 adults of both sexes. To predict losses, 20% was added to the estimated minimum sample size so the fieldwork was planned to be composed of at least 583 interviews.

In the sampling process, the city was stratified into five geographical regions (east, west, north, south and city center) and, in each geographical region, neighborhoods were randomly selected. In each selected neighborhood, 20 streets and avenues were randomly selected. In each selected street/avenue, all the houses were considered and six houses were randomly selected. All adults living in the selected houses, who fulfilled the inclusion criteria, were invited for an interview. In empty houses, the next house in the street was considered eligible; this process was performed until an occupied house was found.

The interview process was performed only with adults who fulfilled all the inclusion criteria and agreed to participate. During the interview, the participants were asked about low back pain, leisure physical activity and sleep quality. After the fieldwork, the sample was composed of 743 adults of both sexes who fulfilled all the inclusion criteria and agreed to participate in the study by signing a written consent form.

Dependent variable: low back pain

The questionnaire developed by Kuorinka et al.¹⁵ and previously validated to Brazilian Portuguese^{16,17} was used, which assess the occurrence of musculoskeletal symptoms (pain, tingling and numbness) in different body segments (neck, shoulders, back, elbows, fists/hands, low back, hip/thigh, knees and ankles/feet). The questionnaire contains four dichotomous questions (yes or no) for each body segment: (i) the occurrence of MD in the previous 12 months; (ii) a detrimental effect of this MD on daily activities in the previous 12 months; (iii) a consultation with any health professional to treat this MD; (iv) feeling the MD in the week preceding the interview. In this study, due to the categorical nature of the

variables, the analyzed outcome considered was the positive response to all four questions in the low back region (Figure 1).

Independent variables

Leisure physical activities

Sport practice in leisure time was assessed through the use of the questionnaire developed by Baecke et al.¹⁸ and validated to Brazilian Portuguese by Florindo et al.¹⁹. Other non-sportive activities performed during leisure time were also considered (resistance training, gymnastics, martial arts and walking). Three components of this sport practice were considered: the intensity (low, moderate and high), weekly practice time (< 1h/week; 1-2h/week; 2-3h/week; 3-4h/week; > 4h/week) and previous engagement (< 1 month; 1-3 months; 4-6 months; 7-9 months; > 9 months). Thus, subjects who reported at least 180 minutes per week (3-4h/week) of moderate or high-intensity physical activities in the preceding four months (4-6 months) were classified as physically active; this classification has been used in previous studies²⁰⁻²². Three categories were created: (score zero) subjects who reported the absence of sport practice; (score one) subjects who reported sport practice but: less than 180 minutes per week or an intensity lower than recommended or previous engagement lower than 4 months; (score two) subjects who met the physical activity recommendations.

Overweight and quality of sleep

Body weight (kg) and height (m) were self-reported by the participants and using these anthropometric data the body mass index (BMI)

was estimated, dividing body weight by squared height (kg/m²). Three categories were created: normal weight, overweight and obese. Quality of sleep was assessed by the Mini-sleep Questionnaire²³, validated to the Brazilian population by Falavigna et al.²⁴, in which there are 10 questions with seven possible responses (never = 1, very rarely = 2, rarely = 3, sometimes = 4, often = 5, very often = 6 and always = 7) and produces a final score (the higher the score, the worse the sleep quality). The final score is classified as: adequate sleep (score between 10 and 24 points), sleep slightly altered (score between 25 and 27 points), sleep quality moderately altered (score between 28 and 30 points) and sleep quality severely altered (score \geq 30 points). In this study, the adopted cutoff was \geq 25 points to denote altered sleep.

Socioeconomic variables

Other variables were also assessed and treated as potential confounders; sex (1 = male and 2 = female), age (1 = 18-29, 2 = 30-44.9, 3 = 45-59.9 and 4 \geq 60 years), ethnicity (1 = Caucasian, 2 = Afro-American, 3 = Oriental and 4 = other) and formal education (1 \leq 4 years, 2 = 5-8 years, 3 = high school and 4 = college).

Statistical analysis

Numerical variables were expressed as mean and standard-deviation (SD). Due to the use of categorical variables, the chi-square test was used to assess the existence of associations, and the Yates' correction was applied when necessary. Independent variables significantly associated in the chi-square test were inserted into three multivariate models (logistic regression) adopting a hierarchical model. The first model was composed of socioeconomic variables (sex, age and schooling); the second model, adjusted by socioeconomic and behavioral variables (leisure physical activity and sleep quality); the third model, adjusted by socioeconomic variables, behavioral variables and overweight. Adjusted odds ratios (OR) and their 95% confidence intervals were generated (OR_{95%CI}). The significance level was set at $p < 0.05$ and the statistical software used was BioEstat (release 5.0).

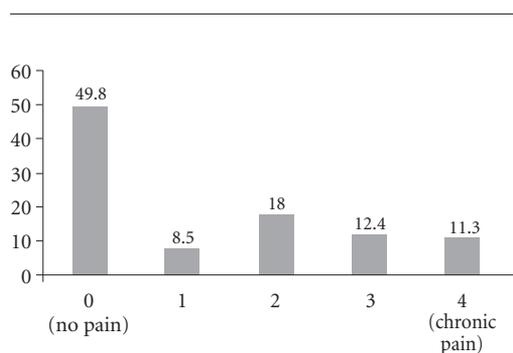


Figure 1. Number of positive responses to musculoskeletal symptoms among adults.

Results

The sample was composed mainly of women ($n = 453$, 60.9%), Caucasians ($n = 616$, 82.9%), physically inactive ($n = 452$, 60.8%), with overweight (overweight [$n = 260$; 35%] and obesity [$n = 173$; 23.3%]); moreover, the majority of subjects studied until high school (61.8%). Mean age was 49.9 ± 17.3 years (95%CI: 48.6; 51.1 years), and 30.6% of the participants were older than 60 years (18-29 years: 14.8%; 30-44.9 years: 25.9%; 45-60 years: 28.6%; > 60 years: 30.6%).

The occurrence of low back pain was 11.3% (95%CI: 9.1; 13.5%) (Figure 1). When taking into account the four questions used to characterize low back pain, it was possible to observe that low back pain in the preceding 12 months was reported by 50.2% of the participants (95%CI: 46.6; 53.8), and in the previous week 32.3% reported the outcome (95%CI: 28.9; 35.6). In addition, 21.1% (95%CI: 18.2; 24.1) of the participants reported that their daily life had been prejudiced in the previous year due to low back pain, while 23.2% (95%CI: 20.2; 26.3) reported a consultation with any health professional to treat low back pain.

Low back pain was associated with the female gender, higher age, lower schooling, worse sleep quality and overweight. In the Yates' correction in the chi-square test, leisure physical activity was not statistically associated with low back pain, but the logistic regression identified an increased odds ratio (OR 2.35 [1.00-5.54]) for insufficiently active subjects to report low back pain (Table 1).

Taking into account the independent variables associated with low back pain up to p -value = 0.200 in the chi-square test, a multivariate model was elaborated with hierarchical insertion of the socioeconomic variables, behavioral variables and overweight. The final multivariate model was adequately fit (Hosmer and Lemeshow's test with p -value = (0.464)) and identified that people ≥ 45 years (45-59.9 years, OR = 13.1 [1.72-98.5] and ≥ 60 years, OR = 9.10 [1.15-71.7]), with sleep disturbances (OR = 3.21 [1.84-5.61]) and obese (OR = 2.33 [1.26-4.33]) constituted a group with an increased likelihood to report low back pain (Table 2).

Discussion

The high prevalence of low back pain in the preceding 12 months (50.2%) was similar to the prevalence of low back pain observed in other nations, such as Germany (59%)⁶, Turkey (51%)⁷, France (55.4%)⁸ and also another Brazilian study (63%)¹, denoting the relevance of this outcome around the world. One important fact reported in this study was the high rate of people reporting difficulties in daily life due to low back pain 21.1% (95%CI: 18.2; 24.1), which was high in the economically active group of the population and thus indicates the harmful effect of low back pain on economic losses related to productivity loss and absenteeism²⁻⁴. Another relevant fact was the high prevalence of low back pain in the previous week (32.3%). Deyo *et al.*² found that acute low back pain is the second most common reason to contact health professionals in the United States. In the present study, the finding of Deyo *et al.*² could be used to support the high rate of participants who reported contacting a health professional to treat low back pain, indicating the relationship between low back pain and increased health care expenditures²⁻⁴.

The association between low back pain and the female sex is similar to findings reported by Silva *et al.*¹¹, and could be justified by anatomical aspects and also the fact that women have double shifts (home and work)⁹⁻¹¹. However, in the multivariate model the effect of sex on low back pain was mediated by lower schooling and higher age. Similar to previous studies^{2-4,11}, higher age was associated with low back pain and there were more women in all age groups, but principally in the ≥ 45 years group. Thus, the higher life expectancy observed for females and the higher number of women in older age groups could be used to justify the mediating role of age in the association between sex and low back pain in the multivariate model.

Regarding schooling, the observed associations were similar to those observed by Silva *et al.*¹¹; the explanation could be based on the occupational activities of people with lower formal education, which usually involve higher physical effort^{2,4}, different to that observed in jobs that

Table 1. Factors associated with low back pain in adults from Presidente Prudente/SP, Brazil.

	Low back pain* n (%)	χ^2 p-value	OR crude (OR _{95%CI})
Sex		0.031	
Male	23 (8.1)		1.00
Female	61 (13.4)		1.78 (1.07-2.95)
Age (years)		0.001	
18-29	01 (0.9)		1.00
30-44.9	15 (7.8)		9.23 (1.20-70.9)
45-60	34 (16)		20.8 (2.81-154)
≥ 60	34 (15)		19.2 (2.59-142)
Ethnicity		0.342	
Caucasian	74 (12)		1.00
Afro-American	07 (8.4)		0.67 (0.30-1.51)
Oriental	00 (0)		---
Other	03 (18.8)		1.69 (0.47-6.07)
Schooling		0.001	
< 4 years	32 (20.6)		3.36 (1.66-6.79)
5-8 years	20 (15.5)		2.37 (1.11-5.05)
High school	20 (6.8)		0.95 (0.45-1.99)
College	12 (7.2)		1.00
Leisure PA		0.065	
< 180 min/week	78 (12.3)		2.35 (1.00-5.54)
≥ 180min/week	06 (5.6)		1.00
Sleep quality		0.001	
Normal	19 (4.8)		1.00
Altered	65 (18.7)		4.57 (2.68-7.80)
Overweight		0.001	
Normal	21 (6.8)		1.00
Overweight	29 (11.2)		1.71 (0.95-3.08)
Obesity	34 (19.7)		3.34 (1.87-5.97)

* = positive response to all questions about low back pain; OR = odds ratio; 95%CI = 95% confidence interval; PA = physical activity

require higher qualifications. The association between schooling and low back pain was mediated by leisure physical activity and quality of sleep. It is well documented that lower schooling is related to lower leisure physical activity, while people with higher formal education have predominantly sedentary occupational activities and are more physically active in leisure time²⁰.

Sleep quality was associated with low back pain in all models (OR = 3.21 [1.84-5.61]), which agrees with Pereira et al.²⁵ who analyzed the sleep quality of 1,111 professional musicians and identified a significant relationship between pain and sleep quality. In the systematic review developed by Kelly et al.²⁶, low back pain was associated with sleep disturbances and lower sleep time, as well as worse quality of sleep. The above mentioned findings can at least in part be attributed to the

difficulty of relaxing and falling asleep in the presence of low back pain, as well as movement difficulties in the bed^{25,26}.

Obesity was associated with low back pain. In fact, obese people have a higher likelihood of reporting low back pain than normal weight people⁹⁻¹¹. A possible explanation is based on the increased physical loading in articulation, as well as modifications in the gravitational axis due to increased body mass⁹⁻¹¹.

Physically inactive people have a higher likelihood of reporting low back pain, denoting a protective effect^{1,3,6}. However, the absence of association between low back pain and physical activity is similar to other Brazilian studies⁹⁻¹¹ and probably due to the fact that physical activity affects outcomes other than low back pain^{27,28}. Moreover, reverse causality should be considered in the in-

Table 2. Adjusted association between low back pain occurrence and independent variables.

	Model-1 OR (OR_{95%CI})	Model-2 OR (OR_{95%CI})	Model-3* OR (OR_{95%CI})
Sex			
Male	1.00	1.00	1.00
Female	1.58 (0.94-2.66)	1.34 (0.79-2.29)	1.44 (0.84-2.47)
Age (years)			
18-29	1.00	1.00	1.00
30-44.9	7.45 (0.96-57.7)	7.30 (0.93-56.8)	7.32 (0.93-57.2)
45-59.9	15.2 (2.03-114)	14.1 (1.87-106)	13.1 (1.72-98.5)
≥ 60	10.1 (1.29-77.7)	9.52 (1.21-74.6)	9.10 (1.15-71.7)
Schooling			
< 4 years	2.61 (1.17-5.77)	1.99 (0.87-4.57)	1.96 (0.85-4.52)
5-8 years	1.98 (0.91-4.27)	1.60 (0.72-3.56)	1.56 (0.70-3.51)
High school	0.98 (0.46-2.09)	0.88 (0.41-1.91)	0.85 (0.39-1.86)
College	1.00	1.00	1.00
Leisure PA			
< 180 min/week		1.72 (0.70-4.24)	1.65 (0.66-4.09)
≥ 180min/week		1.00	1.00
Sleep quality			
Normal		1.00	1.00
Altered		3.60 (2.07-6.23)	3.21 (1.84-5.61)
Overweight			
Normal			1.00
Overweight			1.41 (0.76-2.61)
Obesity			2.33 (1.26-4.33)

OR = odds ratio; 95%CI = 95% confidence interval; PA = physical activity; Model-1: adjusted by socioeconomic variables (sex, age and schooling); Model-2: adjusted by socioeconomic and behavioral variables (leisure physical activity and sleep quality); Model-3: adjusted by socioeconomic variables, behavioral variables and overweight; * = Hosmer-Lemeshow's test with p-value = 0.464.

terpretation of these results, since people with low back pain can perform exercises as a treatment for the outcome. Therefore, the cross-sectional design and absence of more sophisticated methods to diagnose low back pain can be considered the main limitation of this study. Finally, the impossibility to revisit empty houses previously selected should also be considered.

In summary, there was a high prevalence of low back pain in the analyzed sample, while higher age (≥ 45 years), worse sleep quality and obesity were pointed out as risk factors for low back pain. Therefore, the promotion of physical activity targeting weight loss²⁷ and also improving sleep quality seems to be a relevant tool in the prevention of low back pain.

Collaborations

EAC Zanuto, JS Codogno, DGD Christófaró, LCM Vanderlei, JR Cardoso and RA Fernandes participated equally in all stages of preparation of the manuscript.

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