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Prevalence of nonspecific lumbar pain and associated factors among adolescents in Uruguaiana, state of Rio Grande do Sul☆,☆☆

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ABSTRACT

Objective: To identify the prevalence of nonspecific lumbar pain and associated factors among adolescents in Uruguaiana, state of Rio Grande do Sul.

Methods: This was a cross-sectional school-based study conducted among adolescents aged 10–17 years who were enrolled in the day shift of the municipal and state educational systems of Uruguaiana. This study evaluated 1455 adolescents. The data-gathering procedures involved two stages. Firstly, a questionnaire on sociodemographic indicators, behavioral patterns and habits of the daily routine and history of nonspecific lumbar pain was applied. Subsequently, height, body mass, flexibility and abdominal strength/resistance measurements were evaluated. To analyze the data, univariate, bivariate and multivariable methods were used and the significance level was taken to be 5% for all the tests.

Results: The prevalence of lumbar pain among the adolescents evaluated was 16.1%. Grouped according to sex, the prevalence among males was 10.5% and among females, 21.6%. The variables of sex, body mass index, abdominal strength/resistance and physical activity level presented statistically significant associations with nonspecific lumbar pain. In the adjusted analysis, sex (OR = 2.36; $p < 0.001$), age (OR = 1.14; $p < 0.001$) and body mass index (OR = 1.44; $p = 0.029$) maintained significance in the final model.

Conclusions: Female adolescents of older age and who presented overweight or obesity had higher chances of developing nonspecific lumbar pain.

Prevalência de dor lombar inespecífica e fatores associados em adolescentes de Uruguaiana/RS

Palavras-chave:
Dor lombar

RESUMO

Objetivo: Identificar a prevalência de dor lombar inespecífica e os fatores associados em adolescentes de Uruguaiana/RS.

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Adolescente
Sexo
Índice de massa corporal

Métodos: Estudo transversal de base escolar, feito com adolescentes de 10 a 17 anos matriculados no turno diurno das redes municipal e estadual de ensino de Uruguaiana/RS. Foram avaliados 1.455 adolescentes. O procedimento de coleta dos dados ocorreu em duas etapas. Inicialmente foi aplicado um questionário sobre indicadores sociodemográficos, comportamentos e hábitos da rotina diária e histórico de dor lombar inespecífica. Posteriormente foram avaliadas as medidas de estatura, massa corporal, flexibilidade e força/resistência abdominal. Para a análise dos dados foram usados os métodos univariado, bivariado e multivariável e foi considerado nível de significância de 5% para todos os testes.
Resultados: A prevalência de dor lombar nos adolescentes avaliados foi de 16,1%. Por sexo, o masculino apresentou uma prevalência de 10,5% e o feminino, de 21,6%. As variáveis sexo, índice de massa corporal, força/resistência abdominal e nível de atividade física apresentaram associação estatisticamente significativa com a dor lombar inespecífica. Na análise ajustada o sexo (OR = 2,36; p < 0,001), a idade (OR = 1,14; p < 0,001) e o índice de massa corporal (OR = 1,44; p = 0,029) mantiveram significância no modelo final.
Conclusões: Adolescentes do sexo feminino que apresentaram idades mais elevadas e estavam com sobrepeso ou obesidade têm mais chances de desenvolver dor lombar inespecífica.

Introduction

Nonspecific lumbar pain is considered to be one of the main health problems in industrialized countries[1] and it has increased considerably over recent decades among adolescents.[2] The earliest cases of nonspecific lumbar pain occur in the age group from 11 to 12 years, with a gradual increase of approximately 10% per year, until reaching around 50% of adolescents at the age of 18 years.[3] This problem is even more significant when it is perpetuated into adulthood.[4]

It is difficult to identify the etiology of lumbar pain because it is manifested under various conditions[5] and is often of multifactorial nature.[6] Among other causes, lumbar pain presents an association with individuals' lifestyles, such that overweight,[7–9] sedentarism[8,9] and remaining in certain positions for long periods of time[7,10] are triggering factors for this problem.

In this context, a study conducted among school children in Florianópolis, state of Santa Catarina, showed that 25.5% of the individuals who feel lumbar pain indicate that the triggering factor for their painful state consists of situations in which they remain in a seated position for long periods.[10] In addition, adolescents who occupy their time doing activities that allow diversity of posture present a chance of developing lumbar pain that is 2.3 times lower than the rate presented by their sedentary peers.[11]

On the other hand, high levels of physical activity are positively associated with the appearance of nonspecific lumbar pain.[3,4,7] However, this association needs to be analyzed cautiously, since continuous well-guided physical activity practices contribute toward better posture and lower incidence of lumbar pain.

It is important to emphasize that lumbar pain is not a specific pathological condition but, rather, a symptom that may be related to a disease[12] and which, with the passage of time, may result in a degenerative musculoskeletal disorder[2,7] with the capacity to reduce the individual's fitness for work.[13] Thus, knowledge of the etiology of lumbar pain and the associated factors in adolescents may help to prevent and understand the problem in adults.[14]

The present study had the objective of analyzing the prevalence of nonspecific lumbar pain and the associated factors among adolescents in Uruguaiana, state of Rio Grande do Sul (RS).

Method

This was a school-based cross-sectional study conducted among adolescents aged 10–17 years who were enrolled in the daytime shift of the municipal and state school network of Uruguaiana, RS. This study formed part of a larger project developed in 2011, under the title "Habitual physical activity and associated factors among school children in Uruguaiana, RS", which was approved by our institution's research ethics committee (protocol 042/2010) and followed the guidance of Resolution 196/96 of the National Health Council.

According to information from the elementary school census of 2010,[15] the study population comprised 15,210 adolescents in the age group determined. To make the sample calculation, the following procedures were used: prevalence of 50%, since the larger project addressed multiple outcomes; 95% confidence interval (95% CI); sample error of 3%; design effect (*deff*) of 1.5; and an additional amount of 15% to make up for possible losses and refusals. Through using these criteria, it was estimated that it would be necessary to assess 1398 school children. The sampling criterion used was probabilistic in clusters, in which each school was considered to be a cluster. All the public schools in the municipality participated in the draw and had the same chances of participating, according to the number of students enrolled in the age group from 10 to 17 years. To reach the estimated number of adolescents, it was necessary to draw 10 schools: nine in the urban area (seven state schools and two municipal schools) and one in the rural area. All the school children between the ages of 10 and 17 years at the 10 schools that were drawn were invited to participate. Only students who presented a free and informed consent statement signed by an adult responsible for them and who expressed willingness to participate were included in the sample composition.

The data-gathering procedure comprised two stages. Firstly, a questionnaire structured into sections was applied to all the individuals who made up the sample. The questionnaire contained questions relating to: (a) sociodemographic indicators; (b) behavior and habits of the daily routine (including physical activity); and (c) history of nonspecific lumbar pain. In the second stage, anthropometric and motor measurements were made. The data were gathered by a group of trained evaluators (teachers and students/bursary-holders at the institution where the study was conducted). The data-gathering period was from May to November 2011.

Nonspecific lumbar pain (dependent variable) was estimated using an adaptation of the instrument proposed by Sjoile et al.[16] The adolescents gave responses to the following question: "Have you ever had pain or discomfort in your back, in the lumbar region?" There was a drawing beside the question that indicated the location of the lumbar region. The responses possible were: never; only a few times; often; and all the time. For the analyses, the categories of "never" and "only a few times" were grouped and considered to be "without lumbar pain" and the categories of "often" and "all the time" were grouped and considered to be "with lumbar pain".

The variables that formed the sociodemographic indicators were: (a) sociodemographic level (in conformity with the Brazilian economic classification criteria divided into five levels from A to E)[17]; (b) sex (male or female); and (c) age (completed years).

The indicators of behavior and daily routine habits were: (a) time spent doing sedentary activities, involving use of televisions, electronic games and computers (≤3 h or >3 h); and (b) habitual physical activity level, using a questionnaire for physical activities among children and adolescents: Physical Activity Questionnaire for Older Children (PAQ-C)[18] and Adolescents (PAQ-A).[19] The PAQ-C/PAQ-A contains nine questions with five possible responses. Each response is scored from 1 to 5, thus producing the final score for each questionnaire. The individuals were classified into terciles with regard to their physical activity levels: "least active" (tercile 1), "intermediate" (tercile 2) and "most active" (tercile 3).

The anthropometric and motor activities evaluated were: height, body mass, flexibility and abdominal strength/resistance. Body mass measurements were made with the aid of a Plenna® digital balance (Plenna, São Paulo, Brazil) with a capacity of 150 kg and precision of 100 g. Height was measured in centimeters, with one decimal place, with the aid of a measuring stick fixed to the wall. The individuals were positioned in accordance with the Frankfurt plane, using a setsquare on the head. Both of these anthropometric measurements were made in accordance with standard procedures.[20] The body mass index (BMI) was obtained by dividing the body mass in kilograms by the height in meters squared and was categorized as "normal weight" or "overweight" (the overweight and obese categories were grouped), in conformity with the proposal of Cole et al.[21]

Flexibility and abdominal strength/resistance were measured using the sit-and-reach test and according to the number of sit-ups that could be done in one minute, respectively. The measurement procedure followed the recommendations of the Brazilian sports project (Proesp).[22] Through using specific cutoff points according to sex and age, flexibility and abdominal strength/resistance were classified as "less than recommended" or "recommended".

To analyze the data, univariate, bivariate and multivariable methods were used. In the univariate analysis, the absolute and relative frequencies (proportions) were used for each of the variables studied, followed by calculation of the 95% confidence interval (95% CI). For the bivariate analysis, the chi-squared test for heterogeneity and chi-square test for linear trend were used. In this analysis, each independent variable was correlated with the dichotomized dependent variable ("without lumbar pain" or "with lumbar pain"). Also for the bivariate analysis, Student's *t*-test for independent samples was used to test the difference between the mean ages of the groups with and without lumbar pain.

In the multivariable analysis, binary logistic regression was used. Nonspecific lumbar pain was dichotomized as an outcome. Each of the independent variables in this analysis was entered in conformity with the hierarchical theoretical model that was constructed (Fig. 1). The theoretical model used three causal determination levels (proximal, intermediate and distal). The first level (sociodemographic indicators) included the socioeconomic level, age and sex. The intermediate level (lifestyle indicators) included sedentary behavior and physical activity. The last level (anthropometric and motor indicators) included the body mass index, flexibility and muscle strength/resistance. The final multivariable model took the independent variables that presented p-values <0.05 into consideration as factors associated with nonspecific lumbar pain.

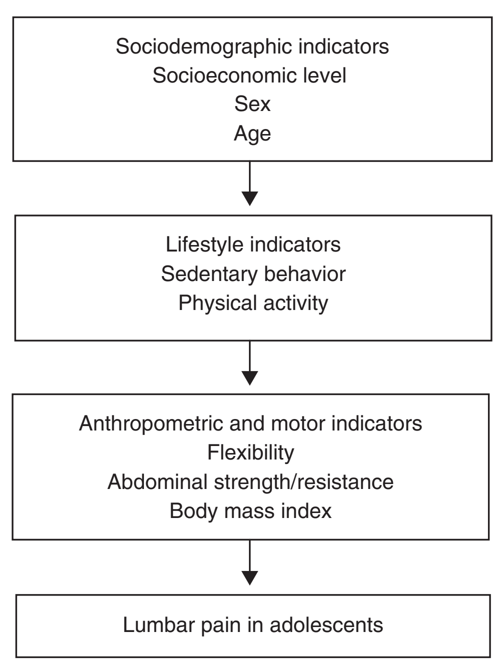

Fig. 1 – Hierarchical model of factors associated with nonspecific lumbar pain in adolescents.

Results

For the analyses, data on 1455 adolescents were gathered. To calculate the prevalences of lumbar pain, 1377 individuals who filled out all the information needed were taken into consideration.

The prevalence of lumbar pain among the adolescents evaluated was 16.1%. Divided according to sex, the male group presented prevalence of 10.5% ($n = 71$) and the female group, 21.6% ($n = 151$).

The frequency distribution of the variables analyzed is presented in Table 1. From this, it can be seen that 26.7% of the individuals evaluated were overweight and that 64.2% were spending more than three hours a day doing sedentary activities.

The results from the chi-square test indicated that only the variables of sex, BMI, abdominal strength/resistance and physical activity level presented statistically significant associations with nonspecific lumbar pain ($p < 0.05$), as shown in Table 2. In relation to age, the *t*-test indicated that adolescents who reported having lumbar pain had a higher mean age than those who reported that they did not feel any lumbar pain ($t = -3.61$; $p < 0.05$).

The crude odds ratio (OR) values from the binary logistic regression analyses confirmed the results from the analyses on the chi-square test. From combined analysis (adjusted OR), sex, age and BMI maintained their significance in the model. It is worth emphasizing that the results from the adjusted binary logistic regression analysis indicated that female adolescents presented approximately a 2.3-fold greater chance of having lumbar pain than their peers. In relation to age, it could be seen that with each year that passed, the chance of lumbar pain increased by 14% (Table 3).

Table 1 – Frequency distribution among the adolescents according to the variables analyzed, Uruguaiana, 2012.

Variable	*n*	% (95% CI)
Sex		
Male	714	49.1 (46.5–51.7)
Female	741	50.9 (48.3–53.5)
Age (years)		
10	79	5.4 (4.2–6.6)
11	209	14.4 (12.6–16.2)
12	205	14.1 (12.3–15.9)
13	232	15.9 (14.0–17.8)
14	211	14.5 (12.7–16.3)
15	221	15.2 (13.3–17.0)
16	174	12.0 (10.3–13.7)
17	124	8.5 (7.1–9.9)
Total	1455	$\bar{X}$: 13.56; SD: 2.02
Socioeconomic level		
Class B	263	20.6 (18.4–22.8)
Class C	817	63.9 (61.3–66.5)
Class D/E	198	15.5 (13.5–17.5)
BMI		
Normal	1004	73.3 (70.9–75.6)
Overweight	359	26.7 (24.4–29.0)
Abdominal strength/resistance		
Recommended	976	72.6 (70.2–75.0)
Below recommended	369	27.4 (25.0–29.8)
Flexibility		
Recommended	913	66.9 (64.4–69.4)
Below recommended	451	33.1 (30.6–35.6)
Time spent doing sedentary activities		
≤3 h	521	35.8 (33.3–38.3)
>3 h	934	64.2 (61.7–66.7)
Physical activity level		
Most active	453	33.2 (30.7–35.6)
Intermediate	453	33.2 (30.7–35.7)
Least active	458	33.6 (31.2–36.2)

n, sample number; %, proportion of sample; 95% CI, 95% confidence interval; $\bar{X}$ mean; SD, standard deviation.

Discussion

Nonspecific lumbar pain in adolescents has been the focus of several studies because of the high prevalences found in the literature and because of the multifactorial nature of its etiology.[4,6,7,11,23–29]

In this context, the results showed that the prevalence of nonspecific lumbar pain among the adolescents in Uruguaiana (16.1%) was lower than the rates presented in the literature, which have ranged from 20% to 60%, approximately.[4,7,10,28,29]

However, this result needs to be analyzed attentively, because sociocultural, environmental and genetic aspects of the reality analyzed should be taken into consideration, which adds difficulty to extrapolating the results to different contexts.[30] Moreover, Masiero et al.[25] commented that the different conclusions regarding the prevalence of lumbar pain may be related to the study design, sample selection, instrument used for measurements and the geographical area, among other factors.

Sex has been indicated as one of the factors associated with nonspecific lumbar pain,[25,28,29,31,32] which is in line with the findings from the present study, which showed that females were more affected by painful conditions and presented around a 2.4-fold greater chances of presenting lumbar pain than shown by males.

The fact that females presented greater prevalence of pain can be explained by cultural issues, in that women may demonstrate their feeling more,[28] along with their specific anatomofunctional characteristics, such as less adaptation to sustained physical effort and joints that are more fragile.[33] It needs to be emphasized that the differences between the sexes may be linked to endogenous pain modulation systems that contribute toward greater sensitivity to and greater prevalence of a variety of painful conditions among women.[34] Moreover, perceptions of pain may be affected by hormonal alterations induced by puberty.[7]

The association between age and lumbar pain has been shown to be positive, with increasing prevalence as age increases. This makes it possible to speculate that lumbar pain during childhood is predictive of lumbar pain in adulthood.[27,31]

In this regard, a study conducted among school children in Bauru, state of São Paulo, also found an association between

Table 2 – Results from chi-square analysis between lumbar pain occurrences (yes/no) and the categorical variables studied among adolescents in Uruguaiana, Rio Grande do Sul, 2011.

Variable	Lumbar pain		*p*
	Yes % (95% CI)	No % (95% CI)	
Sex			<0.001
Male	10.5 (8.2–12.7)	89.5 (87.2–91.7)	
Female	21.6 (18.6–24.6)	78.4 (75.4–81.4)	
Socioeconomic level			0.292
Class B	19.7 (14.9–24.5)	80.3 (75.4–85.1)	
Class C	15.2 (12.7–17.7)	84.8 (82.3–87.7)	
Class D/E	16.7 (11.5–21.9)	83.3 (78.1–88.5)	
BMI			0.009
Normal	14.5 (12.3–16.7)	85.5 (83.3–87.7)	
Overweight	20.3 (16.1–24.5)	79.7 (75.5–83.9)	
Abdominal strength/resistance			0.026
Recommended	14.5 (12.3–16.7)	85.5 (83.3–87.7)	
Below recommended	19.3 (15.3–23.3)	80.7 (76.7–84.7)	
Flexibility			0.473
Recommended	15.8 (13.4–18.2)	84.2 (81.8–86.6)	
Below recommended	16.2 (12.8–19.6)	83.2 (79.7–86.7)	
Time spent doing sedentary activities			0.168
≤3 h	14.7 (11.6–17.7)	85.3 (82.2–88.3)	
>3 h	16.9 (14.5–19.3)	83.1 (80.7–85.5)	
Physical activity level			0.024
Most active	14.1 (10.9–17.3)	85.9 (82.7–89.1)	
Intermediate	14.3 (11.0–17.6)	85.7 (82.4–90.0)	
Least active	19.7 (16–23.4)	80.3 (76.4–84.0)	

%, proportion of sample; 95% CI, 95% confidence interval; *p*, significance level.

lumbar pain and age,[28] thereby strengthening the findings from the present study, in which a significant increase in prevalence relating to advancing age was highlighted.

The increase in prevalence according to age may result from accumulated overload on the spine caused, among other factors, by carrying backpacks and other heavy objects and by remaining in a seated position for long periods.[31]

The variable of socioeconomic level was not found to present any association with lumbar pain. This variable needs

Table 3 – Crude and adjusted odds ratios for lumbar pain (yes/no) and factors associated with pain among adolescents in Uruguaiana, Rio Grande do Sul, 2011.

Variable	*n* (%)	Binary logistic regression			
		Crude OR (95% CI)	*p*	Adjusted OR (95% CI)	*p*
Sex					
Male	678 (49.4)	1	–	1	–
Female	699 (50.6)	2.36 (1.74–3.20)	<0.001	2.36 (1.71–3.26)	<0.001
Age					
	1377 (100)	1.14 (1.06–1.22)	<0.001	1.14 (1.06–1.22)	<0.001
BMI					
Normal	945 (73.3)	1	–	1	–
Overweight	345 (26.7)	1.50 (1.09–2.06)	0.012	1.44 (1.03–2.02)	0.029
Abdominal strength/resistance					
Recommended	929 (72.7)	1	–	1	–
Below recommended	348 (27.3)	1.40 (1.02–1.93)	0.040	1.18 (0.83–1.69)	0.30052
Physical activity level					
Most active	439 (33.1)	1	–	1	–
Intermediate	447 (33.7)	1.01 (0.69–1.48)	0.945	0.76 (0.50–1.14)	0.182
Least active	441 (33.2)	1.49 (1.04–2.12)	0.028	0.91 (0.60–1.38)	0.658

n, sample number; %, proportion of sample; 95% CI, 95% confidence interval; OR, odds ratio; *p*, significance level.

to be analyzed cautiously in this regard, given that socioeconomic level is related to several other factors and may serve as a confounding variable in cases of significant associations with lumbar pain.[35] Nonetheless, a study conducted among the population of Salvador, state of Bahia, also did not find any significant association between lumbar pain and socioeconomic level among the subjects evaluated.[36] Likewise, among students in Londrina, state of Paraná, no association was found between back pain and socioeconomic class.[37]

BMI also presented a significant association with conditions of lumbar pain among the adolescents evaluated here and corroborated the results from the meta-analysis presented by Shiri et al.[38] regarding the association between lumbar pain and obesity. They concluded that both overweight and obesity increased the risk of lumbar pain and also suggested that the association between overweight or obesity and the prevalence of lumbar pain was stronger among women than among men.

In this context, obesity has a negative impact on children's osteoarticular health, because it promotes biomechanical alterations in the lumbar spine and triggers significantly greater frequency of lumbar pain among obese individuals.[39]

However, in an analysis by Jannini et al.[32] on musculoskeletal pain among adolescents, the prevalence of lumbar pain was not found to be greater among obese individuals than among normal-weight individuals. Even so, back pain is the most frequent painful manifestation among obese children and adolescents and affects approximately 39% of these individuals.[40]

Review studies have indicated that back pain in children and adolescents may be associated with seated positions, postural deviations and also weakness of the abdominal muscles, among other factors.[7,41] In the present study, lumbar pain was correlated with abdominal strength/resistance, which corroborates this information.

Jones et al.[6] also found significant differences in abdominal resistance among adolescents with lumbar pain, in comparison with adolescents without pain. However, Balagué, Troussier and Salminen[7] showed that lumbar pain at school age cannot simply be attributed to muscle weakness. This is because there seems to be a correlation between shortening of the posterior muscles of the thigh and lumbar pain. This information is reinforced by the study by Feldman et al.,[35] who assessed adolescents and found an association between lumbar pain and shortening in the hamstring muscles and in the femoral quadriceps.

In the present study, no association was identified between lumbar flexibility and occurrences of lumbar pain. This result may be associated with the fact that there is no consensus regarding what the appropriate values for protection against cases of lumbar pain would be.[7,41] In this regard, one study found that only intermediate trunk flexibility values provided protection against the appearance of lumbar pain, since values indicating hypomobility and hypermobility were predictive of the appearance of the problem.[5]

However, this lack of consonance in the information may be related to the group studied, since the morphological differences between the sexes may affect the results. Thus, the fact that women present greater flexibility and lower abdominal resistance values may give rise to higher prevalence of lumbar pain among women.[6]

The time spent doing sedentary activities did not present any relationship with the states of lumbar pain presented by the individuals evaluated. This result differed from what was found in a study among school children in Bauru, state of São Paulo, in which it was shown that individuals who spent more than two hours watching television presented an 86% greater chance of having lumbar pain.[28] However, it has to be borne in mind that the association between the time spent doing sedentary activities and the presence of lumbar pain is not well defined among students, which shows the lack of studies.[41]

A study conducted in Italy by Masiero et al.[25] among adolescents aged 13–15 years found an association between nonspecific lumbar pain and female sex, family history and sedentarism. A similar result was found by Noll et al.,[29] in analyzing factors associated with back pain among adolescents.

Regarding the association between the physical activity level and lumbar pain, the crude analysis showed that adolescents who were less active had higher chances of presenting lumbar pain. However, when the analysis was adjusted for the sociodemographic variables, the association ceased to present statistical significance.

These results are in line with information available in the literature that indicates that there is no consistency in the results regarding the association between physical activity and lumbar pain. Results stating that lower levels of physical activity are associated with lumbar pain in adolescents[11,24] and that vigorous physical activity practices also may increase the chance of lumbar pain in adolescents[31] are available in the literature and indicate that further studies on the association between these variables need to be conducted.

The results from the present study provide evidence that contributes toward better comprehension of lumbar pain among adolescents. However, certain limitations need to be taken into consideration. Since this was a school-based study, the results cannot be generalized to all of the adolescents in the city. Although significant associations were found between lumbar pain and some independent variables, it was not possible to establish the causality because this was a cross-sectional study.

Conclusions

In relation to the factors associated with lumbar pain, the adjusted model indicated that sex, age and BMI were the factors that predicted cases of lumbar pain. Female sex, greater age and overweight or obesity increased the chance of presenting nonspecific lumbar pain among the adolescents in Uruguaiana, state of Rio Grande do Sul.

Conflicts of interest

The authors declare no conflicts of interest.

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