Prevalence of Back Pain and Idiopathic Scoliosis in Adolescents From the Semiarid Region of Brazil: A Cross-sectional Study

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ABSTRACT

Objective: The purpose of this study was to estimate the prevalence of adolescent idiopathic scoliosis (AIS), and back pain and its risk factors, in schoolchildren from the semiarid region of Brazil.

Methods: A total of 520 adolescents aged 10 to 16 years old were assessed. The students were administered the self-reported Back Pain and Body Posture Evaluation Instrument questionnaire. The screening for AIS included measuring the angle of trunk rotation using a scoliometer in the Adams forward-bend test. Participants with an angle of trunk rotation ≥ 7° were referred for radiography. The prevalence ratio was estimated by multivariable analysis using a Poisson regression model ($\alpha = 0.05$).

Results: Among the participants, 3.1% (95% confidence interval, 3.2%-6.9%) had a confirmed AIS diagnosis: 1.9% girls and 1.1% boys. There was no difference between boys and girls in AIS prevalence. The prevalence of back pain in the previous 3 months was 63.7% (95% confidence interval, 59.5%-67.7%), at a moderate level (visual analog scale = 3.83; 95% confidence interval, 3.57-4.08). Multivariable analysis showed that back pain is associated with postural variables, sex, and age.

Conclusion: The prevalence of AIS in the semiarid region of Brazil was 3.1%, and that of back pain was 63.7%. Only body mass index was different between adolescents with and without AIS, with those with AIS having a lower mean body mass index. Back pain was higher in girls and increased in older adolescents. Furthermore, behavioral and postural habits and hereditary factors were associated with an increased chance of back pain. (J Chiropr Med 2021;20;97-107)

Key Indexing Terms: *Back Pain; Adolescent; Child; Pain*

INTRODUCTION

Scoliosis is the most common spinal disorder in children and adolescents.[1] Adolescent idiopathic scoliosis (AIS) is a complex 3-dimensional deformity of the spine characterized by lateral deviation and axial rotation.[2-4] Another problem that has been common in the adolescent population is back pain, frequently present in 2 or more anatomic areas of the spine in young schoolchildren.[5] Early detection of these 2 conditions (AIS and back pain) contributes to reduction of complications and development into adulthood.

AIS affects adolescents aged 10 to 17 years.[6] Early detection of scoliosis allows for monitoring of the development and progression of the deformity, and timely initiation of bracing treatment.[7-10] School screening studies are carried out with the aim of detecting these adolescents early, avoiding complications, and starting early treatment to avoid the need for surgery.[11] Geographic features like proximity to the equator become important factors in the prevalence of AIS, since sunlight can influence the

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secretion of melatonin, which stimulates early puberty in adolescents, accelerating the growth-spurt process and reducing the incidence of AIS in this population.[12]

One of the most common problems in adolescents with AIS is back pain. The prevalence of back pain is higher in people with AIS than in those without.[13-15] In addition, adolescents with AIS have more intense pain, with longer duration and greater recurrence.[16] The presence of back pain in this population is related to late diagnosis, not wearing a brace, and a rigid lumbar curvature.[14] Social and behavioral factors can also affect the presence of changes in the spine of schoolchildren, including back pain.[17] Back pain is another condition that has been increasingly common in young people.[17,18] Studies show that untreated back pain in adolescence can cause a range of disabilities, complications, absence from work, and impaired quality of life that may persist into adulthood.[19,20]

Previous studies carried out in southern Brazil have investigated the association between behavioral risk factors, back pain, and previous postural changes. These studies used the Back Pain and Body Posture Evaluation Instrument (BackPEI) and found that lifestyle may be associated with postural alterations. The BackPEI is a valid and reproducible instrument that is relevant for the evaluation of back pain and its associated risk factors in children and adolescents.[21]

Brazil is a country of continental dimension, and some regions are closer to the equation, and thus exposed to the sun at all times of the year. However, the only previous study to use the recommendations of the International Society on Scoliosis Orthopaedic and Rehabilitation Treatment regarding AIS screening was conducted in the state of São Paulo, which is located in the southwest region of the country.[22]

The semiarid region of Brazil has lower development indices than the country's average[23] and is more exposed to sunlight, due to its proximity to the equator (7°59′7″ -9°23′39″). These geographic and socioeconomic characteristics can be important factors in the prevalence of AIS and back pain in adolescents. Considering the possible effects of social and climatic conditions in the region and the absence of studies in adolescents in this region of the country, the present study aimed to estimate the prevalence of AIS, as well as back pain and its risk factors, in adolescents from the Brazilian semiarid region.

Methods

Study Design

We performed a cross-sectional study using a convenience sample of adolescents from 8 public schools in 2 cities from the semiarid region of Pernambuco where socioeconomic conditions are below the country's average: Petrolina and Serra Talhada. The Human Development Index for the 2 cities stands at approximately 0.679, compared to 0.759 for the country as a whole.[23] Petrolina has a population of 354 317 inhabitants and a gross domestic product of 6.68 billion reais, and Serra Talhada has 87 467 inhabitants and a gross domestic product of 1.24 billion reais. Both cities have a dry climate, with a unique biome in this region, the caatinga. The climate of the caatinga is tropical semiarid, with average annual high temperatures generally above 25°C, in some places above 32°C, and sparse and irregular rains with long periods of drought. Data collection for this study was performed between April and December 2017 in schools in Serra Talhada, and between April 2018 and June 2019 in Petrolina.

Ethics

Ethical approval for the study was obtained from the ethics research committee of the University of São Paulo (process 1.834.691), and all participants and their responsible parent or guardian signed the consent form.

Participants

A total of 547 adolescents, both boys and girls, were assessed. To be considered eligible, adolescents had to be aged between 10 and 16 years, be enrolled in public schools, and return a consent form signed by a parent or guardian. We excluded adolescents who reported an orthopedic or neurologic problem that prevented them from performing the Adams forward-bend test[24] and those with a difference in limb length ≥ 1.5 cm,[25] as well as those with any condition that would prevent forward flexion of the trunk.[26] Of the 547 adolescents enrolled in this study, we excluded a total of 27 for presenting a limb-length difference of more than 1.5 cm (n = 23), for being pregnant (n = 1), and for reporting orthopedic problems of the spine (n = 3).

Measures

Scoliosis Screening. The screening for AIS included measuring the angle of trunk rotation (ATR) using a scoliometer in the Adams forward-bend test.[27] Tests were performed by an experienced physiotherapist, and final-year physiotherapy students helped with the process of filling in the assessment forms for data collection and preparing the participants for the tests.

Three measurements were taken, with the participant returning to the upright position after each. The mean of the 3 values was registered. All measurements were made with the same scoliometer.[25]

Participants who were suspected of having scoliosis—that is, who had an ATR ≥ 7° at any point on the spine—were referred to a hospital for radiographic examination, and spinal curvatures on the radiographs were evaluated using the Cobb method.[26]

The radiographs were used to measure the Cobb angle and evaluate the Risser sign.[26] The curve with the greatest magnitude was designated the primary curve. The Risser sign was used to calculate the *progression factor*, which indicates the progression of the curvature.[27] The progression factor was calculated using the magnitude of the curve, the Risser sign, and the participant's chronological age: progression factor = [Cobb angle − (3 × Risser sign)]/chronological age.

The same technicians in each municipal hospital performed the radiographic examinations, and a technician with more than 20 years of experience interpreted them. Participants with a Cobb angle ≥ 10° were diagnosed with scoliosis. Those with an ATR < 7° did not have radiographs, and were referred for back-pain investigation.

Back-Pain Evaluation. The BackPEI was used to verify the prevalence of back pain and behavioral and postural habits.[21] The BackPEI addresses the following issues: back pain in the last 3 months (occurrence and frequency); demographic characteristics (age and sex); socioeconomic characteristics (parental education and type of schooling); behavioral characteristics (physical activity, reading or studying in bed, time per day spent watching television and using a computer, time per day spent sleeping); postural factors (sitting posture for writing, using a computer, and talking; way of carrying school supplies; and sleeping posture); and heredity (occurrence of back pain in parents).

For the question about the occurrence of back pain —"Have you felt (or have been feeling) back pain in the last 3 months?"—those who responded "I don't know" (which is an important option to avoid bias from the obligation to choose "yes" or "no") were excluded from all subsequent analyses. The data collection was on school day, in an adapted environment within the school. Each student in the classroom received a questionnaire. The researcher explained to all students how the questionnaire should be answered.

Demographic and Anthropometric Information. Demographic information was collected, including age, sex, grade, and parental education levels. In addition, the anthropometric measures assessed included height, weight, and body mass index (BMI). Height was determined by using a portable scientific stadiometer (Seca, Hamburg, Germany). Body mass was measured on a W200/5 digital scale (Welmy Indústria e Comércio Ltda., Santa Bárbara d'Oeste, Brazil). Body mass index was obtained from the ratio of body weight (kg) to the square of height (m^2).

Statistical Analysis

The sample-size was calculated based on the mean prevalence of AIS and back pain described in the literature: 2% for AIS[22,28] and 44.57% for back pain.[29-32] Considering possible losses, the final sample size was estimated at 480 participants.

Statistical analysis was performed using SPSS version 21.0 (IBM, Chicago, Illinois). First, descriptive analyses were conducted to describe the demographic characteristics of participants. Results for quantitative variables are reported as either mean ± SD and 95% confidence interval (95% CI) or frequency (percentage). Second, the prevalence of AIS and back pain were calculated with nonparametric statistics of a sample with a binomial test, probability ratio, and 95% CI, with specified success values.

Data were analyzed using the χ^2 test for association (bivariate analysis) between the dependent variables and independent variables (demographic characteristics, socioeconomic characteristics, behavioral characteristics, postural factors, and heredity variables). The independent variables with a significance level of $P < .20$ in the bivariate analysis were included in the Poisson regression model with robust variance. To compare the intensity of pain between boys and girls, *t* tests of independent samples was used. Each hypothesis was tested using a 2-tailed analysis at the $\alpha = 0.05$ level of significance.

Results

Adolescent Idiopathic Scoliosis

Among the participants, 9.8% (95% CI, 7.4%-12.6%) presented with an ATR ≥ 7°, and 3.1% (n = 16; 95% CI, 1.8%-4.8%) had a confirmed AIS diagnosis. There was no difference in prevalence between boys and girls (1.9% were girls and 1.1% boys). The average age of girls who received the diagnosis was 13.4 ± 1.78 years, and the boys had an average age of 14.33 ± 1.21 years. There was no statistical difference in the age of boys and girls diagnosed with AIS.

The demographic, heredity, and socioeconomic characteristics of the sample and of the subsample of adolescents with scoliosis are shown in Table 1. There was no association between the variables assessed and the diagnosis of AIS. The anthropometric and physical-activity characteristics and their association with the presence of scoliosis are described in Table 2. Body mass index was statistically lower in adolescents with AIS ($P = .043$).

The Risser sign was ≥ 3 in 75% of the participants with scoliosis. The mean Cobb angle was 18.65° ± 6.86° (95% CI, 14.99°-22.30°). The Cobb angle was ≥ 20°in 8 (50%) of 16 cases. Five adolescents (3 girls and 2 boys; 0.96%) had a double curve. The progression factor was > 1.65 in 0.4% of participants, indicating the need for a brace; the other participants had a progression factor < 1.4, requiring only observation.

Back Pain

The prevalence of back pain was 63.7% (95% CI, 59.5%-67.7%). Although the prevalence of participants with AIS who reported back pain was high (68.8%), there was no statistical association between the 2 conditions

Table 1. *Demographic, Hereditary, and Socioeconomic Characteristics of Participants*

Variable	N	%	AIS n	AIS %	χ^{2a}	PR	Wald 95% CI	
Sex								
Female	299	57.5	10	62.5	0.800	1.203	0.437	3.314
Male	221	42.5	6	37.5		1		
Age, y								
10-12	213	41.0	6	37.5	0.107	0.483	0.162	1.437
13-14	187	36.0	3	18.8		0.275	0.071	1.064
15-16	120	23.1	7	43.8		1		
Puberty								
Yes	376	72.3	13	81.3	0.574	1.510	0.426	5.348
No	144	27.7	3	18.8		1		
Parents with back pain (n = 380)								
Yes	235	45.8	7	43.8	0.906	0.943	0.351	2.533
No	285	54.8	9	56.3		1		
Parents with scoliosis (n = 520)								
Yes	53	10.2	4	25	0.069	2.767	0.884	8.656
No	467	89.8	12	75		1		
Mother's educational level								
Elementary school	101	19.4	1	6.3	0.246	0.246	0.029	2.102
High school	156	30.0	4	25		0.636	0.171	2.368
College degree	124	23.8	5	31.3		1		
Did not attend school	139	26.7	6	37.5		1.127	0.344	3.694
Father's education level								
Elementary school	119	18.1	3	18.8	0.245	1.563	0.163	15.026
High school	140	21.3	7	43.8		3.100	0.381	25.196
College degree	62	9.4	1	6.3		1		
Did not attend school	154	30.2	5	31.3		1.694	0.198	14.500

AIS, adolescent idiopathic scoliosis; *CI*, confidence interval; *PR*, prevalence ratio.
[a] Bivariate analysis, Wald's χ^2 test.

($P = .672$). Pain intensity was moderate, with a visual analog scale score of 3.83 (95% CI, 3.57-4.08). Table 3 presents descriptive data for back-pain frequency and for impediment of daily activities, by sex.

Table 4 shows the association and prevalence ratio between the independent variables and back pain. The bivariate analysis showed an association between back pain and female sex; the prevalence of back pain was statistically higher among girls. Back-pain analysis of different age groups showed an increase in point prevalence with increasing age. Among participants who reported back pain, 58.2% were aged between 10 and 12 years, and

Table 2. *Anthropometric Characteristics of Adolescents Evaluated in a School-Based Scoliosis Screening Program*

Variables	Whole Sample (n = 502) Mean ± SD (95% CI)	Scoliosis Group (n = 16) Mean ± SD (95% CI)	P[a]
Body mass, kg	50.79 ± 13.02 (49.65-51.93)	48.39 ± 11.70 (42.15-54.62)	.467
Height, cm	158.09 ± 10.09 (157.21-158.97)	161.94 ± 13.49 (154.75-169.13)	.138
BMI, kg/m^2	20.12 ± 3.081 (19.78-20.45)	18.18 ± 2.11 (17.05-19.30)	.043
Physical exercise time, min	61.52 ± 83.47 (54.21-68.83)	62.81 ± 75.23 (22.72-102.90)	.951

BMI, body mass index; *CI*, confidence interval.
[a] Using *t* test of independent samples.

prevalence increased to 61% in ages 13 and 14 years and 77.5% in ages 15 and 16 years.

Bivariate analysis showed that back pain is associated with sitting posture for writing, sitting posture for using a computer, sitting posture on a bench, and the way of carrying one's backpack (Tables 5 and 6). Multivariable analysis confirms the bivariate results.

Discussion

To the best of our knowledge, this study is the first to evaluate the prevalence of AIS, as well as back pain and its risk factors, in adolescents in Brazil's semiarid region using the scoliometer as a screening tool. Our results show an AIS prevalence of 3.1% (95% CI, 1.8%-4.8%). Brazilian school screening studies show a prevalence of scoliosis ranging from 1.4% to 5.7%.[22,33,34]

However, the methodology used for screening in these studies is very varied. Although the diagnosis of scoliosis is made with radiography and measurement of the Cobb angle, screening methods with inadequate sensitivity and specificity may mask the real prevalence.

In a previous report, a screening program using a scoliometer and the Adams forward-bend test had 71.1% sensitivity, 97.1% specificity, 2.9% false positives, and 28.9% false negatives.[35] Although some studies consider an ATR > 5° to be significant, we used an ATR ≥ 7° to decrease the rate of false positives and unnecessary referral of participants for radiographic examination. These data, added to the number of participants who did not undergo radiography, may contribute to the prevalence of AIS found in our study.

In Brazil, only 1 study, carried out in cities in the interior of São Paulo, has used the scoliometer as an instrument for screening. In that study, a prevalence of 1.5% was found in a sample of adolescents aged 10 to 14 years, as well as a discrepancy in the proportion of girls and boys diagnosed, with a higher prevalence in girls.[22] Our study showed no statistical association between AIS and sex.

Several studies have shown a higher prevalence of AIS in women and girls.[11,22,36-38] The fact that the present study identified a similarity in the prevalence and characteristics of AIS between girls and boys can be associated with 2 factors.

Table 3. *Back-Pain Frequency in the Previous 3 Mo and Impediment in Performing Daily Activities*

Variable	Girls (n = 206) % (n)	Boys (n = 125) % (n)	Total (N = 331) % (n)
Frequency of back pain			
Only once	12.6 (26)	11.2 (14)	12.1 (40)
Once/mo	9.7 (20)	5.6 (7)	8.2 (27)
Once/wk	9.7 (20)	9.6 (12)	9.7 (32)
2-3 times/wk	21.4 (44)	14.4 (18)	18.7 (62)
≥4 times/wk	8.7 (18)	11.2 (14)	9.7 (32)
No answer	37.9 (78)	48.0 (60)	41.7 (138)
Impediment in performing activities of daily living			
Yes	24.3 (50)	24.0 (30)	24.2 (80)
No	41.7 (86)	38.4 (48)	40.5 (134)
No answer	34.0 (70)	37.6 (47)	35.3 (117)

Table 4. *Associations (χ^2) and Prevalence Ratios Between Back Pain and Demographic, Hereditary, and Socioeconomic Characteristics*

Variable	Back Pain (n)	Back Pain (%)	χ^{2a}	PR	Wald 95% CI	
Sex						
Female	206	62.2	0.004[b]	1.434	1.371	1.501
Male	125	37.8		1		
Age, y						
10-12	124	37.5	0.001[b]	1.207	1.090	1.336
13-14	114	34.4		1.185	1.071	1.312
15-16	93	28.1		1		
Puberty						
Yes	248	37.7	0.469	0.942	0.800	1.108
No	83	12.6		1		
Parents with back pain						
Yes	194	58.6	0.018[b]	1.074	0.927	1.245
No	137	41.4		1		
Mother's educational level						
Did not attend school	3	1.2	0.129	1.136	0.780	1.657
Elementary school	67	27.5		0.904	0.797	1.027
High school	105	43		0.890	0.794	0.998
College degree	69	28.3		1		
Father's educational level						
Did not attend school	10	4.7	0.962	0.972	0.745	1.269
Elementary school	75	35.5		0.967	0.833	1.123
High school	89	42.2		0.962	0.831	1.113
College degree	37	17.5		1		

CI, confidence interval; *PR*, prevalence ratio.
[a] Bivariate analysis, Wald's χ^2 test.
[b] Significant association ($P < .05$).

The adolescents analyzed in our study were older than the recommendation of the International Society on Scoliosis Orthopaedic and Rehabilitation Treatment for screening studies.[39] In addition, most screenings that have found an association between scoliosis and girls were performed with younger adolescents (aged 10 to 14 years).[11,22,36,40] However, it is important to point out that scoliosis is associated with the growth phase that occurs later in boys. Therefore, our study expanded the age range of screening in order to identify the presence of scoliosis in boys. This expansion contributed to our result, since the majority of male participants diagnosed were aged about 15 years at the time of diagnosis, and would not have been diagnosed if screening recommendations up to the age of 14 had been followed.

Another factor that contributed to our result is the geographic location of the cities where our study was conducted. The semiarid region of Brazil has cities close to the equator, with a lot of sun exposure in all seasons. This factor stimulates endogenous melatonin

Table 5. *Associations (χ^2) and Prevalence Ratios Between Back Pain and Independent Behavioral Variables*

Variable	N	%	Back Pain (n)	Back Pain (%)	χ^2[a]	PR	Wald 95% CI	
Physical exercise (n = 519)								
Yes	383	73.6	236	71.5	0.153	1.071	0.977	1.174
No	137	26.4	94	28.5		1		
Physical exercise weekly frequency (n = 378)								
1-2 d/wk	183	48.4	119	51.1	.039[b]	4.239	0.783	1.056
3-4 d/wk	75	19.8	52	22.3		0.910	0.736	1.031
> 5 d/wk	66	17.5	32	13.7		0.871	0.897	1.284
Depends	54	14.3	30	12.9		1.073	0.897	1.284
Practice competitive exercise (n = 382)								
Yes	183	47.9	144	48.5	0.765	0.985	0.894	1.086
No	199	52.1	121	51.5		1		
Time spent watching television per day (n = 518)								
≥ 3 h/d	319	61.1	196	59.6	0.375	1.035	0.933	1.148
4-7 h/d	88	17	61	18.5		0.956	0.839	1.090
≥ 8 h/d	111	21.4	72	21.9		1		
Time spent using computer per day (n = 383)								
≤ 3 h/d	321	83.8	194	85.1	0.394	1.016	0.845	1.222
4-5 h/d	33	8.6	16	7		1.145	0.896	1.464
≥ 6 h/d	29	7.6	18	7.9		1		
Time spent sleeping per night (n = 519)								
≤7 h/d	206	39.7	135	40.9	0.751	0.964	0.861	1.080
8-9 h/d	208	40.1	130	39.4		0.994	0.887	1.114
≥ 10 h/d	105	20.2	65	19.7		1		
Read or study in bed (n = 265)								
Yes	194	73.2	133	76.9	0.063	0.885	0.775	1.010
No	71	26.8	40	23.1		1		

CI, confidence interval; *PR*, prevalence ratio.
[a] Bivariate analysis, Wald's χ^2 test.
[b] Significant association ($P < .05$).

production, accelerates menarche in girls, and reduces the prevalence of AIS in girls to approximately the prevalence in boys.[12] Among all the variables observed in this study, only BMI showed a difference between participants with scoliosis and the general sample. Low BMI is associated with more severe curves and surgical complications in people with scoliosis.[35] Other studies corroborate ours and also point to an association between the presence of AIS and low BMI.[41]

In our sample of 520 children and adolescents, more than half reported back pain during the preceding 3 months. The prevalence of back pain in our study is higher than in

Table 6. *Associations (χ^2) and Prevalence Ratios Between Back Pain and Independent Postural Variables*

Variable	N	%	Back Pain (n)	Back Pain (%)	χ^{2a}	PR	Wald 95% CI	
Postural								
Sleeping posture (n = 472)								
Supine	257	54.4	158	53.2	0.707	1.061	0.915	1.230
Lateral decubitus	169	35.8	108	36.4		1.035	0.888	1.207
Prone	46	9.7	31	10.4		1		
Sitting posture for writing (n = 265)								
Adequate	71	26.8	40	23.1	0.034[b]	1		
Inadequate	194	73.2	133	76.9		1.146	1.010	1.301
Sitting posture on a bench (n = 520)								
Adequate	53	10.2	25	7.6	0.016[b]	1		
Inadequate	467	89.8	306	92.4		1.135	1.021	1.262
Sitting posture for using a computer (n = 519)								
Adequate	59	11.4	29	91.2	0.039[b]	1		
Inadequate	460	88.6	301	8.8		1.106	1.002	1.221
Posture for lifting an object from the floor (n = 519)								
Adequate	36	6.9	20	6.1	0.299	1		
Inadequate	483	93.1	310	93.9		0.917	0.776	1.085
Way of carrying school supplies (n = 519)								
Backpack	504	97.1	310	96.7	0.426	1		
Another (briefcase, purse, or other)	15	2.9	11	3.3		0.904	0.720	1.136
Way of carrying a backpack (n = 517)								
Adequate (symmetrical handles on both shoulders)	391	75.6	239	72.6	0.036[b]	0.887	0.824	0.955
Inadequate (asymmetrical)	126	24.4	90	27.4		1		

CI, confidence interval; *PR*, prevalence ratio.
[a] Bivariate analysis, Wald's χ^2 test.
[b] Significant association ($P < .05$).

other studies conducted in other regions of Brazil.[24-27,29-42] This result may be related to methodological differences in the studies, which use several instruments to evaluate the prevalence of back pain. Different questionnaires may approach the presence of back pain differently. We used the BackPEI, a questionnaire that asks about the presence of back pain in the previous 3 months and has been created and validated for children and adolescents. In addition, cultural and social differences specific to the semiarid region may contribute to a population of adolescents with a higher prevalence of back pain.

The prevalence was higher in older participants compared to younger ones. An increased prevalence of back pain in older adolescents has been reported by other studies investigating sedentary and athletic adolescents.[42-45] Older adolescents tend to show greater sensitivity to pain, as a result of puberty. Also, younger children may be less exposed to physical and environmental risk factors, because they are less exposed to high-intensity activity than are older children. The increase in back pain after age 13 years is possibly a reflection of pubertal growth and the greater tension of the spine with greater time spent at school.[45] There was also a higher prevalence of back pain among girls. Some studies have likewise shown a difference in the prevalence of back pain between girls and boys, usually being higher among girls[43]; we found this same difference in our study. However, pain intensity was similar in both sexes.

Although the prevalence of back pain was high and most participants (56.8%) reported feeling back pain at least once a week, the pain intensity, assessed by the visual analog scale, is considered moderate. Furthermore, 32.63% reported reduced daily function because of back pain. This prevalence is higher than in other studies with similar samples, which have indicated that 15.5% of adolescents report reduced daily function because of back pain.[45]

We found an association between back pain and inadequate posture when sitting for writing, using a computer, and sitting on a bench. These associations have also been identified in other studies. This result shows that the adoption of an inadequate posture for long periods can predispose a person to discomfort in the spine region.[45,46]

We emphasize that health education programs, covering both parents and children with an orientation toward postural habits in the school and family environment, must be initiated in the formative stages of development with an understanding of the anatomy of the spine, pathophysiology of pain, biomechanics, fear avoidance, and perceptions of well-being. Primary prevention starting in the formative stage—focusing on education, psychosocial and social factors, and healthy lifestyles with exercises and with smoking avoidance—are crucial factors in lowering the overall prevalence of spine injuries and pain, specifically chronic back pain and associated comorbidities.[47]

Limitations

The limitations of this study include a lack of differentiation between participants with chronic pain and those with acute pain. In addition, there was a significant loss in the number of adolescents who did not undergo radiographic examination (those with ATR $\geq 7°$; 39.21%). Another limitation is the lack of investigation regarding the impact of back pain on school absence and the relationship of social and economic factors typical of this semiarid region with back pain. For future research, we suggest that it is essential to include school absence as an important variable for the analysis. Our study highlights the need to prospectively assess the implications of postural and behavioral habits in the development of back pain. Additional studies are needed to assess the implications of AIS and back pain on quality of life and health-related costs.

Conclusion

Our findings from a regional sample of children and adolescents in the semiarid region of Brazil show a 3.1% prevalence of AIS and a high prevalence of back pain (63.7%). The expansion of the age group allowed us to identify more cases of AIS in boys. Only BMI was different between adolescents with and without AIS, with those with AIS having a lower mean BMI. Back pain is very frequent and affects performance of daily activities. Back pain was higher in girls and increased in older adolescents. Furthermore, behavioral and postural habits and hereditary factors are associated with an increased chance of back pain.

Funding Sources and Conflicts of Interest

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Contributorship Information

Concept development (provided idea for the research): M.G.B.D., S.M.A.J.
Design (planned the methods to generate the results): M.G.B.D., S.M.A.J.
Supervision (provided oversight, responsible for organization and implementation, writing of the manuscript): M.G.B.D., S.M.A.J.
Data collection/processing (responsible for experiments, patient management, organization, or reporting data): A.N.A., H.J.C., K.P.F., B.B.N., L.S.S., A.P.S.S.
Analysis/interpretation (responsible for statistical analysis, evaluation, and presentation of the results): M.G.B.D., A.N.A., H.J.C., B.B.N.
Literature search (performed the literature search): M.G.B.D., K.P.F., A.P.S.S.
Writing (responsible for writing a substantive part of the manuscript): M.G.B.D.
Critical review (revised manuscript for intellectual content, this does not relate to spelling and grammar checking): P.J.P., S.M.A.J.

Practical Applications

- Our findings demonstrate that greater proximity to the equator does not seem to affect the prevalence of adolescent idiopathic scoliosis (AIS; 3.1%).
- Expanding the age range allowed us to identify more cases of AIS in boys.
- Only body mass index was different between adolescents with and without AIS, with those with AIS having a lower mean body mass index.
- Back pain is very frequent in our sample (63.7%), and affects their performance of daily activities.

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