

EPIDEMIOLOGY

Is Health-related Quality of Life Decreased in Adolescents With Back Pain?

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Rosely Sichieri, MD, PhD,* and Diana Barbosa Cunha, PhD***Study Design.** Cross-sectional study.**Objective.** To evaluate the association between back pain and health-related quality of life (HRQoL) among adolescents.**Summary of Background Data.** The prevalence of back pain has been increasing not only in the adult population but also among children and adolescents. The better knowledge about the association between back pain and health-related quality of life could facilitate the implementation of new intervention strategies on prevention and treatment of back pain.**Methods.** A sample of 350 students from the fifth to ninth grades of one public school in Niterói, Rio de Janeiro, Brazil. Anthropometric measures and information regarding sociodemographic, lifestyle, frequency and intensity of neck (NP), thoracic (TP), and low back pain in the previous month were collected using a personal digital assistant. HRQoL was assessed by KIDSCREEN-27. Multiple linear regression analyses were performed to investigate the association between back pain and HRQoL by sex.**Results.** The mean age of participants was 12.7 (± 1.6) years. Frequency of NP, TP, and low back pain was 34.3, 27.1, and 13.1%, respectively. The mean intensity of pain was 2.3 (± 0.2) for neck, 2.0 (± 0.2) for thoracic, and 1.3 (± 0.1) for low back pain. The presence of two/three painful sites was reported by 21.7% of the adolescents. The frequency and severity of neck pain were inversely associated with global HRQoL in both the

sexes. There is a strong inverse association between the number of painful sites and global HRQoL and domains.

Conclusion. The presence and intensity of cervical pain and the number of painful regions were associated with lower HRQoL in adolescents, which is worrying due to the important relationship between back pain in the adolescence and in the adulthood.**Key words:** adolescents, back pain, cross-sectional, frequency of pain, intensity of pain, kidscreen, low back pain, neck pain, pain, quality of life, schoolchildren, thoracic pain.**Level of Evidence:** 3**Spine 2018;43:E822–E829**

Musculoskeletal pain constitutes a significant public health problem in the modern society, not only in adults but also in children and adolescents, accounting to personal impacts and social costs. Back pain (BP) is an important cause of disability among children and adolescents¹ and its prevalence has been increasing all over the world, reaching 30 to 70% of the adolescents, depending on the definition of back pain and the study population.² The high prevalence in this age group, similar to that observed in adults,³ is a point of concern due to the important tracking from adolescence to adulthood.^{4,5} Most chronic diseases have an impact on the quality of life and, although studies about quality of life have been growing around the world, the evaluation of child and adolescent well-being are still scarce.^{6,7}

Health-Related Quality of Life (HRQoL) could be defined as the self-evaluation of well-being in a wide area of life, considering the influence of a variety of health conditions and its impact in their health status.⁸ Moreover, little is known about the overall health status of children and adolescents with back pain, and the majority of studies conducted until now search for prevalence and risk factors associated with back pain. Therefore, the clinical relevance of back pain is still underreported and studies examining the influence of back pain and its different sites (neck, thoracic, and low back) on a wide variety of outcomes, including quality of life, are necessary.

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The few studies that evaluated the association between back pain and quality of life in adolescents focused in only one region of the spine and presented controversial results. For instance, no association was found for low back pain and HRQoL on a cross-sectional study evaluating European adolescents.⁹ On the other hand, a cross-sectional study including Brazilian schoolchildren showed an important negative impact of low back pain on quality of life in comparison with those without pain.¹⁰ Therefore, the aim of the present study is to evaluate the association between back pain (neck, thoracic, and low back) and the self-perception of health-related quality of life in adolescents.

MATERIALS AND METHODS

Study Design

A cross-sectional study of fifth to ninth grades of one school in the city of Niterói (Rio de Janeiro, Brazil) was conducted from August to December 2015. The exclusion criteria included age < 10 or ≥ 18 years, pregnancy, physical, or mental impairments that prevented from filling the questionnaire or performing anthropometric measurements.

Sample size was calculated based on a back pain prevalence of 30%¹¹ with an estimated error of 5 and 95% confidence interval, totalizing 323 adolescents. Accounting for a nonresponse rate of 30%, the total sample size needed to the present study was 419 students.

The research project was approved by the Research Ethics Committee of the Social Medicine Institute of the State University of Rio de Janeiro. Only adolescents whose parent/guardian signed an informed consent were included.

Measurements and Procedures

Questionnaire was self-administered on a Personal Digital Assistant. The HRQoL was measured using the KIDSCREEN-27 questionnaire, a generic self-administered instrument, developed by the European group¹² for children and adolescents, healthy or chronically ill. Originally, the instrument consisted of 52 questions in English, which were translated and adapted to Brazilian population.¹³ In the present study, the KIDSCREEN-27, a shorter five dimension (“physical well-being”, “psychological well-being”, “autonomy and relationship with parents”, “social support and peer group”, “school environment”) version of the original instrument was used. The answers in ordinal scale (1 to 5) generate a score for each dimension to identify the frequency and intensity of behaviors, feelings, or specific actions in the previous week. The global HRQoL score was based on 10 of the 27 question of KIDSCREEN-27.¹²

The prevalence of back pain was based on the questions “Have you had neck pain in the previous month?”, “Have you had middle back pain in the previous month?”, and “Have you had low back pain in the previous month?”. A diagram with the shaded spinal areas was shown beside each question.^{14,15} Pain intensity for each site was evaluated by the Faces Pain Scale with six faces gradually scored from 1 to 6, where 1 corresponds to “no pain” and 6 to “very much

pain.”¹⁶ For the analysis, we used the Faces Pain Scale-Revised, resized from 1 to 6 to 0 to 10 being 1=0, 2=2, 3=4, 4=6, 5=8 e 6=10, which allows the comparison between others pain scales using the same metric.¹⁶ The number of painful sites in the spine was calculated by adding neck (NP), thoracic (TP), and low back pain (LBP).

Anthropometric, sociodemographic, and lifestyle variables (sex, age, race, smoke, screen time, hours of sleep, physical activity, and nutritional status) were also evaluated as potential confounders of the association between quality of life and back pain.^{17–19}

Body weight was measured using an electronic scale *Tanita* and height was measured twice using a portable stadiometer (*Alturaexata*) following Gordon *et al*²⁰ recommendations. Nutritional status was classified based on the values of body mass index/age in z-scores using the curves of the World Health Organization.²¹ Race was self-reported and categorized as white, black, mulatto, others, and unknown. Smoking was considered any smoke experience during lifetime. Screen time included time spent in the computer, tablet/mobile, watching television, or playing video games during a regular day (less than 2, 2 to 8, and 8 h per day). Hours of sleep was measured by the difference between the time in which adolescent was used to sleep and time they was used to wake-up (continuous variable).

Physical activity was evaluated using a validated questionnaire including information about the time and frequency of physical activities in the previous 7 days, being the adolescents classified as active (≥300 min), insufficiently active (150–299 min and 1–149 min), and inactive (no physical activity).²²

Data Analyses

The analysis of KIDSCREEN follows the recommendation of the European Group of KIDSCREEN. The Rasch model was used in this analysis to make the interpretation of the dimensions more intelligible.¹² Values between 45 and 55 classify HRQoL as normal, meanwhile values below 45 indicate a negative and above 55 indicate a positive perception.

Descriptive statistics comprised means and standard deviation. Linear regression models evaluated the associations between back pain and HRQoL. Global HRQoL index and the dimensions were considered dependent variables with models for each painful site (neck, thoracic, and low back), intensity of pain in each site and the number of painful sites. A univariate linear regression stratified by sex was performed to determine the covariates to be included in the multivariate model that included all those variables with *P* value < 0.20. The backwards method was used to remove the variables that presented *P* value greater than 0.05 in the multivariate analysis, stratified by sex, until the final model was obtained. The age variable was maintained in the models due to its established association with the variables exposure and outcome. The fitness of the models was evaluated for normality and homoscedasticity and residuals did not show major deviation. All analyses were stratified by sex and performed using Stata 13.0.

TABLE 1. Sociodemographic, Lifestyle, Anthropometric, and Back Pain Characteristics of Adolescents From a Public School of Niteroi, State of Rio de Janeiro, Brazil (n = 350)

	Total	
	n	%
Sex		
Girls	180	51.4
Race		
White	67	19.1
Black	51	14.6
Mulatto	177	50.6
Others	11	3.1
Unknown	44	12.6
Smoke		
Experienced	34	9.7
Screen time		
≤ 2 h	107	30.6
2 to 8 h	135	38.6
> 8 h	108	30.8
Physical activity		
Active (≥300 min)	167	47.7
Insufficiently active (150–299 min)	61	17.5
Insufficiently active (1–149 min)	95	27.1
Inactive	27	7.7
Nutritional status		
Underweight + eutrophic	227	64.8
Overweight	64	18.3
Obese	59	16.9
Area of pain (%)		
Neck pain	120	34.3
Thoracic pain	95	27.1
Low back pain	46	13.1
	Mean	SD
Age (yr)	12.7	1.6
Sleep hours	8.3	2.2
Intensity of pain		
Neck pain	2.3	0.2
Thoracic pain	2.0	0.2
Low back pain	1.3	0.1

RESULTS

A total of 425 students from fifth to ninth grade were enrolled. The inclusion criteria were not fulfilled by 12 schoolers (10 students with physical or mental condition, one pregnant girl, and one over 18 years). Of the 413 eligible students, 56 did not accept or did not have parental permission to participate and seven were excluded from the analyses due to missing data in the BP questionnaire and/or in the HRQoL questionnaire, totalizing 350 adolescents in the analyses.

Sociodemographic, lifestyle, and anthropometric characteristics of adolescents included in the study are described in

Table 1. The intensity of pain was 2.3 (± 0.2) for NP, 2.0 (± 0.2) for TP, and 1.3 (± 0.1) for LBP. The frequency of NP was 34.3%, followed 27.1% of thoracic pain (TP) and 13.1% of low back pain (LBP) (Table 1). Overall, girls were more affected than boys were, being with the majority of adolescents reporting NP (59.2%), TP (59.0%), and LBP (63.0%).

The frequency of painful sites in the spine in the previous month was 47.7% in at least one site (26.0% in one site and 21.7% in two or three sites). The mean T-score of HRQoL ranged from 46.7 to 51.2 for the entire study population and were higher for boys on “physical well-being”, “psychological well-being”, and “autonomy and parent relation” domains, and higher for girls on “social support and peers” domain. When boys and girls were stratified by the amount of painful sites in spine, higher “physical well-being”, “psychological well-being”, and “autonomy and parent relation” T-scores were observed among boys without pain. Among individuals with one painful site, higher T-scores for boys in “physical well-being” and “psychological well-being” domains were observed. There was also a reduction of the T-score means for domains and global HRQoL index as the number of painful sites in the spine increases for both sexes (Table 2).

Neck pain was associated with lower HRQoL in almost all domains for boys and girls. Exceptions were for boys in “physical well-being” domain, which was observed significant influence of thoracic pain, and “psychological well-being” domain, which was not observed any association. Another exception was for girls in “social support and peers” domain, which was observed influence of thoracic pain (Table 3).

A reduction of beta values as the number of painful sites in the spine increases was observed, suggesting that there is a reduction of the HRQoL as the amount of painful sites increases, in both sexes (Table 4).

Multiple linear regression for intensity of pain and T-score of HRQoL stratified by sex showed an statistically significant inverse association of intensity of neck pain and T-score of HRQoL for “physical well-being”, “psychological well-being”, and “school environment” domains for girls and global HRQoL index for both sexes (Table 5).

DISCUSSION

In the present study, we found a high frequency of BP (47.7%) in adolescents. Neck was the most frequent site of pain, followed by TP and LBP with a significant inverse association between NP, number of painful sites and intensity of pain with HRQoL and its different domains.

BP is a multifactorial disorder and a possible explanation for the high prevalence of BP among adolescents in this study could be a decline in muscular fitness over the last decades.²³ Bo Andersen *et al*²⁴ examined the association between back pain, physical activity level, and physical fitness in 9413 adolescents from Denmark and found that BP was associated with the lowest isometric muscle endurance of the back extensors. No other associations were

TABLE 2. Mean and Standard Deviation of T-score of HRQoL by Domain and Global Index for the Entire Study Population and Compared by the Number of Painful Sites in the Spine Stratified by Sex in Adolescents From a Public School of Niteroi, State of Rio de Janeiro, Brazil (n = 350)

	Boys		Girls		
	N	Mean (SD)	n	Mean (SD)	P Value
Total	170 (48.6%)		180 (51.4%)		
Physical well-being		51.27 (12.60)		45.66 (11.01)	<0.01
Psychological well-being		49.94 (11.57)		45.04 (9.71)	<0.01
Autonomy and parent relation		48.51 (13.31)		44.92 (11.39)	<0.01
Social support and peers		49.57 (13.01)		52.68 (12.02)	0.02
School environment		49.44 (11.78)		49.13 (10.01)	0.80
Global HRQoL index		48.96 (11.58)		45.24 (9.58)	<0.01
No pain	102 (60.0%)		81 (45.0%)		
Physical well-being		53.43 (12.40)		49.24 (11.34)	0.02
Psychological well-being		52.35 (11.27)		48.46 (10.49)	0.02
Autonomy and parent relation		51.61 (12.48)		47.89 (11.35)	0.04
Social support and peers		52.13 (12.25)		55.50 (11.92)	0.06
School environment		52.02 (11.57)		52.04 (10.38)	0.99
Global HRQoL index		52.18 (12.01)		49.49 (9.84)	0.11
One painful site	37 (21.8%)		54 (30.0%)		
Physical well-being		51.07 (13.24)		43.28 (9.32)	<0.01
Psychological well-being		47.47 (11.99)		43.15 (8.59)	0.05
Autonomy and parent relation		44.78 (13.67)		44.36 (12.24)	0.88
Social support and peers		48.44 (11.75)		52.26 (11.70)	0.13
School environment		46.07 (11.95)		47.55 (8.45)	0.49
Global HRQoL index		46.16 (9.80)		43.35 (7.56)	0.13
Two or three painful sites	31 (18.2%)		45 (25.0%)		
Physical well-being		44.40 (10.09)		42.07 (10.53)	0.34
Psychological well-being		44.94 (10.07)		41.15 (7.31)	0.06
Autonomy and parent relation		42.74 (12.85)		40.25 (8.61)	0.32
Social support and peers		42.46 (14.34)		48.13 (11.35)	0.06
School environment		44.94 (10.12)		45.79 (9.78)	0.71
Global HRQoL index		41.69 (7.38)		39.86 (7.84)	0.31

Values of global index and domains of HRQoL are in T-score.

HRQoL indicates health-related quality of life.

Values in bold are those statistically significant ($P < 0.05$).

found to aerobic fitness, functional strength, flexibility, or physical activity level with back pain after adjustments for muscle endurance. However, due to the study design, the authors were unable to define if the weakening is the result or the cause of back problems.²⁴

Although nonspecific LBP is the most common type of BP among children and adolescents, the prevalence of NP has been increasing over the last years and seems to be the most recurrent/persistent musculoskeletal complaint during adolescence.²⁵ A possible explanation for this increase is the poor posture, mainly due to the growing use of tablets and smartphones which is a concern related to the integrity of the neck.²⁶ A Harvard Editorial Board speculated that high-school students may spend 5000 hours per year in a poor posture using smartphones²⁷ and Meziat-Filho *et al*²⁸ found an association between some home posture habits and NP in Brazilian

high-school adolescents. On the other hand, a large community-based sample of Australian adolescents found no association between neck posture and NP.²⁹ Therefore, the influence of posture on incidence of NP is still a matter of debate.

In our study, girls were more affected by BP and many studies with adolescents support these findings.^{2,30} Stahl *et al*³⁰ believe that sex-related hormonal changes, differences in musculoskeletal system, and behavioral factors are some etiological factors that might be related to these findings. Moreover, girls might overestimate their symptoms while boys have a tendency to deny it during puberty.³⁰

The mean T-score of HRQoL for the entire study population was classified as normal. In general, boys had a better HRQoL, which was expected by the European KIDSCREEN group.¹² Girls presented high scores only for the “social support and peers” domain, which can be explained by their

TABLE 3. Linear Regression According to Site of Pain in Spine on HRQoL, Stratified by Sex, in Adolescents From a Public School of Niterói, State of Rio de Janeiro, Brazil (n = 350)

	Boys		Girls	
	β	P Value	β	P Value
Physical well-being				
Neck pain	-0.8	0.75	-6.7	<0.01
Thoracic pain	-4.8	0.05	-1.5	0.41
Low back pain	-5.2	0.11	0.9	0.68
Psychological well-being				
Neck pain	-3.0	0.16	-4.6	<0.01
Thoracic pain	-4.2	0.06	-2.6	0.09
Low back pain	-0.8	0.80	-1.3	0.49
Autonomy and parent relation				
Neck pain	-10.5	<0.01	-7.2	<0.01
Thoracic pain	0.6	0.83	-0.9	0.64
Low back pain	2.5	0.47	-0.7	0.78
Social support and peers				
Neck pain	-7.6	<0.01	-3.7	0.07
Thoracic pain	-0.02	1.00	-5.4	<0.01
Low back pain	-0.9	0.80	-0.3	0.91
School environment				
Neck pain	-6.4	<0.01	-5.0	<0.01
Thoracic pain	0.5	0.83	-1.5	0.34
Low back pain	-0.9	0.77	0.8	0.67
Global HRQoL index				
Neck pain	-6.6	<0.01	-7.5	<0.01
Thoracic pain	-2.8	0.19	-2.4	0.10
Low back pain	-2.2	0.46	0.6	0.76

Values of global index and domains of HRQoL are in T-score.
 HRQoL indicates health-related quality of life.
 Values in bold are those statistically significant ($P < 0.05$).

personal preferences. On the other hand, boys are more prone to present greater scores for physical-related domains while girls are more prone to present higher scores for environment-related domains.³¹

Most of the literature addressing the association of quality of life and BP in adolescents emphasizes LBP^{9,10,32-34} due to its high prevalence in children and adolescents. One strength of our study is the evaluation of the whole spine, which enabled demonstrating an inverse association between NP and HRQoL in adolescents. TP was also inversely associated with the domains “physical well-being” for boys and “social support and peers” for girls.

To our knowledge, the only study that evaluated the association between NP and quality of life was a cross-sectional study that assesses the prevalence of recurrent neck and shoulder pain and its influence on quality of life using a 36-item Short Form questionnaire in Korean high-school male students. Even though there were differences between the instruments to measure both NP and quality of life, they found similar results in comparison with our study with significant associations between recurrent NP and general health, body pain and vitality.³⁵

Another important finding of our study was the negative association between the amount of painful sites and HRQoL.

We observed that as the number of painful sites increases, the scores of HRQoL and domains decrease, in both sexes. In accordance, a school-based survey that investigated the prevalence of self-reported daily and multisite pain among 3000 Danish adolescents showed that those who reported one site of pain or multisite pain had worse HRQoL than ones without pain.³⁶ A study with 412 European adolescents reveals that participants suffering from pain in more than one spinal area reported higher pain intensity and frequency when compared with adolescents who reported pain in only one spinal area.³⁷

Although the mean intensity of BP in the present study was low, there was an inverse association between NP intensity and HRQoL for “physical well-being,” “psychological well-being,” and “school environment” domains for girls and global HRQoL index for both sexes. This finding reveals an important concern issue that even small mean intensity of pain can lead to a reduction in HRQoL in adolescence.

Pellisé *et al*⁹ evaluated the association between LBP and HRQoL using the KIDSCREEN-52 among European scholars and found that HRQoL scores decreased as pain severity increased. Conversely, a cross-sectional study conducted in 2012 in Swiss schoolchildren observed that there was an increasing impact of BP on quality of life with age as a result of an increase in recurrence but not in the intensity of pain.

TABLE 4. Linear Regression According to the Number of Painful Sites in the Spine on HRQoL, Stratified by Sex, in Adolescents From a Public School of Niteroi, State of Rio de Janeiro, Brazil (n = 350)

	Boys		Girls	
	β	P Value	β	P Value
Physical well-being				
One site	-1.9	0.40	-6.2	<0.01
Two or three sites	-7.7	<0.01	-7.8	<0.01
Psychological well-being				
One site	-4.9	0.02	-5.2	<0.01
Two or three sites	-6.5	<0.01	-7.6	<0.01
Autonomy and parent relation				
One site	-7.3	<0.01	-3.7	0.06
Two or three sites	-8.7	<0.01	-7.8	<0.01
Social support and peers				
One site	-3.4	0.16	-5.2	0.02
Two or three sites	-7.9	<0.01	-8.6	<0.01
School environment				
One site	-5.5	0.01	-3.7	0.02
Two or three sites	-5.4	0.02	-6.2	<0.01
Global HRQoL index				
One site	-6.0	<0.01	-5.5	<0.01
Two or three sites	-9.5	<0.01	-9.5	<0.01

Values of global index and domains of HRQoL are in T-score.

HRQoL indicates health-related quality of life.

Values in bold are those statistically significant ($P < 0.05$).

TABLE 5. Multiple Linear Regression for Intensity of Pain and T-score of HRQoL Stratified by Sex, in Adolescents From a Public School of Niterói, State of Rio de Janeiro, Brazil (n = 350)

	Boys		Girls	
	β	P Value	β	P Value
Physical well-being				
Neck pain	-0.4	0.40	-0.8	<0.01
Thoracic pain	-0.1	0.81	-0.1	0.79
Low back pain	-0.8	0.18	0.1	0.80
Psychological well-being				
Neck pain	-0.7	0.14	-0.7	0.01
Thoracic pain	-0.6	0.27	-0.3	0.25
Low back pain	-0.4	0.50	-0.1	0.87
Autonomy and parent relation				
Neck pain	-0.7	0.18	-0.5	0.09
Thoracic pain	0.2	0.75	-0.5	0.15
Low back pain	-0.6	0.41	-0.2	0.69
Social support and peers				
Neck pain	-0.5	0.34	-0.5	0.12
Thoracic pain	0.7	0.27	-0.3	0.45
Low back pain	-1.1	0.10	-0.3	0.46
School environment				
Neck pain	-0.7	0.13	-0.6	0.03
Thoracic pain	0.3	0.63	-0.4	0.18
Low back pain	-0.7	0.20	0.2	0.45
Global HRQoL index				
Neck pain	-0.9	0.04	-0.8	<0.01
Thoracic pain	-0.1	0.82	-0.3	0.28
Low back pain	-0.6	0.27	-0.04	0.90

Values of global index and domains of HRQoL are in T-score.

HRQoL indicates health-related quality of life.

Values in bold are those statistically significant ($P < 0.05$).

They also perceived that the presence of more than one spine painful site could only be related to increasing age and female sex (with double risk).³⁸

The cross-sectional design of our study precludes to establish causal relationships and a bidirectional association is possible. It has been suggested that back pain in adolescents is a set of physical, psychological, and social factors, but the strength and direction of these relationships are still unclear.^{1,38,39} Despite this fact, we observed a high frequency of BP but with normal overall scores of HRQoL, leading us to believe that the influence of BP on HRQoL is the most appropriate direction. Furthermore, clinical trial supports the hypothesis that BP precedes a decline in quality of life since an important reduction in BP and a consequent improvement in quality of life after medical interventions have been observed.⁴⁰ Although it is unlikely that adolescents with congenital spinal abnormalities have been included in the present study, the lack of a specific evaluation to detect congenital deformities and its relationship with back pain and HRQoL could also be considered a study limitation.

To conclude, an important frequency of BP, specially of NP, among a population of adolescents was found. Adolescents without pain had higher scores of HRQoL reinforcing the idea that adolescent with BP needs more attention and support since there is an important relationship between the quality of life in adolescence and in adulthood.

➤ Key Points

- Girls presented higher frequency of BP and lower scores of HRQoL.
- Presence of NP was inversely associated with HRQoL in both sexes.
- Intensity of NP was inversely associated with HRQoL in both sexes.
- The number of painful sites in spine was inversely associated with HRQoL.
- Adolescents without pain had higher HRQoL scores.

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