Int. J. School. Health. 2020; 7(4)

Published online 2020 October.

Research Article

Association of Physical Activity with Low Back Pain in School-Age Children and Adolescents: A Cross-Sectional Study

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Received July 20, 2020; **Revised** August 19, 2020; **Accepted** August 31, 2020

Abstract

Background: Low back pain (LBP) is a common condition that often appears in childhood. The purpose of this study was to explore the association between LBP and factors related to physical activity among Iranian school-age children and adolescents.
Methods: This cross-sectional study included 4,644 school-age children and adolescents living in Bandar Abbas City. Participants and their parents responded to a questionnaire on back pain and physical activity; the questionnairewas developed based on previous studies. In multiple logistic regressions, we investigated the correlation between LBP and physical activity-related exposure variables during lifetime.
Results: 21.4% of the children reported a history of LBP at present or in the past. According to the findings of this study, LBP was associated with age and sex; there were positive and negative relationships between currently active (CA) and previously active (PA) participants (OR=1.285. P=0.012 and OR=0.66. P=0.014, respectively). LBP also negatively correlated with the amount of time spent on physical activity .
Conclusion: According to the results, age and sex could be predictors for LBP; specific levels of physical activity were associated with reduced risk of LPB. Based on these associations, children and adolescents must be motivated to participate in physical activity; also, future studies should investigate the optimal amount and type of physical activity for back health in this age group.

Keywords: Low back pain, Physical activity, Exercise, Child, Adolescent

How to Cite: Bayattork M, Gheitasi M, Andersen LL, Khorsandi Kolur M, Mozafaripour E. Association of Physical Activity with Low Back Pain in School-Age Children and Adolescents: A Cross-Sectional Study. Int. J. School. Health. 2020;7(4):12-19.

1. Introduction

One of the most common and costly musculoskeletal disorders (MSDs) in all societies is low back pain (1). Although LBP has been comprehensively researched among adults (2), it only more recently has been considered in children and adolescents (3). Based on literature, LBP has a major impact on children and adolescents, so that up to 94% might experience certain degrees of disability (4). It has further been suggested that the LBP experienced during childhood and adolescence augments the risk of LBP in adulthood, possibly through the development of maladaptive beliefs, behaviours, and attitudes related to earlier pain events (1, 3).

Previous studies have shown that the prevalence of LBP in Iranian children and adolescents is relatively high (17-48%) (5-7). On the other hand, children experiencing persistent or recurrent chronic pain might have to deal with some consequences such asmissing school, being left out of social activities, and running the risk of internalizing symptoms in response to their pain (8). Therefore, , factors related to pediatric LBP (prevalence, age of onset, epidemiology, aetiology, risk factors, measurement, and treatment) must be considered by clinicians and researchers to enable them develop effective strategies for overcoming this condition.

Exercise or physical activity, when performed sufficiently, is widely known to have essential health benefits, especially in children and adolescents. Also, reduced physical activity has been linked to several chronic health problems, including musculoskeletal complaints (9, 10). In school children, one cohort study and one cross-sectional study found that participating in a high level of physical activity at leisure time might be associated with decreased LBP prevalence (11, 12). Moreover, a cohort study reported that high-level

physical activity in childhood seemed to prevent LBP in early adolescence (10). In contrast, two cross-sectional studies showed that high to very high levels of physical activity correlated with a high prevalence of LBP (13, 14). Two cross-sectional studies reported no association between physical activity at leisure time and LBP (15, 16). A systematic review concluded that due to the inconsistent findings of multiple high-quality cohorts and cross-sectional studies, there was conflicting evidence for the relationship between physical activity and LBP in school children (9).

Despite the high prevalence of LBP in Iranian children and adolescents, most previous studies were conducted in Europe whereas few reports were published in Iran. Accordingly, this study aimed to investigate the association between LBP and physical and sports activities among Iranian children and adolescents. Given the conflicting evidence based on previous studies, we determined whether we could reject the null hypothesis of no association between physical activity and LBP.

2. Methods

Study Design and Setting

The present large-scale cross-sectional study was based on a questionnaire administered to children living in a defined area in Bandar Abbas City, Iran. All participants and their parents filled out written informed consent forms before inclusion. The questions used for this study were specified below and approved by a local ethics committee. The report of this study conforms to the guideline 'Strengthening the Reporting of Observational Studies in Epidemiology' (STROBE)(17).

Participants

The present study included school children and adolescents of 24 public schools in Bandar Abbas City. We sampled the schools based on a 3rd to 10th-grade school quotient of at least ten children per grade and the data availability of the school health service on body height, weight, and general health status. Based on these criteria, 24 out of 30 eligible schools agreed to participate. Theincluded participants were girls and boys, with an age range of 9-16 years, whocompletely filled out the questionnaire. Exclusion criteria were a history of fracture, surgery, or joint diseases in the spine. A total of 4,644 participants responded, of whom 2046 (44.1%) were boys and 2598 (55.9%) were girls.

Questionnaire

An anonymous questionnaire, which protected any personal information, was developed and distributed to each school. The elementary school children filled out the questionnaire at home together with their parents or guardians; after that, they were collected at school. The questionnaire was developed based on the previous studies on physical activity and LBP among children and adolescents (12, 18). Moreover, its reliability was assessed in a pilot study including 100 subjects using Cronbach's alpha statistical method (α=0.824). A multi-hour training and briefing session was held for the participants and their parents to complete the questionnaires.

Low Back Pain

Any experience of LBP was described with multiple choice answers in the first question of the questionnaire; the options were divided between the present and the past; the details of LBP were continuously surveyed using the selected answer form for students who had experienced LBP. Also, the severity of LBP was divided into three levels (level 1: no restrictions on activities; level 2: the need to prohibit physical activity due to LBP; level 3: the need for absenteeism due to back pain); and LBP that is necessary to refrain from participating in sports and physical activity and necessary to be absent from school was described as severe back pain (levels two and three).

Physical Activities

The details of sports activities other than school physical education classes, musical activities, and social activities were reported in the questionnaire. The amount of time involved in physical activities (hours per week) was also specified on the answer form. Based on the answer to the second question, the participants were divided into four groups: the first group included those who did not participate in sporting activities; the second group consisted of those who were both previously and currently engaged in sporting activities. The third group comprised individuals who were currently engaged in regular sports activities but had not participated in regular sports activities in the past; the fourth group included those who used to perform regular sporting activities in the past but were not currently involved in regular sports activities.

The duration of participation in physical activities was divided into three groups and then compared with each

other (group 1: less than 6 hours per week; group 2: 6 to 12 hours per week; group 3: 12 hours per week or more).

Statistical Analysis

We used a multiple logistic regression model to determine whether the variables of interest predicted LBP. We performed a univariate analysis for each independent variable with low back pain as the dependent variable. We selected variables with significant associations with P<0.20 in the linear model analysis for inclusion in the multiple logistics regression. Also, we controlled the statistical analyses for potential confounders, including educational level, BMI, backpack type, and psychosocial school factors. Hosmer estimated the regression model fit, and Lemeshow statistic LBP was the dependent variable. We considered physical activity-related factors, age, sex, weight, and height as predictor variables. All statistical analyses were performed using the SPSS statistical software (version 20) for Windows.A significance level of P<0.05 was considered in all cases, and the results were reported as odds ratios (OR) and 95% confidence intervals (CI).

3. Results

The findings of this study showed that among the 4.644 students aged 9 to 16 years old in Bandar Abbas, 980 (21.10%) had a history of LBP at present or in the past. Table 1 presents other descriptive data . Most of the students participating in the study (30.91%) had a history of regular sports activities but were not currently involved in regular club activities. However, the percentage of participants who have been active from the past to now and inactive ones were 30.60% and 29.60% respectively.

Based on the multiple logistic regression results, LBP correlated with age and gender. Thus, being a female and increased age were the predicting factors for LBP (OR=1.38. P=0.001 and OR=1.33. P=0.001, respectively). Furthermore, LBP was positively and negatively associated with currently active participants and those who were previously active, respectively (OR=1.285. P=0.012 and OR=0.66. P=0.014, respectively) (Table 2).

According to the findings, LBP had a negative relationship with the amount of time spent in physical activities as 6-12 h/week participation in physical activity was the strongest predictor of LBP (OR=0.85. P=0.001). Results also showed that LBP was not associated with weight and height (OR=1.23. P=0.32 and OR=1.56. P=0.12, respectively) (Table 2).

4. Discussion

The main results showed the high prevalence

Table 1: Demographics, LBP and physical activity characteristics.

	N	Mean	SD	%
Age, years	4644	13.54	3.72	-
Gender				
Boys	2046			45.70
Girls	2598			54.30
BMI	4644	19.31	2.14	-
LBP				
With LBP	980			21.10
Boys	424			9.10
Girls	556			12
Without LBP	3664			78.91
Boys	1622			34.92
Girls	2042			44
LBP severity				
Level 1	343			35
Level 2	397			40.50
Level 3	240			24.50
Physical activity				
Activity	3298			71
Less than 6 hours a week	2055			44.25
Between 6 to 12 hours a week	1005			21.64
More than 12 hours a week	238			5.11
Without activity	1346			29

BMI: Body Mass Index ($kg \cdot m^{-2}$), LBP: Low Back Pain, Activity: The overall time of physical activity per week

Table 2: Significant (P<0.05) risk factor related to low-back pain (LBP)

Dependent variable	Potential factors	B	P value	OR	95% confidence interval	
					Lower	Upper
LBP	Age	0.324	0.001*	1.382	1.285	1.479
	Gender[2]	0.292	0.001*	1.331	1.015	1.661
	Weight	0.278	0.321	1.233	0.923	1.536
	Stature	0.456	0.123	1.567	0.821	2.313
	Currently active[3]	0.251	0.012*	1.285	1.056	1.565
	Individuals experience[4]	-0.390	0.014*	0.667	0.496	0.925
	Activity time(0-6h/week)	-0.099	0.419	1.104	0.868	1.406
	Activity time(6-12h/week)	-0.620	0.001*	0.859	0.733	0.985
	Activity time(more than 12h/week)	0.168	0.477	1.183	0.754	1.879

*Statistically significant associations were observed using a multiple logistic regression model; [2]Being female; [3]Currently active: Subjects who are currently active; [4]Individuals experience: Subjects with experience of physical activity in the past

(21.10%) of LBP among children and adolescents. Indeed The prevalence of LBP mentioned in the present study is in the range of prevalence reported by the literature, which varied from 20.0% to 70.0% (18, 19). Skoffer et al. (19) investigated the frequency of low back pain in 546 school children aged 14-17 in Denmark, where 51.30% had shown LBP in the three months prior to the research. Kovacs et al. (20) also assessed the prevalence of back pain in 7,048 teenagers from Spain; they reported a high prevalence, which was higher for females (69.30%) than males (50.90%).

Another finding of our study was the inverse association between LBP and moderate physical activity in both genders. A review by Sjolie (12) and some other studies (10, 21) confirmed the negative relationship between LBP and physical activity reported by the students (20),. However, Noll et al. (22) reported no significant correlation between physical activity and back pain. They showed that their result was unexpected as the beneficial effects of physical activity on pain are well-documented (10, 18). In a longitudinal study, Aartun et al. (23) showed that there were neither cross-sectional nor longitudinal associations relationship between physical activity levels and the sudden pain of the spine. Moreover, they did not report any correlation between physical activity and back pain, inter-sectional, and longitudinal. In fact, their study revealed neither cross-sectional nor longitudinal associations between the different levels of objectively measured physical activity and spinal pain over the two years.

In one of the very few longitudinal studies (three-year follow-up) on the relationship between physical activity and LBP in adolescents, subjects with initial LBP had a lower frequency of physical activity and reduced strengthat baseline and follow-up (24). On the contrary, a four-year follow-up study on 10 to 19-year-olds showed a significant relationship between increased physical activity and more common history of LBP (25). Auvinen et al. (13) concluded that very active participation in physical activities in both sexes was related to self-reported LBP. Others have also suggested that participating in physical activities and sports may cause rather than prevent back pain in young individuals. Moreover, it has been demonstrated that the prevalence of LBP correlates with participation in sports and the level of competition (26, 27).

Based on some research, there exists a U-shaped association between physical activity and the incidence of LBP in school-aged children, with both low and high levels of physical activity associated with a higher risk (18). Contrary to these results, we found that LBP was negatively related to the amount of time spent in physical activities because 6-12 h/wparticipation in physical activity (defined here as moderate-intensity physical activity) was the strongest predictor for LBP. Interestingly, despite the negative association between LBP and physical activity, low-level physical activity (less than 6 hours per week) and high-level physical activity (more than 12 hours per week) were not significantly correlated. Still, the evidence for such relationships is insufficient (28). Furthermore, it is not possible to quantify the optimal type and amount of physical exercise based on the existing literature. Nevertheless, it was hypothesized that sufficient physical activity during growth might improve the development of the low back structures to tolerate more physical load in adulthood; also, high level of physical activity might lead to excessive load on spine and back structure and cause a different kind of back pain in children and adolescences (29).

On the other hand, physical activity increases trunk muscle strength, endurance, and motor abilities, which may help improve the back function (30). Another reason may be the hyperalgesia that results from the differences in experiencing pain stimuli at central nervous system (CNS) level that occurs more often in patients with chronic low back pain than in controls (31). Physical activity during childhood and adolescence may modify the sensory perception of peripheral pain at CNS level; this possibly explains the fewer pain symptoms in subjects who have been physically active during childhood and adolescence. Skoffer and Foldspang (2008) (18) stated that prevalence studies regarding LBP involved some "chicken-or-egg"-questions; this means that indicators may actually denote the consequences rather than the causes of LBP, or they may include at least an element of LBP impact. Therefore, standing talking during school breaks may denote an example of physical inactivity associated with increased LBP as well as pain coping reaction. Silva et al. (32) also reported that it LBP was a common condition among these adolescents.

The physical activity level in our study was reasonably valid as we defined three levels of physical activity. Physical activity less than 6 hours a week was defined as low-level physical activity (33), between 6 and 12 hours a week was considered as moderate physical activity (34), and more than 12 hours a week defined as a high physical activity. Thus, we triedto record all LBP experiences and all physical activity levels. In a recent study, the authors stated that the multivariable analysis showed a contradictory result in terms of the frequency of physical exercise. On the one hand, those who exercised 1 to 2 days a week were more likely to experience pain than those who exercised more than 3 days a week; this probably indicates a decrease in pain with the increase in the weekly frequency of exercise. On the other hand, those who did not exercise were also less likely to experience pain compared with those who exercised 1 to 2 days a week; this could indicate that not exercising is better than doing exercise at a low frequency (22).

Our study also revealed that the prevalence of LBP increased with age. This result might be related to adolescents with enhanced growth and reduced flexibility, including that of the hamstring and the quadriceps muscles, causing functional failure in the lumbar muscles as a result of back pain (35). In addition, it seems with the increase in age, children engage in more studying and educational processes; this forces them to spend more time on their homework and lessons, exposing them to perilous conditions which lead to LBP. Furthermore, extensive population studies showed that the prevalence of LBP increased from 12 to 20 years of age, where the trend of LBP was flattened towards the age of 40 (36). One related study indicated that adolescents with LBP tended to be from higher grades, and a few studies revealed that LBP correlated with increased age (35).

Our findings showed that the prevalence of LBP among females was significantly higher than males, and being a female is one of the predicting factors for LBP. Most studies found that LBP was common among females (35, 37), which is probably related to female hormonal changes and menstrual cycles (21, 38). Additionally, it can be drawn from sociocultural factors in Iranian societies that the participation of girls in physical activity has some limitations associated with cultural and religious beliefs. Whether these results can be trusted or not depends on factors such the validity of the LBP reported by the subjects and the validity of the questionnaires that measure physical activity. As in all studies on LBP in children, there is no method to validate the presence or absence of back pain (10); therefore, in this study, we tried to design a questionnaire in which all LBP occured in the subjects can be remarkable and they can count them. Still, all self-reports might have various limitations due to recalling and averaging values for the previous weeks or months. Such issues may lead to both under- and overestimation of the variables of interest (39). In our study, this might have affected both the primary exposure variable (physical activity) and outcome variable (LBP) since both variables require the respondents to recall and average variable levels from the previous six months. Furthermore, the perceived level of strain considered as physical activity and the perceived level of pain severity may also be influenced by individual differences. The main limitation is that the LBP is a multifactorial disorder, and we could not control all confounder variables such as students' posture at school, school type, school equipment, classroom lighting, and physcosocial differences . However, we tried to control some of the main confounders. Furthermore, our results relied on the self-reported values of LBP and physical activity, whichis the usual method in population-based epidemiological studies but prone to desirability bias.

5. Conclusion

Our study found a negative association between LBP and physical activity in both genders; we also observed that LBP was more common in girls than

in boys, which might be related to the fewer physical activity facilities in Iran. Future longitudinal research is needed to investigate the LBP and physical activity with objective methods.

Acknowledgements

The authors would like to express their gratitude to all the participants, their parents, and the schools.

Ethical Approval: The study design was approved by the local Ethics Committee of Sport Science Department at the University of Hormozgan (120452018).

Funding: This study received no grant from any institution/company/university.

Conflicts of interest: None to declare.

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