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**RESEARCH ARTICLE**

# NONSPECIFIC LOW- BACK PAIN IN SAUDI SCHOOLCHILDREN AND ADOLESCENTS: PREVALENCE AND ASSOCIATED RISK FACTORS

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**ABSTRACT**

This study aimed to investigate the prevalence, severity, consequences and associated factors of low-back pain (LBP) in Saudi schoolchildren. This cross-sectional study included 311 students (13.37±1.36 years). They completed self-reported questionnaire and 87students underwent a spine medical examination. The cumulative lifetime prevalence of LBP was 31.5%. LBP was responsible for 66% and 60% of school and sports absenteeism respectively. Medical care requirement was observed in 25.5%.Chi-square analysis showed that ten factors were associated with LBP: age, gender, body mass index, dissatisfaction with school chair, way of handling school bag, family history of LBP, watching television (TV), and spine and sports injuries. Stepwise logistic regression revealed three predictors of LBP: gender, odd ratio (OR) =7.13 (95% confidence interval [CI], 2.97-17.14), dissatisfaction with school chair, OR=2.89 (95% CI, 1.76-4.75) and watching TV, OR=2.67 (95% CI, 1.6-4.45).This high prevalence requires preventive measures and longitudinal studies, which are very important from the standpoint of public health.



## INTRODUCTION

It is well known that back pain (BP) is a common and costly problem in the general population. Previously, BP in schoolchildren was considered rare and a sign of a potentially serious disorder (Burton, 1996; Balague *et al*, 1999). Today, according to a recent systematic review, the general opinion would be that BP; including low back pain (LBP), mid back pain (MBP) and neck pain (NP), starts already early in life to accelerate during the early teens up till early adulthood (Jeffries *et al*, 2007) and that its presence in young age is a precursor for BP also in adulthood (Hestbaek *et al*, 2006). The term LBP was defined by Andersson (1977) as “pain limited to the region between the lower margins of the 12th rib and the gluteal folds”. LBP is the most common type of back pain (Balague *et al*, 1999), occurring in about 60–80% of people at some point in their lives (Anderson, 1989).

In recent years there has been a considerable increase in research studies that examine the prevalence of LBP (Shehab *et al*., 2004;Sjolie, 2004; Bejia *et al*, 2005; Yao *et al*,2011; Akdag *et al*,2011; Mohammad El-sais, 2013) but studies exhibit great variability in prevalence rates, with estimates ranging from 1.1% (Taimela *et al*, 1997) to 66% (Sjolie, 2004).A linear increase of LBP prevalence has been reported by age from 4 to 65 years (Woolf and Pfleger , 2003**)**.The one year prevalence rate of LBP in schoolchildren has been reported from 7% to 58% (Smith *et al* 2007). It has been reported that the life time prevalence of LBP by age 20 is up to 80 % (Jones and Macfarlane, 2005). Regarding risk factors of LBP, a large number of studies (Balague *et al* 1999; Bejia *et al*, 2005) examined gender differences, height and weight, body mass index (BMI), sports time, differences in lifestyle, family history, and mental factors; however, no definitive conclusion has yet been made.

Little data is available regarding complain of LBP in schoolchildren and adolescents in Middle East. To our knowledge few number of epidemiological studies were conducted in Kuwait, Tunisia and Ha'il region of Saudi Arabia (Shehab *et al*., 2004; Bejia *et al*, 2005; Mohammad and El-sais, 2013) and further researches are needed to measure the magnitude of the problem of LBP in Arabic schoolchildren and adolescents. This stimulated us to look into LBP among 11-16 years old Saudi schoolchildren and adolescents in the largest city of Saudi Arabia, Riyadh city. Furthermore, there are no reports about the incidence of LBP among this group in Saudi Arabia. The aims of the study were to determine the prevalence, severity, medical and functional consequences and the associated risk factors of LBP in Riyadh city of Saudi Arabia. We also examined whether indicators from a medical examination correspond to self-reported LBP

## MATERIALS AND METHODS

This cross-section study was based on an investigation carried out in September 2013 on 311 schoolchildren and adolescents recruited from three governmental preparatory schools of Riyadh city, Saudi Arabia. Both male and female students were randomly selected using systematic method. The schoolchildren and adolescents represent all the students of these three schools, but the participation rate was 97% (3% of the schoolchildren were absent the days of the inquiry and/or did not complete the questionnaire). We did not observe any

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objection to participation, and the students were very motivated, because it was the first time this type of inquiry had been done. The three schools were representative of the preparatory schools of Riyadh, and the social class of the schoolchildren and adolescents is the same (middle class). The number of subjects needed for our study was calculated after an inquiry among 100 students.

The number of subjects needed (n) was calculated according to the formula: n= $(\epsilon/e)^2$ p (1-p), where $\epsilon$ is the reduced gap (=1.96 ≈ 2); e is the precision (=5%); and p is the prevalence (=28%). The alpha level was fixed at 5%. Thus, the number of subjects needed was 311 schoolchildren. The schoolchildren and adolescents filled in a questionnaire inspired by and derived from the Salminen (Salminen *et al* 1995) and (Troussier *et al*, 1994) LBP questionnaires. The researchers presented the questionnaire and explained the items, using a drawing to precisely indicate the location of the low back. They also helped the students to fill in the questionnaire, if necessary. The questionnaire was composed of 20 items and self-administered with an easy yes/no response format. These items evaluated the perceived characteristics of back problems, functional limitations, schoolchildren's activities and psychological parameters.

This questionnaire, validated elsewhere among 72 pupils suffering from LBP (Coleman *et al*, 1998), gave a good reliability (kappa coefficients between 0.70 and 1.00). The Arabic version of the questionnaire showed high levels of reproducibility for all items that evaluated perceived characteristics of back problems and functional limitation (Kappa coefficient=0.71-1.00). The questionnaire used in the present study provides reproducible information and can be used as a survey tool for the investigation of LB Problems in children and adolescents (Bejia *et al*, 2006).

Of all population only 87 schoolchildren and adolescents had a specific spine medical examination. We searched for morphological abnormalities of the lumbar spine (kyphosis, hyperlordosis), contracture on palpation of the paravertebral muscles and pain on palpation of the spine. We examined the mobility of the lumbar spine and measured the Schober index and the finger-foot index. If LBP was present, an evaluation of pain by a visual analog scale was performed. Only 311 questionnaires were analyzed (40 were not completed).

***Statistical analysis***

Statistical analysis was performed using descriptive statistics, and student's t-test. Chi-square and stepwise logistic regression analysis were carried out to determine the predictor and risk factors associated with LBP.

## RESULTS

The main age of our population was 13.37±1.36 years (range 11–16 years). There were 245 females and 66 males.

***LBP prevalence***

Of all population 46.3% (n= 144) suffered from rachialgia and/or sciatica.

The prevalence rates of cervicalgia, dorsalgia, LBP and sciatica were 21.2% (n=66), 21.9 % (n=68), 34.7% (n=108) and 2.3% (n=7) respectively. The cumulative life time prevalence of LBP (LBP occurring in the last 12 months) was 31.5% (n= 98 of 311) the point prevalence of LBP (LBP occurring in the course of the week preceding the inquiry) was 29.3% (n=91). LBP prevalence rates were 37.2%, 39.4% and 23.4% for occasional, frequent and chronic categories respectively. The cumulative prevalence rate of chronic LBP among whole population was 10.6%.

***LBP consequences***

Medical care requirements (medical consultation and physiotherapy) were observed in 25.5% of LBP patients. The cumulative prevalence of medical consequences in the entire population was 11.9%. The medical consequences of occasional, frequent and chronic LBP were 17.6%, 24.1% and 40.6% respectively.

***Functional limitations***

The functional consequences of LBP were evaluated by functional school and sports absenteeism. Among LBP sufferers 66% of the subjects indicated that LBP was severe enough to force them to miss school and 60% were prevented from playing sports. Among chronic LBP sufferers 53.1% missed school and 50% were prevented from playing sports.

***Daily life consequences***

The consequences on daily life were assessed according to the posture resulting in LBP (experienced pain in a particular posture), which occurred among LBP sufferers in 662.8% in sitting position and 59.9% in the standing position.

***Psychological consequences***

Anxiety, tiredness, sleeplessness, and depression- which have a quite different meaning spoken Arabic-were revealed in the item pertaining to psychological troubles were observed in healthy (31.6%, 6.9%, 16.1% and 15.5% respectively), in occasional LBP (47.1%, 19.6%, 54.9% and 29.4% respectively) in frequent LBP (53.7%,24.1%,29.6% and 31.5% respectively) and in chronic LBP (53.1%, 37.5%, 43.8% and 53.1% respectively).

***LBP associated factors***

LBP associated risk factors that were studied include age, gender, body mass index (BMI), school failure (held back for a year), school chair, the home- school journey, satchel (carriage by hand or on the shoulder), family history of LBP, TV watching, whether the child is right-handed or left-handed, smoking and history of injury and exercise (sports and spine injury).Chi-square analysis showed significant association with age and gender and BMI (P= 0.005, 0.000 and 0.006 respectively).The mean age of occasional, frequent and chronic LBP subjects were (13.12%±1.32), (13.11%±1.34) and (12.97±1.47) respectively and age ranged from 11 to 16 years. Over all, there was a significant trend towards increase in proportion of schoolchildren and adolescents with LBP as age increased despite inconsistencies at some ages and were at the maximum at age 14 years (75.3%) and age 16 years (78.6%). LBP prevalence rates for girls and boys were 41.6 (n=102) and 9.1% (n=6) respectively (P=0.001).

Of the subjects with LBP (47.2%) were dissatisfied with the school chairs compared with (23.6%) of those without LBP. The results revealed significant association between LBP and dissatisfaction with school chair (P=0.000).The average home-to-school journey in all subjects lasted 15 min (range: 1:75

min) with 93.6% go to school by car and 6.4% walking to school. Of LBP sufferers 44.4% had family history of LBP and 27.6% of the subjects without LBP had a family history, the association was significant. Past medical history of subjects was also associated with LBP.Almost14.1% of the subjects reported that LBP had interfered with their school and sports activity during the past 12 months and 29.3% of subjects reported point (current) LBP (LBP for the last 7 days).About 74.1% of LBP sufferers were watching TV greater than 2 hr/day with significant association with LBP. Way of handling school bag was associated with LBP where 79.6% of LBP subjects carry bag on shoulder while 20.4% use handbag. In addition the results showed significant association with history of injury and exercise (spine and sports injury) (P= 0.000). The results also revealed non-significant association with whether the child is right- handed or left-handed, smoking and school failures (held back for a year) and LBP (P>0.05) (Table 1).

**Table1**LBP associate risk factors in cross tabulation.

| | Associated Factors | $\chi^2$ value | P-value |
|---|---|---|---|
| 1. | Age | 16.68 | 0.005* |
| 2. | Gender | 24.29 | 0.000** |
| 3. | BMI | 12.18 | 0.006* |
| 4. | School chair | 18.06 | 0.000** |
| 5. | School failure | 4.02 | 0.064 |
| 6. | Right –or-left-handed | 0.02 | 1.000 |
| 7. | LBP family history | 9.00 | 0.004** |
| 8. | Home –school journey | 0.26 | 0.632 |
| 9. | Past medical history | 18.06 | 0.000** |
| 10. | Hours of watching TV | 14.61 | 0.000** |
| 11. | School bag | 4.39 | 0.045* |
| 12. | Smoking | 0.01 | 1.000 |
| 13. | Sports injury | 23.19 | 0.000** |
| 14. | Spine injury | 24.29 | 0.000** |

P < 0. 01* P<0.001**

Sixteen variables were introduced in the model for a stepwise logistic regression analysis for LBP. The stepwise logistic regression analysis showed that only three factors were associated with LBP and may be considered as predictors of LBP: gender, dissatisfaction with school chair and watching TV (Table 2).

**Table 2** LBP predictor factors in stepwise logistic regression odd ration (OR) and p-value

| | Predictors of LBP | OR | p-value |
|---|---|---|---|
| 1. | Gender | 7.133 (95% CI, 2.968-17.142) | 0.001** |
| 2. | Dissatisfaction with school chair | 2.889 (95% CI, 1.757-4.752) | 0.001** |
| 3. | Watching TV | 2.667 (95% CI, 1.600-4.445) | 0.002** |

CI = confidence interval *Significant at P≤0.01 **Significant at P≤0.001

***Objective findings***

The study of the objective findings with the aim of determining whether indicators from a medical examination corresponded to self-reported LBP was performed with 87 schoolchildren and adolescents. This subgroup was representation for the whole population. The main age was 13.52±1.80 year (range: 11-16). The most common spine –curvature abnormalities was scoliosis (44.83%) (n=39). The analysis of the objective findings showed that 41.4% out of 87 schoolchildren and adolescents suffered from LBP.

## DISCUSSION

This study focused on the prevalence, severity, medical and functional consequences and the associated risk factors of LBP among 11 to 16 years old Saudi students according to gender and age in one of the largest cities in Saudi Arabia. It is apparent that LBP is common, with a prevalence rate in Saudi students as high as in western schoolchildren. In the current study, the prevalence rate of LBP was 34.7% where the prevalence rates for occasional, frequent and chronic categories were 37.2%, 39.4% and 23.4% respectively. The cumulative lifetime prevalence of LBP in literature review has been reported to vary between 21% and 74% (Bejia *et al*, 2003). In our study the cumulative lifetime prevalence of LBP among Saudi schoolchildren and adolescents in Riyadh city was nearly on the middle bound (31.5%) and the point prevalence was also high (29.3%). Furthermore the cumulative prevalence rate of chronic LBP among whole population was 10.6%.

This result was in accordance with Bejia *et al*., 2005 in which LBP life time prevalence among Tunisian schoolchildren and adolescents was 28.4% and the prevalence of cases was 53% had frequent or chronic LBP, and 8% of the total population suffered from chronic LBP. On other hand the LBP life time and point prevalence among Kuwaiti schoolchildren and adolescents were 57.8% and 35% respectively. These are higher than our prevalence. Furthermore, the prevalence reported in the current study coincide with Olsen *et al*. (1992) who recorded an incidence of 30 % and this obtained by Yao *et al*., 2011 who reported that the occurrence of non-specific LBP was high; with 29.1% of Chinese students aged 10 to 18 years suffering from this condition in the past 3 months

The incidence found in this study was higher than that of Watson *et al* (2002) and Balagué *et al* (1988). Watson *et al* (2002) recorded an incidence LBP with 23.9% while Balagué *et al* (1988) reported an incidence of 27% among Swiss teenagers. A nearly prevalence was estimated by Masiero *et al* (2008) who found that 20.5% teenagers reported one or more episodes of LBP. In addition, it was revealed that LBP in childhood and adolescence is also a common complaint in Japan (Sato *et al*., 2008).

The lowest incidence of LBP (17.6%) was found by Fairbank *et al*. (1984) while (Mohammed and El-Sais,2013) recorded that the life time prevalence in Saudi schoolchildren and adolescents aged 12-18 years in Ha'il region of Saudi Arabia was (19.2%). The differences in reported prevalence rates of LBP depend on several factors, including the variation in age, subject and the methodology, definition of LBP and type of prevalence (cumulative prevalence or prevalence rate) used in the study.

A higher proportion of adolescent with BP reporting LBP, causing absenteeism (66%) from school and need medical care (25.5%). This is in contrast to Shehab and Al-Jarallah (2005) who found that a few of students absent from school and need medical/instrumental assessment for their problem recorded a lower proportion. Of the cases with LBP, the sitting position was a factor in 62.8% and standing position in 59.9%. Inappropriate school furniture and the high number of hours spent in sitting position are the possible precipitating factors of LBP among schoolchildren, as observed by other authors (Sheldon, 1994; Salminen *et al* 1995; Bejia *et al*., 2005). As for the psychological symptoms, they can be an etiological factor or the consequence of LBP, mainly when it takes a chronic evolution. The psychological factors play a role in the experience of LBP. In fact poor self-perception of health (health belief) could be a factor behind reporting LBP (Szpalski *et al*, 2002). Furthermore, pain perception and psychological factors were associated with LBP (Staes *et al* 2003).Adverse psychosocial factors and the presence of other preexisting somatic pain symptoms (abdominal pain, headaches, and sore throats) were also predictive of future LBP for Jones (Jones *et al* 2003). Poor well-being, in particular poor self-perceived fitness, was associated with LBP among adolescents in the study of Sjolie (2004). The psychological factors were significantly associated with reported nonspecific LBP and its consequences in the study of Balague *et al* (1995).

In the present study, the mean age at onset of occasional, frequent and chronic LBP subjects were (13.12%±1.32), (13.11%±1.34) and (12.97±1.47) respectively. This finding is in consistent with the report of Salminen *et al*, 1995 and Bejia *et al*., 2005; they showed that the first LBP often occurs at 13–14 years of age. There was a trend towards increase in proportion of children with LBP as age increased and were at the maximum at age 14 years (75.3%) and age 16 years (78.6%). Studies have reported different rates of LBP in relation to gender. LBP was gender dependent in our study .The findings revealed higher LBP prevalence rates for girls 41.6 (n=102) compared to boys 9.1% (n=6) (P=0.001) that is in agreement with the results of Grimmer and Williams (2000); Kovacs *et al*. (2003); Shehab and Al-Jarallah (2005); Masiero *et al*. (2008); Dianat *et al*. (2013). This may be attributed to earlier female puberty and it's accompanying hormonal changes, boys tend to worry less about this problem or to the fact that Saudi girls are more sedentary and less physically active than boys.

Of the subjects with LBP (47.2%) were dissatisfied with the school chairs compared with (23.6%) of those without LBP. Dissatisfaction with the school chair concerned height and comfort, as evaluated by the students. The school chairs were, in fact, very uncomfortable, old-fashioned with a standard form and height. Coleman *et al*. 1998 studied the preferred settings for lumbar support height and depth of 123 subjects. The mean preferred height setting was 190 mm above the compressed seat surface. The mean depth setting (horizontal distance from front of seat to lumbar support point) was 387 mm .Thus; they were not adapted for schoolchildren of various ages (11–16 years) and wide-ranging heights (115–192 cm).

The findings of the present study are in contrast with those of (Watson *et al.*, 2002; Skoffer, 2007), who found no relationship between non-specific LBP and sitting at school, the types or dimensions of the school furniture or body dimensions. Our study, in line with Ramadan (2011), revealed too low or too high chair and table heights of Saudi school furniture relative to the students' body dimensions increased the stresses acting at L5/S1 as well as discomfort ratings. Our findings suggested increase in stress on the back with uncomfortable school furniture. Symptoms associated with stress to the structures of the back during sitting depend on the design features of the desk and chair which indicate mismatch between the dimensions of school furniture (chair/desk) and the anthropometric characteristics of school students. The design of many schools furniture was made to be durable rather than ergonomically sound.

In contrast to Akdag *et al*, 2011, the results revealed significant association between LBP and school bag handling (P< 0.05). This result was in line with Bejia *et al*, 2005; Korovessis *et al* (2004) and Mohammad and El-sais, 2013 who reported that back pain increased with increasing bag weight among schoolchildren. Similar to the current study Balague´ *et al* (1995) and Bejia *et al*, 2005 demonstrated that sibling history of LBP was significantly associated with reported non-specific LBP and its consequences. Salminen *et al*, 1995, Brattberg, 1994 and other cross-sectional studies (Brattberg, 1994;, Coste and Paolaggi, 1989; Duggleby and Kumar, 1997; Gunzburg *et al*, 1999) have likewise demonstrated the influence of genetic factors in the occurrence of LBP in children and adolescents. Incidence of LBP in those with positive family history of LBP is almost two times more than those without LBP.

Several studies had reported some inactivity indicators related to back pain. In contrast to the current study being transported inactively to school has previously been demonstrated to be associated with LBP (Gunzburg *et al*., 1999), and in another study LBP was observed more frequently in schoolchildren who did not walk to school (Szpalski *et al* 2002 ). The contradiction between our result and results of previous studies may be due the fact that the average home- to- school journey in all subjects lasted 15 min (range: 1:75 min).Therefore, the non- association between the reported inactivity and LBP seems relevant.

Differences in lifestyles such as the amount of sedentary activity; how much time was spent doing desk work, and how long did they watch TV or play video games are associated with LBP. Similar to the current study other authors have found LBP to be positively associated with time spent on watching TV (Balague *et al*, 1988, Sjo¨lie, 2004). It is well documented that physical inactivity has biochemical consequences and may exert heavy impact on the connective tissue of the locomotor system (Kjaer, 2004). The results also revealed non-significant association with whether the child is right-handed or left-handed and smoking. Unlike Salminen, 1984, Troussier *et al*, 1998 and Bejia *et al*, 2005, we found that school failure was not associated with LBP.

In this study, we focused on sports activities as a risk factor for LBP in childhood and adolescence. It was revealed that sports participation was not associated with LBP, this comes in disagreement with Kujala *et al* 1996, and Troussier *et al*,1998 ;they found that basketball, swimming and bowling were found to be associated with LBP, but football and bowling were associated with chronic LBP. Exercise has been considered a risk factor for LBP and chronic LBP, especially if intense and competitive. In the present study, it was noticed that Saudi schoolchildren are less sharing in sports and physically inactive. Available data from a small number of studies suggests a high prevalence (43.3%-99.5%) of physical inactivity among Saudi schoolchildren and adults alike (Al-Hazzaa, 2004).

Concerning the objective findings in our cases, they were retained by the physician after his impression of a simple clinical spine examination. It was performed with 87 schoolchildren and adolescents. There are, in fact, very few clinical signs that can help to single out schoolchildren with LBP. Scoliosis was the commonest spinal deformity. This finding may be attributed to the way of carry the school bag and the abnormal sitting position for longer time during the day. The study of the objective findings confirmed that the indicators from a medical examination corresponded to self-reported LBP where 41.4% out of the 87 schoolchildren and adolescents suffered from LBP**.**

Compile all of the above, LBP cumulative lifetime prevalence among Saudi schoolchildren and adolescents was 31.5%, and chronic LBP prevalence was 10.6%. It has shown an association with ten factors: age, gender, BMI, dissatisfaction with school chair, spending long time for watching TV, positive family history of LBP, school bag, and history of injury and exercise. While the results of stepwise logistic regression revealed only three risk factors and predictors of LBP: gender, dissatisfaction with school chair and watching TV. Because of the nature of the design of the study (cross-sectional), no specific cause, effect, or inferences can be drawn. Research in LBP in schoolchildren and adolescents deserves a high priority in the future to provide evidence for a relevant prevention strategy to decrease its incidence. As shown, it is needless to say that the factors in the risk of LBP cannot be explained by a single cause and it is therefore necessary to evaluate other risk factors. In the future, we think that it will be necessary to survey other influences, especially the influence of mental factors in schoolchildren as well as in adults and also investigate the clinical diagnoses made with imaging modalities and thus make a prospective evaluation of LBP using longitudinal studies including all regions of Saudi Arabia to clarify LBP in childhood and adolescence. Moreover, we also believe that these results may greatly help to elucidate various factors behind LBP in adults. We can conclude that there is a need to tackle the problem earlier by introduce the back care advice into the primary and secondary school curricula, and greater attention needs to be given to ergonomic improvements of chair and desk design in the classroom to prevent the initial episode of LBP or at least delay it.

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