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# Prevalence of spine pain among Tunisian children and adolescents and related factors

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## Abstract

**Background** The prevalence of back and neck pain is common in children and adolescents, and in some series the numbers are alarming. Various risk factors have been identified, although some are controversial.

**Objective** To determine the prevalence of neck and back pain in children and adolescents and to investigate the potential association with various risk factors identified in the literature.

**Methods** We established a questionnaire targeting parents of children and adolescents aged between 6 and 18 years old in Tunisia. The recruitment of participants was done online using the Google Forms application. The questionnaire was divided into 2 parts: Part one collected the sociodemographics characteristics of the participants : age, gender, body mass index (BMI), exposure to passive smoking, the practice of a physical activity, puberty status and age at puberty if applicable, type and weight of the schoolbag, mean daily time spent on electronic devices, type of school the child attends (private/public), mode of transport from home to school, parental history of neck and/or back pain (mid or low back pain (LBP)), posture of the sitting position of the child, and finally whether the child reports neck/ back pain. The second part was aimed at parents whose child reported neck and/or back pain. We asked about the weekly frequency of neck/back pain, school absenteeism due to neck/back pain, whether it prevented the child from practicing physical activity and, finally, whether the child had ever seen a doctor/chiropractor/physiotherapist for their neck/back pain.

**Results** Eighty-eight children (45 females, 43 males) were enrolled. Mean age was 11.9 ± 3.8 years [6–18]. Mean BMI was 18.8 ± 4.2 [15.8–35.5]. Thirty-four (38.6%) were pubescent. Twenty-five (28.4%) children were exposed to passive smoking. Parental history of spine pain was found in 58% of cases. A poor sitting position was noted in $n = 49$ (55.7%). Mean daily screen time was 88.3 ± 75.56 min [0-360]. Prevalence of spine pain was 44% ($n = 39$) distributed as follows: neck pain ($n = 21$, 23.8%), mid back pain ($n = 15$, 17%), LBP ($n = 26$, 29.5%), neck, mid back and low back pain ($n = 4$, 4.5%) Professional help seeking for spine pain in children was reported by 15 participants (25.3%). Among them, 20.3% visited a physician and 5% consulted a chiropractor or physiotherapist. A significant correlation was found between spine pain and age ($p = 0.006$) and BMI ($p = 0.006$). A significant association was found between LBP and exposure to passive smoking, puberty status, type of school bag and poor posture. A positive parental history of spine pain was significantly associated with the presence of spine pain in their children with $p = 0.053$ (neck pain), $p = 0.013$ (back pain) and $p < 0.00$ (LBP) respectively. A significant association was found between the presence of spine pain

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and school absenteeism, participation in sports, consultation with a doctor or physiotherapist/chiropractor ($p < 0.0001$ respectively).

**Conclusion** The prevalence of spinal pain was frequent in our series. A positive parental history of spinal pain, a bad posture while sitting, passive smoking, use of backpack, higher age and higher BMI were potential associated factors.

**Keywords** Back pain, Children, Pediatric rheumatology, LBP in children

## Introduction

Chronic pain, previously thought to be a condition that predominantly affects adults, has recently drawn considerable attention in relation to children and adolescents. This phenomenon has sparked increasing interest within academic circles [1] and its prevalence is estimated to be between 11 and 38% depending on the underlying etiology of the pain [2].

One of the most common types of chronic pain in children and adolescents is spine pain which has been reported to affect up to 74% of this population [3, 4]. This is a higher rate than known pediatric health issues like asthma, abdominal pain, drug use and road injury [5]. Spine pain in children and adolescents is particularly relevant as it has long-term implications, including decreased participation in physical activities and poorer performance in school [6]. In fact, neck pain and other musculoskeletal diseases were identified respectively as the 4th and 10th most prevalent health conditions causing disability for adolescents aged between 15 and 19 years old [5]. Moreover, back pain in children and adolescents is particularly concerning, as it is associated with future back pain in adulthood [7].

The prevalence is on the rise, in part due to heightened awareness and detection of chronic pain in children and recognition of its impact. Indeed, studies indicate that prevalence rates of back pain in children and adolescents have increased over time and a meta-analysis showed higher prevalence rates in recent studies compared to earlier ones, highlighting the urgent need for effective screening and intervention strategies [4].

This study aims to establish prevalence of spine pain among tunisian children and adolescents and to identify the possible related factors.

## Methods

This is a cross-sectional study including children and adolescents aged 6 to 18 years and/or their parents in Tunisia. Participants were recruited online using the Google Forms application.

The questionnaire was divided into 2 parts: Part one collected the following characteristics of the participants : age, gender, body mass index (BMI), exposure to passive smoking, the practice of a physical activity (marked as a yes or no question), puberty status and age at onset, type and weight of the schoolbag, mean daily time spent on electronic devices, type of school the child attends (private or public), mode of transport from home to school, parental history of spine pain (neck and/or mid back pain and/or low back pain (LBP)), posture of the sitting position of the child (good or bad), and finally whether the child reports spine pain (marked as a yes or no question).

The second part was intended at participants whose child had reported spine pain. We asked about the weekly frequency of spine pain, school absenteeism due to spine pain, whether it prevented the child from engaging in physical activity (PA) and finally, whether the child had ever seen a doctor/chiropractor/physiotherapist for their spine pain.

The parents were asked to complete the questionnaire once for each of their children (if they have more than one child).

All statistical analyses were performed using the Statistical Package for Social Sciences (SPSS) version 25.0. A descriptive study was primarily conducted, with simple and relative frequencies calculated for qualitative variables and means and standard deviations for quantitative variables. The association between qualitative and quantitative variables was assessed using Student's t test. Correlation was assessed using Pearson's correlation coefficient (r). A significance level of $p < 0.05$ was considered for all statistical tests.

## Results

### Characteristics of the patients

Eighty-eight children (45 females, 43 males) were enrolled. Mean age was 11.9±3.8 years [6–18]. Mean BMI was 18.8±4.2 [15.8–35.5]. Thirty-four (38.6%) were pubescent. Mean age at onset of puberty was 12.5±1.5 years [10–16]. Twenty-five (28.4%) children were exposed to passive smoking. Parental history of spine pain was found in 58% of cases. A poor sitting position was noted in 49 patients (55.7%). Mean daily screen time was 88.3±75.56 min [0-360].

### Prevalence and characteristics of spine pain

Prevalence of spine pain was 44% ($n=39$) distributed as follows: neck pain ($n=21$, 23.8%), mid back pain ($n=15$, 17%), LBP ($n=26$, 29.5%), neck, mid back and low back pain ($n=4$, 4.5%). During the last week, mean frequency of spine pain was 1.9±1.5 times [0–7]. Three children reported missing school due to spine pain. The truancy

rates for these children were 1, 4, and 12 per trimester, respectively. Professional help seeking for spine pain in children was reported by 15 participants (25.3%). Among them, 20.3% visited a physician and 5% consulted a chiropractor or physiotherapist.

Table 1 reports physical activity data and school related data of the participants.

### Related factors to spine pain

A significant association was found between spine pain and respectively age (13.3 years old for children with spine pain versus 10.7 years old for those without; $p=0.006$) and BMI (20.2 kg/m² for children with spine pain versus 17.7 kg/m² for those without; $p=0.006$). Spine pain was also significantly associated with longer daily screen time (101.5±94.3 min for children reporting spine pain verus 77.2±53.9 min for children without; $p=0.001$).

A significant association was found between LBP and exposure to passive smoking, puberty status, type of school bag and poor posture. Children not exposed to passive smoking ($n=63$) reported less LBP than those who were expossed. In fact, 80.6% of the group not exposed didn't report any LBP (this difference was statsistically signifcant, $p=0.004$). Most children who didn't have LBP were impubescents (62.4%) (this difference was statsistically signifcant, $p=0.058$). Among children who reported LBP ($n=26$), the majority carried a backbag ($n=19$, 73%), and had a poor posture ($n=19$, 73%) (this difference was statsistically signifcant, $p=0.034$ and $p=0.033$ respectively). A positive parental history of spine pain was significantly associated with the presence of spine pain in their children with $p=0.053$ (neck pain), $p=0.013$ (back pain) and $p<0.00$ (LBP) respectively.

A significant association was found between the presence of spine pain and school absenteeism, participation in sports, consultation with a doctor or physiotherapist/chiropractor ($p<0.0001$ respectively). Table 2 reports the relationship between spine pain and patient characteristics. Table 3 reports the relationship between spine pain, physical activity and school-related data.

## Discussion

Our study reported a high prevalence of spine pain in children and adolescents. It also identified potential factors associated with neck, mid-back and low back pain in this population including: age, BMI, puberty status, poor posture of the sitting position, exposure to passive smoking, parental history of spine pain, type of school bag, daily screen time, school absenteeism and professional help seeking. However it is important to state the limitations including the cross-sectional design and relatively small-sample size.

### Prevalence of spine pain

Our study has revealed that a considerable number of children (44%) experience spine pain. Prevalence of spine pain among this population in the literature is high and often times higher than in our study. A study investigated the trajectories of spinal pain frequency from 6 to 17 years of age in 1556 children followed for 5.5 years and found that 63% of children experienced spinal pain

**Table 1** Physical activity data and school related data of the participants

| Participants Characteristics ($n=88$) | | | | Data |
|---|---|---|---|---|
| Physical activity (PA) | YES | Curricular PA, n (%) | | 29 (32.9) |
| | | Regular extracurricular PA, n (%) | swimming | 11 (12.5) |
| | | | basketball | 9 (10.2) |
| | | | tennis | 9 (10.2) |
| | | | football | 9 (10.2) |
| | | | gymnastics | 6 (6.8) |
| | | | other | 12 (13.6) |
| | NO (because of spine pain), n(%) | | | 9 (10.2) |
| | Weekly duration of PA (hours/week ± SD [min-max] | | | 2.8 ± 1.5 [1–9] |
| School-related data | Type of school, n (%) | Public | | 28 (31.8) |
| | | Private | | 60 (68.1) |
| | Mode of transport, n (%) | Walking | | 11 (12.5) |
| | | Public transport | | 1 (1.1) |
| | | Family car | | 76 (86.4) |
| | Type of school bag, n (%) | backpack | | 56 (63.6) |
| | | Rolling bag | | 25 (28.4) |
| | | Hand bag | | 7 (7.9) |
| | Mean weight of school bag (kg) ± SD [range] | | | 7.39 ± 5.5 [1–35] |
| | School absenteeism due to spine pain, n (%) | yes | | 3 (3.4) |
| | | no | | 59 (67) |

**Table 2** Relationship between spine pain and patient characteristics

| | | Neck pain | | Back pain | | Low back pain | | Spine pain | |
|---|---|---|---|---|---|---|---|---|---|
| | | **n** | ***p*** | **n** | ***p*** | **n** | ***p*** | **n** | ***p*** |
| Age | | - | $p=0.090$ | - | $p=0.028$ | - | $p=0.024$ | - | $p=0.006$ |
| BMI | | - | $p=0.222$ | - | $P=0.390$ | - | $p=0.002$ | | $P=0.006$ |
| Gender | Male | 12 | $p=0.384$ | 5 | $p=0.186$ | 14 | $p=0.545$ | 21 | $p=0.533$ |
| | female | 9 | | 10 | | 12 | | 19 | |
| Passive smoking | Yes | 6 | $p=0.985$ | 7 | $p=0.085$ | 13 | $p=0.004$ | 14 | $p=0.211$ |
| | No | 15 | | 8 | | 13 | | 26 | |
| Puberty status | Pubescent | 11 | $p=0.138$ | 7 | $p=0.483$ | 14 | $p=0.058$ | 19 | $p=0.119$ |
| | Impubescent | 10 | | 8 | | 12 | | 21 | |
| Posture of the child | good | 6 | $p=0.096$ | 4 | $p=0.131$ | 7 | $p=0.033$ | **12** | $p=0.014$ |
| | poor | 15 | | 11 | | 19 | | 28 | |
| Daily screen time | | - | $p=0.180$ | - | $p=0.035$ | - | $p=0.05$ | **-** | $p=0.001$ |
| Parental history of spine pain | Yes | 16 | $p=0.053$ | 13 | $p=0.013$ | 23 | $p<0.001$ | **30** | $p=0.003$ |
| | No | 5 | | 2 | | 3 | | 10 | |

**Table 3** Relationship between spine pain, physical activity and school-related data

| | | Neck pain | | Back pain | | Low back pain | | Spine pain | |
|---|---|---|---|---|---|---|---|---|---|
| | | **n** | ***p*** | **n** | ***p*** | **n** | ***p*** | **n** | ***p*** |
| Physical activity | Extracurricular | 10 | $p=0.259$ | 7 | $p=0.377$ | 12 | $p=0.183$ | 21 | $p=0.390$ |
| | Curricular activity | 10 | | 6 | | 11 | | 16 | |
| | No | 1 | | 2 | | 3 | | 3 | |
| Number of hours / week dedicated to PA | | - | $p=0.085$ | - | $p=0.825$ | - | $p=0.548$ | - | $p=0.250$ |
| Type of school | Public | 6 | $p=0.714$ | 10 | $p=0.890$ | 17 | $p=0.715$ | 13 | $p=0.900$ |
| | Private | 15 | | 5 | | 9 | | 27 | |
| Mode of transport to school | Walking | 1 | $p=0.389$ | 2 | $p=0.898$ | 3 | $p=0.792$ | 3 | $p=0.270$ |
| | Private car | 20 | | 13 | | 23 | | 37 | |
| | Public transport | 0 | | 0 | | 0 | | 0 | |
| Type of school bag | backpack | 13 | $p=0.143$ | 13 | $p=0.176$ | 19 | $p=0.034$ | 27 | $p=0.032$ |
| | Rolling bag | 4 | | 1 | | 3 | | 7 | |
| | Hand bag | 4 | | 1 | | 4 | | 6 | |
| Weight of school bag | | - | $p=0.533$ | - | $p=0.753$ | - | $p=0.276$ | - | $p=0.630$ |
| School absenteeism | | - | $p<0.001$ | - | $p<0.001$ | - | $p<0.001$ | - | $p<0.001$ |
| Participation in sports | | - | $p<0.001$ | - | $p<0.001$ | - | $p<0.001$ | - | $p<0.001$ |
| Consultation with doctor or physiotherapist/chiropractor | | - | $p<0.001$ | - | $p<0.001$ | - | $p<0.001$ | - | $p<0.001$ |

at least once during that period. Another epidemiological population study in Brazil found that the prevalence of back pain in the last three months was 55.7% among schoolchildren [8]. Similarily, Wirth B et al. reported that overall spine pain prevalence in swiss school children was high and ranged between 30% (female aged 6–9) and 77.8% (female aged 13–16) [9]. These results suggest that spine pain is a widespread complaint in children and that its prevalence varies across populations and geographic regions.

### Factors associated with spine pain

Understanding the factors that contribute to the onset and persistence of spine pain in children is essential for effective prevention and treatment.

### Child-related intrinsic factors

In our study, increased age was significantly associated with pain in the neck, mid back and low back, consistent with findings from multiple studies [10].

A cross-sectional, questionnaire-based cohort survey in Finland revealed that the prevalence of LBP in 14- and 16-year-old adolescents were higher than in school children (14% and 1% respectively) [11]. This suggests that adolescence is a period characterized with a prevalence of spine pain approaching that in the adult period [12]. Further supporting these observations, a study involving 1,221 Tunisian school-adolescents found a significant association between age≥16 years and both neck and low back pain [3]. Additionally, in a lebanese study, neck pain prevalence was higher in adolescents than in children (60% versus 40% respectively) [13]. Several factors may contribute to the higher prevalence of spine pain in adolescents. These include increased physical activity,

leading to greater strain on the spine and an increased risk of injury, rapid growth spurts, poor posture, as well as psychological factors associated with stress and anxiety.

Moreover, in our study, higher BMI was associated with spine pain in children. This is consistant with various studies, although most of them focused on the strong association between obesity and LBP [8, 14]. In an interesting systematic review, among the twelve studies included, five showed a relationship between LBP and BMI, seven between back pain and BMI and two between neck pain and BMI [15]. Several explanations have been mentioned including increased mechanical loading and hormonal metabolic activity in obesity.

Pubertal status also seems to influence the prevalence of back pain in younger population, consistant with our findings. In the study including children and adolescents from Murcia, Spain, the authors concluded that pubertal development and linear growth were precipitating factors for spine pain [16]. Lardon A et al. confirmed a linear increase of back pain according to the stage of puberty [17]. The influence of puberty on back pain in children has yet to be fully elucidated, but several explanations were suggested: Growth spurt [18], changes in body composition, with an increase in fat mass that could replace active muscle fibers [19].

On the other hand, poor posture is considered by many authors the hot topic of the century and many are fearful of its possible eventual implications [20, 21]. In our study a poor posture of the sitting position was associated with LBP in children. Daily screen time was however associated with pain in all three sites. Postural problems are on the rise mainly due to the modern lifestyle with increased participation of electronic devices [22]. In fact, prevalance of incorrect posture among chinese children and adolescents was 65.3% [23]. These children are at higher risk of developing pain syndromes. Notably, school children in the Czech Republic with poor posture reported cervical and lumbar spine pain more frequently [24]. A review article indicated that posture is linked to the onset of LBP in children, and is identified as a triggering risk factor [14]. Azevedo et al. showed, through thorough assessment of posture using the Spinal Mouse®, that poor posture in children, especially a poor sitting position is associated with non-specific back pain [25]. Although in our study the posture was poorly assessed through a yes or no question, it still gives us insight on the importance of having balance and better static positions especially during childhood [26].

Furthermore, in our study, daily screen time was significantly higher in children and adolescents with spine pain. A systematic review investigating the relationship between screen time and LBP in children and adolescents found that adolescents exposed to screen time for at least three hours a day were more likely to report LBP [27]. The connection between poor posture and extended screen viewing duration is well-documented [28, 29]. In an observational study, screen viewing time was closely linked to pathological neck and head flexion postures particularly when seated [30].

#### Environment-related factors

Environmental factors have been associated with spine pain in both old and young populations. Among these factors, passive smoking has emerged as a potential risk factor for LBP in our study. In a meta-analysis, Shiri et al. showed that the association between smoking and the incidence of LBP is stronger in adolescents than in adults [31]. An epidemiological research on adolescent spine pain demonstrated a consistent association between spine pain and parental smoking for both genders [9]. The understanding of active and passive smoking role in developing spine pain remains limited, however some data support the hypothesis that increasing levels of environmental tobacco smoke may contribute to the dysregulation of pain perception [32, 33] and promotion of disc degeneration [34, 35].

In exploring spine pain in younger population, it's worth examining the potential association between a parent's history of spine pain and the likelihood of their children experiencing similar issues. In this study, a positive parental history of spine pain emerged as a risk factor for developing spine pain in children. A significant association between parental spine pain and presence of back pain in their children has been reported across mutliple studies [9]. The reasons for this association may be mutifactorial. Children may inherit a predisposition to spine pain from their parents [36]. Shared environmental and behavioral factors have also been mentioned such as parental socioeconomic status, family income, family functioning and altered parental behavioral modeling [36, 37].

#### School-related factors

A significant relationship between the type of school bag and LBP in children was found. However, the weight of the bag was not associated with the presence of spine pain. Data in the literature is controversial [38, 39]. A systematic review of 69 articles found no association between the aspects of schoolbag use and the risk of back pain in children and adolescents [40]. Some studies are, however, in line with our findings and reported a robust link between spine pain and the use of a schoolbag that is both a backpack and heavyweight [41, 42]. In fact, according to a recently published systematic review, improper use of backpacks contributes to musculoskeletal injuries among adolescents [43]. The same study found that perceived school bag load, duration of carriage, and

method of transport to school are associated with spine pain in adolescents.

### Impact of spine pain in children and adolescents

School absenteeism, participation in sports and professional help seeking were significantly associated with the presence of spine pain in the present study. Numerous studies have reported a noteworthy association between spine pain and school impacts in children. A study by Kamper et al. showed that back and neck pain were major causes of disability in adolescents and can lead to limitations in school attendance or participation in physical activities in up to a quarter of cases [44]. LBP was significantly associated with not only school absenteeism and impaired health related quality of life but also with care seeking and medication use [45]. Another cross-sectional survey including over 637 children found a strong link between school absenteeism and occurrence of back pain [46].

Furthermore, in our study a significant relation was found between spine pain and sport participation. Most data available supports the hypothesis that sport participation in children can be associated with back pain rather than the notion that back pain restricts engagement in physical activity [47].

Besides the educational and social aspects, spine pain in children and adolescents carries economic implications, as it has been associated with increased rates of medical visits, which aligns with the findings of our study. In fact, a cross-sectional study conducted in Norway found that 18.7% of children with nonspecific back pain reported a need for a physician visit [48]. In a longitudinal study, authors noted that spinal pain is a common reason for seeking medical care in children and adolescents [49]. In their evidence-based guidelines for Treatment of Unspecific Back Pain in Children and Adolescents, Frosch and colleagues emphasized that back pain is a common reason for medical visits, and thus, elaborated specific medical recommendations [50].

## Conclusion

Despite certain limitations, our survey highlighted the high prevalence of spine pain and a number of potential related factors in the pediatric and adolescent populations. These factors encompass not only the intrinsic characteristics of the child but also the environmental circumstances in which he/she evolves. The manifestation of spinal discomfort in children has immediate and long-lasting repercussions, as it carries significant costs on society. It is therefore imperative to investigate these factors further and effectively guide affected children towards appropriate management strategies. This can help reduce the negative impact of back pain in this vulnerable population, and optimize their overall well-being.

#### Abbreviations

| | |
|---|---|
| BMI | Body mass index |
| LBP | Low back pain |
| PA | Physical activity |
| SPSS | Statistical Package for Social Sciences |
| r | Pearson's correlation coefficient |

## Supplementary Information

The online version contains supplementary material available at https://doi.org/10.1186/s12969-024-01007-w.

Supplementary Material 1

Supplementary Material 2

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None.

#### Author contributions

AF: Conceptualization, correcting original draft, agreement to be accountable for all aspects of the work. CI (corresponding author): Data collection, writing original paper, agreement to be accountable for all aspects of the work. SM, HB, YM: approval of final version of manuscript. KBA, AL: Supervision.

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#### Data availability

Upon request.

## Declarations

#### Ethics approval and consent to participate

Yes, ethical approval number: MS00323.
Ethics committee and number: Mongi Slim Hospital: MS2023002. This study was carried out in accordance with the guidelines in the Declaration of Helsinki.

#### Consent for publication

All authors read and approved the final manuscript and gave their consent for publication.

#### Standards of reporting

STROBE guidelines were followed.

#### Conflicts of interest

We declare that we have no conflicts of interest in this work.

#### Competing interests

None.

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