Prevalence of and Factors Associated with Back Pain among High School Students
A Cross-Sectional Study

Janhavi Sirsat¹, Shivram Kumar¹, Zahra Rehman¹
Rachel Rajan¹, Roaa A. Al-Qatraní¹
Ayman Z. Mirghani¹
Year 4 MBBS Students
Gulf Medical University
Ajman, UAE

Jayakumary Muttappallymyalil²
Faculty, Dept. of Community Medicine
Gulf Medical University
Ajman, UAE

Abstract—Back pain, a widely disregarded topic on the whole, amongst high school children around the world is on a dramatic rise. Many factors such as sedentary lifestyle, smoking, poor back support, strenuous activities and heavy loads have shown to be associated with this phenomenon. The study was conducted primarily to find the prevalence of back pain in high school students along with identifying the factors involved in its development. A total of 184 students, both genders, from grades 9 to 12 (age group 13 to 18 years) were selected by means of convenience sampling. They filled out questionnaires after the parents of those below 18 years of age signed a consent form. The prevalence of back pain was found to be 65%. Among which females suffered twice as much compared to males. The most affected region of the back was also found. Other factors included sleeping position, hours in school, extracurricular activities, duration and weight of school bags carried. Prevalence of back pain is a major issue in today’s generation and awareness among the students is highly essential for early prevention. Awareness needs to be raised among high school students, their parents, and academic departments in schools regarding the ways to reduce these risk factors. Also, a nationwide study should be done to obtain a more generalizable result.

Keywords- Back pain, students, prevalence, risk factors

I. INTRODUCTION

Low back pain is defined as ‘neither a disease nor a diagnostic entity of any sort’. The term referred to pain of variable duration in an area of the anatomy afflicted so often that it had become a paradigm of responses to external and internal stimuli [1]. A study in Al Ain reported 59% prevalence of low back pain [2], which is a rather large percentage. A prevalence of 68% was found in medical students in UAE University, Al Ain [3]. This further reflected that younger age groups are getting affected with back pain and the pain advanced, as students got older. Studies exhibit great variability in prevalence rates, with estimates ranging from 1.1-66% [4, 5]. This variability may be due to differences among the studies in such factors as the age of the sample, sample size, definition of back pain, recall period, strategy for extracting data, methodology used [5].

Back pain, among adolescents, was a pressing issue since it was on a constant rise. Moreover, children already having back pain are at a higher risk to develop major back problems.

Back pain can be classified based on either duration of symptoms into acute (< 6 weeks), sub-acute (6 to 12 weeks) and chronic (> 12 weeks) or based on cause of the pain into mechanical/non-specific or secondary back pain [6].

Furthermore, other studies demonstrated the effects of various factors in association with back pain and they included carrying heavy loads that far exceeded the recommended weight (10-15% of a person’s body weight) [7]. Another study looked at physical inactivity and the practice of strenuous physical activities. Both were shown to contribute to back pain [8, 9]. Inactivity can cause decreased muscle flexibility and trunk strength, which are among the factors associated with back pain [10].

Posture was a significant factor contributing to back pain. The amount of time spent sitting and watching television [8], the chair height being too low [11] and the backrest being too high also contributed to the back pain experienced by these students. Increased reporting of back pain by 90% was also reported by students who had a bad habit of twisting the back for more than 10 minutes during lessons [11].

Obesity/BMI was also shown to have a substantial impact on the development of back pain. An increase in BMI increased the risk of back pain [12]. Certain pathological conditions such as spondylisis, kyphosis and juvenile arthritis also were found to cause back pain [13]. A study also found the possibility of certain psychological, emotional and social factors that could cause back pain [14].

Back pain is a rapidly rising global concern. It mainly manifests during childhood, affecting the quality of life and limiting the routine activities. Unfortunately, very less research has been conducted in the UAE and the GCC countries to increase awareness for this matter. The root cause of this research was to increase awareness of this growing issue, and attempt to rectify it before it caused major problems for
children in the future. Prevalence of back pain and factors associated with it were assessed and reported in this article.

II. MATERIALS AND METHODS

The high school students were selected from grades 9 to 12 and the age group of these students ranged from ages 12 to 18 years. A total of 184 students from 3 schools participated in this research.

Sample population was selected using convenience sampling. Both genders were included in the study; also various nationalities of participants were included. The research proposal was first approved by the Gulf Medical University Ethics committee, which was followed by a documented consent taken from schools before the study was conducted in that particular school. The instrument chosen was a self-administered questionnaire, as it is the least time consuming and most feasible method for children. It was in the English language since the schools involved were English speaking schools. A pilot study on 10 students was also done to validate the questionnaire. Before handing out the questionnaires, a consent form was signed by the parents as the students were below 18 years of age. The questionnaire was then distributed and self-reported by the students and a definition of back pain was given to make it easier for them to understand. Confidentiality and Anonymity was maintained upon collecting the questionnaires, as personal information of the students was not asked such as name and address and the fact that the researchers and the supervisors were only allowed to access them. Data was collected all at once and the research was conducted over a period of 6 months. The data was entered in Microsoft excel and was then imported to Statistical Program for Social Sciences (SPSS version 20) for analysis. Bivariate analysis was performed to observe strength of association between the independent and dependent factors (gender/age and affected region/muscles of the back, respectively) and was analyzed by using the Chi Square test (P < 0.05 would be considered statistically significant). There were a few limitations encountered in the study, which included recall bias. Since the students were asked events of their past, there was a chance of them not being completely certain of what they have answered. Also, cause-effect relationship could not be assessed since it was a cross sectional study.

III. RESULTS

Fig. 1 shows that in the student population studied, 65% reported back pain and the majority (40%) had a self-reported mild form of back pain. This was followed by 23% students who had moderate pain and a small percentage, 2%, who had severe back pain.

![Figure 1. Prevalence of self-reported Back pain among the participants. (N=184)](image)

Peak time of pain was mostly during the evening (60.7%), which was followed by 34.2% students who experienced pain during school hours, 19.7% felt pain in the mornings and the least was bedtime (13.7%) respectively.

Age of students ranged between 12 and 18 years. There was a trend observed in the percentage of self-reported back pain and their respective age. As the age increased, back pain increased. It was observed that 85.7% in the age 17 and above category reported back pain, which was followed by 64.6% students in the 15-16 age range and 56.1% below 14 years of age. A statistically significant association was observed between age of the participants and back pain. Females (75.5%) experienced back pain as compared to males (51.3%), as seen in Table 1. Also, in each grade, females were still found to be experiencing back pain more than males. However, a trend is not seen with increasing grade.

**Table 1: Prevalence of Back Pain in Both Genders (N=120)**

<table>
<thead>
<tr>
<th>Groups</th>
<th>Back Pain</th>
<th>No Back Pain</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No.</td>
<td>%</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>40</td>
<td>51.3</td>
</tr>
<tr>
<td>Female</td>
<td>80</td>
<td>75.5</td>
</tr>
</tbody>
</table>

**Table 2: Comparison Between Sleep Pattern and Presence of Back Pain (N=105)**

<table>
<thead>
<tr>
<th>Sleeping Position</th>
<th>Groups</th>
<th>Back Pain</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>No.</td>
<td>%</td>
</tr>
<tr>
<td>On Back</td>
<td>Yes</td>
<td>26</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>77</td>
</tr>
<tr>
<td>On Stomach</td>
<td>Yes</td>
<td>37</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>66</td>
</tr>
<tr>
<td>On Sides</td>
<td>Yes</td>
<td>67</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>36</td>
</tr>
</tbody>
</table>

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In the study, it was found that majority of the students preferred to sleep on their sides (65.4%) followed by on their stomach (26.9%). Table 2 shows that among the various positions students sleeping on their stomach suffered the most from back pain (75.5%) followed by on their sides (56.3%). Minority of the sufferers were those who slept on their backs (54.2%).

Students attending school for longer hours, have higher prevalence of back pain (54%). From the schools that were surveyed it was seen that normal school hours was 6 – 7 hours and certain students stay back for an extra 1 to 2 hours for either extra classes or extra-curricular activities, hence these students attend school for 8 – 9 hours.

Those students who did not take part in any extracurricular activities had more prevalence of back pain (71.4%) than those taking part in some sort of activities (52.6%).

Among students taking part in extracurricular activities, those playing sports or taking part in other activities (such as dance or aerobics) suffered more back pain (53.7% and 53.8% respectively) than those going to the gym (51.9%).

In the posture factor study location and use of back support was studied. It was found that students studying without a back support or in places such as the floor had more back pain. However, both these results were found to be non-significant (p value > 0.05) probably due to the lack of sample size.

The next factor studied was the effect of bags on prevalence of back pain. It was found all types of bags had similar prevalence with trolley bags being the majority. This factor was however, non-significant.

Fig. 2 shows that students carrying bags for more than one hour had more back pain (63.8%) than those carrying less than one hour (54.1%).

In order to determine the region and muscle in which the pain was felt most accurately, the students were given a picture of the back and asked to tick the most appropriate region. Fig. 2 suggests that 27.2% students reported pain in the neck region, which was the majority, followed by lower medial (19.8%) and lower lateral (19.3%) respectively. Infra- scapular and suprascapular regions were reported by 15.6% and 15.2% students respectively. Very few students, 7.1% reported that they had pain in the gluteal region. This is shown in Fig. 3.

![Figure 3: Distribution of pain according to affected regions of the back. (N=120)](image)

Among students carrying one bag, as the weight increases the prevalence of back pain increases (45.5% for less than 1 kg to 53.2% for 1 - 2 kg to 54.7% for more than 2 kg).

Similarly, among students carrying bags weighing 1 – 2 kg or more than 2 kg, the prevalence of back pain increases with increase in no. of bags carried (For 1 – 2 kg it increases from 53.2% to 83.3% and for more than 2 kg it increases from 54.7% to 66.7%).

**IV. DISCUSSION**

Back pain among school children, particularly adolescents has been rising alarmingly [15]. So much that it was almost on equal footing with the prevalence of the back pain in the adult population. Lifetime of prevalence of back pain can reach up to 70-80% [7]. Another study observed that, where over a couple of years out of all the children who participated 20% have shown an increase in incidence of back pain [16]. All this research further solidifies the increasing issue of back pain in children and adolescents, and that it deserves to be investigated and controlled.

Evidently, it should not start so early, as it usually only gets worse with age. Therefore, the earlier the onset of back pain, the worse it would be in the future. Furthermore, a study stated that acute back pain was more common and did not lead to ‘disabling consequences’ when compared to pain of a chronic nature [17]. The peak time at which the back pain was felt showed a trend which indicated that as the day progresses, students tend to feel the pain. This, however, could not be backed up with other studies as no study establishes the frequency of back pain among high school students.
The students were given a choice of six regions of the back to choose from in order to specify where they felt the pain. The most popular response was the neck region, followed by lower medial back. Neck strain can cause ‘hypertension of the lumbar spine’ which could result in lower back pain [18]. For this reason, neck and lower medial regions of the back were the two most common areas of pain. Furthermore, ‘the muscles involved in the neck that are at risk of getting injured are the anterior, medius and posterior scalenus muscles. These muscles elevate the 1st and 2nd ribs and also laterally flex and rotate the cervical part of the vertebral column [19].

A five year study on adolescents of age 12-16 was performed and the result showed an increase of annual incidence of back pain of 12% at the age of 12 and 21.5% at the age of 15 [20]. The results obtained in this study showed that students above the age of 17 reported the most which is similar to another study [21]. A study states that newer generation children suffer from back pain much earlier in their life than past generations [22]. According to another study, the adolescents experience more pain just before and after onset of puberty [23]. On the contrary, the occurrence of back pain among students aged 17 could be due to other factors like carrying heavy bags rather than weak muscles.

Among the genders, it was found that only 38.5% of the males suffered from back pain compared to 78.8% of the females. Studies show more prevalence of back pain among females than among males [24, 25]. Similar results were also seen in another study [26]. According to a study, during puberty due to high amounts of testosterone and IGF-1 in males, development of muscles is much more than compared to females. High levels of estrogen in females increase development of bone mass than muscle mass, hence, making women more susceptible to back pain [27]. Grade 12 students reported to have more back pain in comparison to grades 9-11. It was also noted that in all grades females affected more than males.

Sleep hours were found to have no association with back pain from our results. No study clearly contradicts these findings. The body unconsciously adopts various positions while sleeping. This could probably lead to back pain [18]. The results show that stomach sleepers suffer the greatest degree of back pain than students who sleep on their sides or back. It is probably due to the fact that there is a certain degree of twisting of the neck, as the person would find discomfort in sleeping with their face straight down into the pillow [18].

Regarding school hours affecting back pain it was found that students attending school for longer hours had higher prevalence of back pain. This can be attributed to the fact the students probably carry bags for longer hours or perform various extra activities which could lead to excess fatigue and pain of the neck muscles. No existing study clearly provides statistical proof of the obtained results. In terms of study hours it was found that there is no correlation between study hours and prevalence of back pain and again no study is strongly able to link the two either.

Students taking part in any form of extra-curricular activities have shown to have a lesser prevalence of back pain than those who don’t take part in any activity. This is probably due to the fact that students who don’t do any sort of physical activity have a weaker back and a lesser muscle mass. A study stated that physical fitness is inversely proportional to development of back pain [28]. Among those students taking part in these activities it was found that minority of the back pain sufferers were those going to gym while majority were those playing sports or other activities such as dance and aerobics. This can be attributed to the fact that going to the gym helps properly build muscle mass and stronger backs whereas those students playing sports are at risk of having trauma and hence, developing severe back pains. A study stated that sports related injuries healed much slower than other injuries and also said that sports is a risk factor for development of back pain [29].

The cross tabulation between back support and prevalence of back pain showed no association between the two as the results were found to be non-significant. However, a study does states that flexion of the spine to its extreme could cause back pain, that is students moving from a normal sitting position to a slouched position were at risk of developing back pain [30]. Also study location was found to be non-significant when coupled with back pain. No study is able to link the two either.

One of the major objectives was to study the key relation between carrying bags and prevalence of back pain. These variables include types of bags, duration of carrying bags, number of bags and weight of bags carried. It was found that type of bag had no effect on development of back pain from our results. No study was found to contradict this. Students carrying bag for more than an hour were found to have a higher prevalence of back pain. Another study also had similar results as in they found that students carrying bags for more than 30 minutes had a higher prevalence of back pain due to fatigue of the neck muscles [31]. Another study stated that a strong relationship exists in regard to cervical and shoulder posture when bags are carried for a long time [32]. Weight of bags is the next variable and the results stated an increase in back pain with increase in weight of bags. Other studies support the findings as they state that safe weight of bags should not be more than 10% of the body weight and any more would cause increase in risk of back pain [33, 26]. Another study also stated that many students carry bags weighing more 20%-40% of their body weight [34]. The last variable under this factor was number of bags. The results found showed that increase in number of bags also increases prevalence of back pain. Both weight and number of bags don’t have a smooth trend due to the fact that both these factors overlap each other causing minor disparity in the results. No study was able to statistically back up these findings as this variable has not been studied in depth.

Finally the last factor regarding lockers was found that lockers have no effects on prevalence of back. Once again this factor has not been clearly studied by other studies.
V. CONCLUSION

The conclusive result of this study performed on high school students was that 65% of the participants reported back pain, most often in the neck region. The number of females who reported that they had back pain was greater than males. There was an increase observed in the female students who reported back pain with an increase in their grade. From the study it can be concluded that the factors that affect back pain are: Sleep position (stomach sleepers), school hours (longer hours), extracurricular activities (inactive students and students playing sports or other activities such as dance and aerobics), duration of carrying bags (more than an hour), weight of bag (heavier bags) and number of bags (more number of bags). The sample size was calculated to be 260, unfortunately only 184 were collected. Other limitations include re-call bias and the fact that the study cannot be generalized to the entire population as only a small sector of the population was studied.

VI. RECOMMENDATION

In order to avoid the harmful consequences of back pain, early prevention is essential. Although various control methods have been suggested and applied, a study showed that only a few were effective [35]. Based on the results, preventative methods can be followed in order to reduce the prevalence of back pain in the future. Educating children and parents about the consequences of back pain by running awareness campaigns is one of them. A recent study was performed where the chosen children were made to follow a routine exercise pattern so they could test at the end if it the intensity of back pain has reduced. The conclusion was that the was a decrease in pain in a percentage of the children [36]. This can be co-related to this study on back pain prevalent in high school students and steps that can be used in order to prevent it all together by promoting a healthier lifestyle which includes everyday exercise. One of the participating schools also took the initiative to incorporate e-books in order to reduce the load carried by students on a daily basis. Methods similar to this should be adopted with the main purpose of reducing the weight students carry. Awareness can be raised among the target population (students, parents and teachers) through seminars presented by health care professionals or by handing out leaflets containing information about the magnitude of the problem and ways to prevent it. This study can also be used as a platform for performing nationwide studies as back pain in children deserves a high priority in the future to provide evidence for a relevant prevention strategy [37].

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