EFFECTS OF HEAVY BAGS, PLUS DESKS AND POSTURAL VARIATIONS ASSOCIATION WITH LOWER BACK PAIN IN SCHOOL GOING CHILDREN

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ABSTRACT
Lower Back Pain in school children is a serious public health problem. Pain reported by children is believed to be from multiple risk factors related to a child's daily activities. To investigate the effect of heavy bags, plus desks and postural variations in schools of Karachi, and finding association with lower back pain in children. It was a descriptive Cross-sectional study with a sample of 500 school going children aged between 10-13 years, including 241 boys and 259 girls, from three private schools in Karachi. A Questionnaire analyzed by SPSS 17. About 23% reported Lower Back Pain, 41.2% reported Shoulder Pain and 38.6% reported Neck Pain, 24.3% females reported Lower Back Pain as compared to 21.6% in males. Pain was associated with school bag weight greater than 15% of their total body weight, 62.8% children perceive their school bag to be heavy. Shoulder Pain was significantly associated with older ages and lower Body mass index (BMI). Most of the pain was reported in BMI range below 18 kg/m^2. 14% students sat hunched on their desks and 65.9% children reported postural discomfort while doing class work. 44.8% children reported postural discomfort while playing out door games. Lower Back Pain in school going children is associated with high school bag weight expressed as percentage of total body weight, older age, female gender and low BMI. The prevalence of lower back pain was lower than that of shoulder pain and neck pain. There was no significant relation between Plus desks and Lower Back Pain
Keywords: School children, Lower Back pain, Musculoskeletal Disorders, Postural Variations, Plus Desks

INTRODUCTION

Lower Back Pain in school going children is a serious community health problem.[1] It was shown in a recent study that about 86% of children reported some type of musculoskeletal symptoms in at least one body region, with the greatest frequency of shoulder complaints (70%).[2] Results of another research indicated that school bag load and classroom furniture played a major role in prevalence of Musculoskeletal Disorders.[3]

Heavy school bag load has been shown to be associated with spinal pain. [4] Back pain in school children has become an alarming health problem giving rise to awareness to dangers associated with use of improper and heavy childhood school bags. [5]

Much international attention among the health related literature has been focused on the schoolbag weight, as a general guideline of schoolbag weight less than 15% of body weight is usually recommended. [6] It has been reported a high incidence of subjects carrying more than 30% of their body weight and its findings reflected great variation in the school bag load carried by the school children. [7] Heavy back load carried on one shoulder only, may also lead to more musculoskeletal pain. [8] Low Back Pain among school age children is believed to be from numerous casual factors. [9] The risk factors are usually different aspects of a child's daily activities. Other causes that may be responsible for lower Back Pain in school going children are non-adjustable classroom furniture (Plus Desks) and

Postural variations (distribution of the mass of body parts) in the children's day to day activities. A correct sitting posture means with the back erect and the shoulders pulled back. The weight of the body should be distributed evenly between both hips. Knees should be bent at a right angle while the feet are placed flat on the floor. Factors affecting a student's sitting posture would be included the anthropometric dimensions of school children, to the measurement and design features of the school furniture. [10] If a vertical line is dropped from the edge of the desk top, fell to the floor without touching the front edge of the seat, it would mark a plus distance and the desk would be termed as a Plus Desk. The desk recommended for school children is that of Minus or Zero type. Prolonged sitting with poor posture is associated with development of Lower Back Pain. [11] Musculoskeletal pain has been cited to be associated with school furniture (chair/desk). [12, 13] A number of studies have demonstrated that there was a mismatch between the design of school furniture and the anthropometric dimensions of school children. [12, 14] According to Mandal (1985) "60% of these teenagers complained of pains in back, neck or shoulder for which they blamed the furniture.[15]" Salminen et al (1993) said that "Lower Back Pain was, due to an unsuitable school desk". [16]

SUBJECTS / METHODS

500 school going children aged between 9-15 years, including 241 boys and 259 girls, participated in the study. Students of grade five through eight were randomly selected from schools located in Karachi. Research was conducted at three different schools using the plus desk.

This descriptive, cross sectional study was conducted during a four month period in the months of June to September 2012. A portable height chart was used to measure the standing height of each student (in meters), and were measured by trained person. A manual weighing scale was used to measure the body weight of students (in kilograms) and a spring weighing balance was used to measure school bag weight (in kilograms).

A Questionnaire was developed and used to collect data.

A proper sitting position is to sit with relaxed position, leaned back at 135 degrees with feet on the floor. While improper sitting position is sitting straight with either less than 70 degrees or at 90 degrees.

Low back pain: Is pain in the lower back area that can relate to problems with the lumbar spine, the discs between the vertebrae, the ligaments around the spine and discs, the spinal cord and nerves, muscles of the low back, internal organs of the pelvis and abdomen, or the skin covering the lumbar area.

Chi-square test was used to compare the significance between two variables (Boys and Girls). All analysis was conducted using SPSS software version 17.0 for Windows. Results were considered significant when alpha probability was less than 0.05.

RESULTS

Out of 500 students, 241 males (48.2%) and 259 females (51.8%) in age group of 09-15 years included. The Mean age was 11.79 years with standard deviation of ±1.219. Mean (std. dev) height was 1.52m (±0.105) and mean (std. dev) weight was 40.95 kg (±11.35). The Mean for Body Mass Index (BMI) was 17.84 kg/m² with standard deviation of ±3.60. (Table 1 shows the difference in values for boys and girls), 23% reported Lower Back Pain,

41.2% reported Shoulder pain, followed by neck pain (38.6%). Lower Back Pain was found to be 24.3% in females and 21.6% in males. (Table2, Fig. 1) Age was significantly associated with shoulder pain (P-value=0.048) (Table 3). BMI was significantly associated with Lower Back Pain (P-value=0.003) and neck pain (P-value=0.045). Most of the cases of musculoskeletal pain were reported in BMI range below 18 kg/m², with 12.8% cases of Lower Back Pain, 23.8% cases of neck pain and 26.4% cases of shoulder pain. 52% children reported Lower Back Pain sometimes during the previous year while 16% suffered from it continuously throughout last year (Table 2). 11.3% consulted a doctor / went to hospital, 50.50% told their parents, 29% ignored the pain, 6% stopped participating in physical activities and 2.3% stayed at home for a day (Figure 2). 45.8% children reported their Pain had got better after putting their bag down and 48.4% children had pain which got worse on carrying extra things to school. 91.2% children carried Two Strap bags and 80.8% children carried the Two Strap bags on both shoulders. Mean Bag weight was 7.103 kg with standard deviation of ±1.40 (Table 1 shows bag weight difference between boys and girls). 62.8% children said their school bag was heavy, 29.6% classified their school bag as moderate weight and 7.6% felt their bag to be light weight. The weight of the bags perceived by the children was significantly associated with Shoulder Pain (P-value=0.0001).

The mean school bag weight as a percentage to body weight was 18.47% with standard deviation of ±5.59. 3.4% had bag weight below 10% of their body weight, 27.4% had bag weight between 10-15%, 36.8% carried bag weight between 15-20% and 32.4% had bag weight above 20% of their total body weight. Relative Bag Weight to total body weight was significantly associated with lower Back Pain (P-value=0.03).

All the school desks were reported to be Plus Desks. There were seen to be a minimum distance of 08 cm and maximum of 10 cm between the falling height of desk and chair. 65.8% children reported postural discomfort while doing class work and 14% were found to sit in a hunched position over their desks. 70% children played outdoor games for less than 01 hour, 23.6% played for 01-04 hours, 4.8% played for 04-08 hrs and 1.6% for more than 08 hours. 44.8% children reported postural discomfort while playing. Postural Discomfort while playing was significantly associated with neck pain (P-value=0.001) and shoulder pain (P-value=0.03).

Table 1: Means (SD), Ranges of Different Variables

Category	Mean (SD)	Range	Mean (SD)	Range
	Boys		**Girls**	
Age of Student	11.91 (±1.23)	9-15	11.68 (±1.201)	9-14
Height Of student (m)	1.514 (±0.113)	1.27-1.80	1.495 (±0.097)	1.20-1.77
Weight of Student (kg)	40.95 (±11.778)	21-88	40.96 (±10.959)	22-71
Bag Weight of Student (kg)	7.118 (±1.503)	1-12	7.088 (±1.308)	4-12
Bag Weight % of Body Weight	18.402 (±5.223)	2-37.04	18.535 (±5.930)	7.02-36.36

BMI	17.607 (±3.599	10.67-30.12	18.074 (±3.608)	11.72-29.09

Table 2: Prevalence of Neck, Back and Shoulder Pain

	Neck Pain	Shoulder Pain	Back Pain	Neck/Back/Shoulder Pain during Last year
Boys	95 (39.4%)	90 (37.3%)	52 (21.6%)	108 (44.8%)
Girls	98 (37.8%)	116 (44.8%)	63 (24.3%)	152 (58.7%)
Total	193 (38.6%)	206 (41.2%)	115 (23%)	260 (52%)

Figure1: Prevalence of LBP in Girls was reported to be 24.30% which is higher than the prevalence of LBP in Boys, reported to be 21.60%.

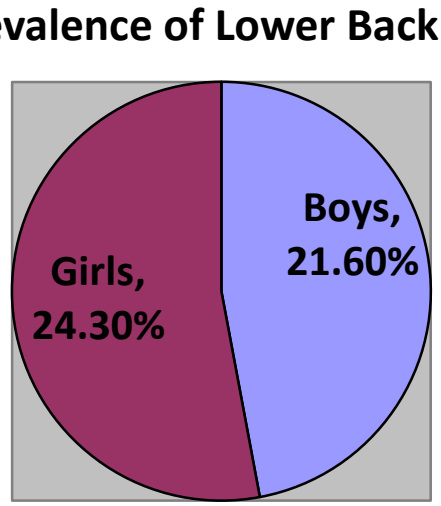


Table 3: Relation between Age and MSD

	Neck Pain	Shoulder Pain	Back Pain
Age of Student			
9	1(0.51%)	2(0.97%)	1(0.86%)
10	44(22.79%)	40(19.41%)	21(18.26%)
11	45(23.31%)	54(26.21%)	31(26.95%)
12	47(24.35%)	53(25.72%)	32(27.82%)
13	46(23.83%)	52(25.24%)	23(20%)
14	10(5.18%)	5(2.42%)	7(6.08%)
Total	193	206	115

Figure 2: What Students did to alleviate their pain

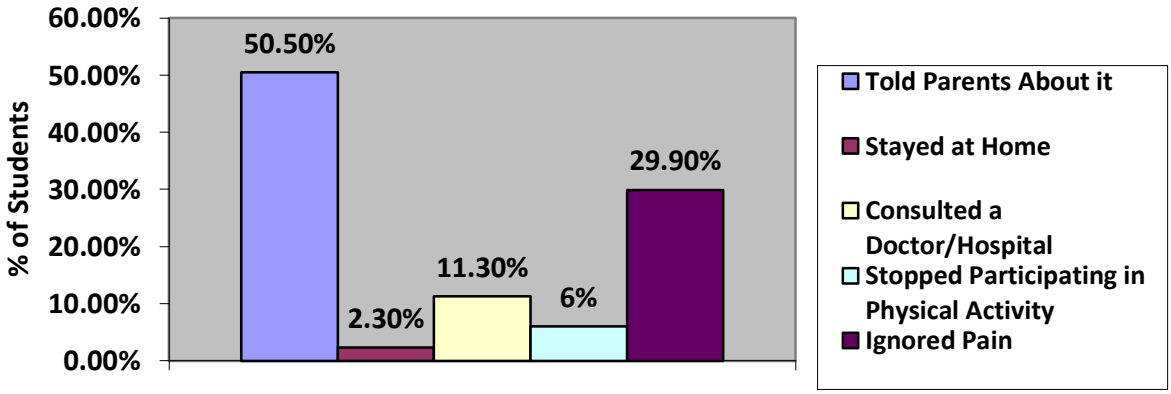
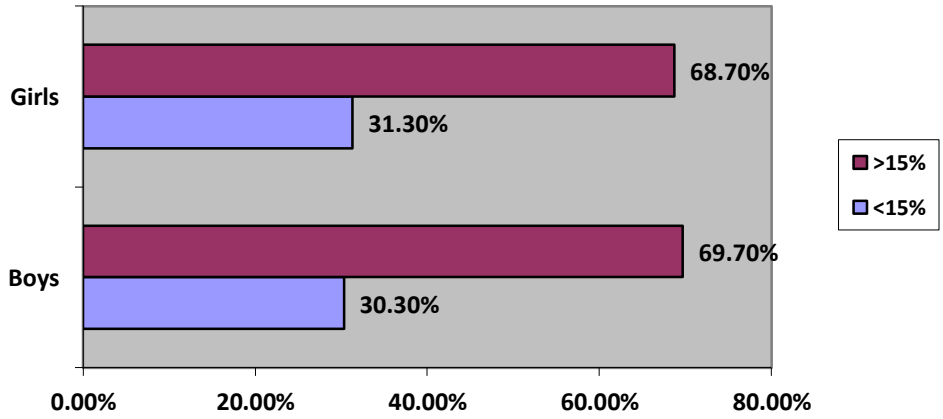


Figure 3: Bag Weight Carried by Students as a percentage of their total body weight



DISCUSSION

Back pain in children and adolescents varies from 8%- 74%. Risk factors of back pain have been age, gender and some psychological factors.[23]Out of 500 students, the overall incidence of Lower Back Pain was 23%. Previous studies have shown varying incidence of lower back pain e.g. Olsen et al (1992) reported lower back pain incidence of 30%, [1] Prendeville & Dockrell et al (1998) found it to be 41.5% [17] and Balague et al (1988) showed LBP incidence of 27%. [18]

The results showed that the school children suffered most from Shoulder pain (41.2%), followed by neck pain incidence of 38.6%.

About 91.2% children carried Two Strap bags and 80.8% children carried the Two Strap bags on both shoulders. Two Strap Bag was also reported to be the most popular method in studies done by Whittfield et al (2005) [14] and Dockrell et al (2006). [19] Mean Bag weight was 7.103 kg with standard deviation of ±1.40. 62.8% children perceived their school bag to be heavy, 29.6% classified their school bag as moderate weight and 7.6% felt their bag to be light weight.

Increased incidence of LBP was found to be associated with bag weight greater than 15% of total body weight [5, 7, 8] A distance of 08-10 cm between the falling height of desk and chair classified all desks in the participating schools to be Plus desks. There was a high incidence of postural discomfort among the children while doing class work (65.8%) and many were reported to sit in a hunched position over their desks. Improper sitting posture and dissatisfaction with class room furniture was a prominent exacerbating factor for Pain symptoms in children. [3, 19, 20] Salminen et al (1992) was also of the opinion that an unsuitable school desk contributed to lower back pain to some extent. [16]

According to Prendeville & Dockrell (1998), "there is no significant association between sports activities and Lower Back Pain". [17]

Other factors that may give rise to Lower Back pain in school going children may be Gender, Age and Body Mass Index. There were more reports of Lower Back Pain in girls (24.3%) as compared to boys (21.6%). Siambanes et al (2004) reported, similar to several other researches that females were found to have a higher incidence of musculoskeletal pain as compared to males. [2,3,19,21,22].

Age was significantly associated with shoulder pain (P-value=0.048) with a higher incidence of lower back pain in older children i.e. of 11-13 years as compared to younger ones. Low BMI was significantly associated with Lower Back Pain (P-value=0.003) and neck pain (P-value=0.045).

CONCLUSION

According to this study, we found that prevalence of lower back pain was lower than that of shoulder pain and neck pain. Females and children with low BMI experienced more musculoskeletal pain than males and children of normal BMI, respectively. Majority of the schoolchildren carried bag loads much heavier than the recommended guidelines and this load was regularly imposed onto their spinal column, causing abnormal posture and musculoskeletal problems. It was concluded that the predisposing factors which propagate lower back pain in school going children were heavy school bags, use of plus desk in schools, female gender and low Body mass index.

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