

## Use of Single Shoulder Handling Bag: Scoliosis and Musculoskeletal Pain in School Going Children. “A Cross Sectional Study”

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### ABSTRACT

**Objectives:** The objectives of the study were to assess the Frequency of musculoskeletal pain, and to check whether single strapped bags are culprit of causing scoliosis in school going children or not as compared to other types of school bags i.e. double strapped and trolley type bags.

**Methodology:** The study design was an observational cross-sectional. The process of data collection from the school going children (n=398) between the ages of 8 and 16 years was carried out in the government schools of the Faisalabad through a simple random sampling technique. Measurements of weight were taken through spring scale and subjective self-administered questionnaire was completed from each student along with Cobb's angle to measure the curvature and Adam forward bend test was also performed on each pupil.

**Results:** Majority of the students used to carry single strapped bag with average value of 50.5% while double strapped bag with average percentage of 48.0%. Most of the students were used to carry bag on one side of shoulder with an average value of 68.3% and only 31.7% carried bag on both sides of shoulders. Most of the children reported pain in the neck and shoulder region with average percentage of 73.6% and in back/buttock were 105 with percentage of 26.4%. 92.5% of the children stated that their pain was relieved when they took off their bags and 51.3% were used to take medicine for pain reduction. On visual analogue rating scale, 57.8% of the children reported the moderate level of pain. Mean  $\pm$  SD of students using single strapped and double strapped bags were  $2.2438 \pm 0.579$  and  $1.7958 \pm 0.64497$ . Adam forward test was also most frequently positive in students using single strapped bag as compared to other types of bags (p value = 0.000) reflecting scoliosis

**Conclusion:** Students majority who used to wear one side shoulder bag were prone to suffer scoliosis and pain in neck and shoulder region.

**KEYWORDS:** Scoliosis, Musculoskeletal Pain, School bags, Children

### INTRODUCTION

School going children carry heavy backpacks on their shoulders as an integral part of their daily routine.<sup>1</sup> School bags consist of mandatory stuff

containing books, copies and other helping material but these advantageous learning assets can cause a number of harmful effects on the child's health, growth, and overall physical appearance. School bags are available in numerous sizes, shapes, lengths and styles but they can cause a serious or life-threatening condition known as Scoliosis. The word scoliosis is derived from a Greek word which means the crooked. Significantly, out of every 100 people 03 persons struggle against some form of scoliosis.<sup>1</sup> The heavy load of bags carrying on back results in associated compensatory changes in posture causing forward trunk inclination to maintain the balance while in standing or walking.<sup>2</sup> It is important to find an inter-relationship between the ways of carrying backpacks, symmetry or asymmetry, weight carrying on back, and the posture assumed while carrying the schoolbags.<sup>1</sup> It was found that the trunk forward bending was

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increased proportionally with increase in the weight and walking distance, causing more stresses on the vertebral column and subjecting the spine to a list of problems more commonly the back pain.<sup>2</sup> At present, there is emerging evidence that the children are greatly influenced by both acute and chronic low back torment. The rising number of children giving back pain complaints is connected with static physical activities like sitting, standing, or lifting loads during day-to-day routine.<sup>2</sup> Scoliosis is a major worldwide problem. As a matter of fact, 28 million patients are affected and children suffer from scoliosis in the age of 10-16 years with overall prevalence of 0.47% to 5.2% in present literature. In United States, the overall cases reported is approximately more than 5.88 million which ranges from 2.5% to 60%. It is anticipated that in future the number of patients will increase hysterically. It is predicted that there will be over 36 million scoliosis patients in 2050.<sup>3</sup> The goal of treatment in children is to prevent progression. For children with a scoliosis of 20° or more, a brace is usually recommended. For a scoliosis of 45° or more, surgery may be necessary. The intervention for adults having scoliosis is based on an individual's specific needs, with physical therapy and supportive braces contributing a relatively trivial role.<sup>4</sup> Screening adolescents in middle and high schools for idiopathic scoliosis is important for early identification, prevention of future deformities, and healthy body growth.<sup>5</sup> Therefore, the aim of this study was to check the Frequency of musculoskeletal pain and scoliosis due to wearing heavy schoolbags, assessing the ways of carrying bags and bring the awareness among pupils and their guardians.

## METHODOLOGY

It was a cross-sectional study. The duration of this study was 6 months after approval from research and ethical review board. In this research, total 398 students were surveyed, in which 148 were males and 250 were females. Frequency of Scoliosis and musculoskeletal pain were examined in students of age group of 8-15 years in government schools of Faisalabad. Written informed consent were taken from all institutes from where data had to be collected. Geographical or economic representation were not special

considered. All students received detailed understanding and information regarding the purpose of research. Simple random sampling was used. The sample size is 398, calculated with margin of error 5%, and confidence level of 95%. The estimated population of school going children is 200000, in Faisalabad Pakistan. The sample size is calculated according to the following formula,

$$x = \frac{Z(c/100)2r(100-r)}{N} \\ n = \frac{x}{((N-1)E^2 + x)} \\ E = \text{Sort} [(N - n) x/n (N-1)]$$

A self-made questionnaire was used containing information regarding demographics, school bag type, way of wearing bag, duration of carrying bag, distance to class, use of stairs carrying bag, Pain in regions, Pain in past few days, Restriction in physical activity, Restriction in extracurricular activity, leave from school due to pain, Pain reduction, Treatment or medication for pain, Pain on VAS, Difficulty in breathing, Difficulty in standing straight, Difficulty in walking, Difficulty in toe touching, for collection of data from different public schools. Measurements of weight were taken through spring scale and subjective self-made questionnaire was completed from each student. Adam forward bend test was performed on each pupil, they were asked to lean forward keeping feet together and their knees straight with arms hanging by side. Any deviation in spinal curvature was noted. Frequencies and percentages were measured for all variables and in order to check the association based on gender, the chi square analysis was performed. The data was statistically analyzed via the IBM SPSS version 23 software.

## RESULTS

Out of total sample size 398, the male frequency was 37.2% and female frequency was 62.8%. The frequency of school bag types with single strapped bag was 50.5%, double strapped bag was 48.0% and trolley bags was 1.5%. It showed that most of the students carried single strapped bags with next popularity of double strapped bags and lesser numbers were found with trolley ones. students with percentage of 68.3% were found to wear bag on side of the shoulder while 31.7% were found to carry school backpack on both sides of the shoulders. The weight of school bag was divided into three categories ranging from 5kg, 10kg, and

15kg. Higher frequency distribution was seen in those students whose school bag weight was 5kg, next was 10 kg and least frequency distribution.

**Table 1: Frequency distributions of different variables of the study (n = 398)**

Variables	Frequency (Percent) N (%)
Gender	
Male	148(37.2)
Female	250(62.8)
Education/class	
Middle Group	40(10.1)
Higher Group	358(89.9)
What is your school bag type?	
Single strapped bag	201(50.5)
Double strapped bag	191(48.0)
Trolley bag	6(1.5)
Do you wear bag on one side or both sides of the shoulders?	
One side	272(68.3)
Both side	126(31.7)
What is the weight of your bag?	
5kg	187(47.0)
10kg	160(40.2)
15kg	51(12.8)
What is the duration of carrying bag on your back every day?	
5minutes/day	77(19.3)
10minutes/day	90(22.6)
15minutes/day	231(58.0)
How much is your Distance from gate to classroom while carrying bag?	
50 steps by foot	227(57.0)
70 steps by foot	116(29.1)
90 steps by foot	55(13.8)
Do you use stairs to reach Class or not?	
Yes	236(59.3)
No	162(40.7)
Do you feel pain in your ___?	
Neck/Shoulder	293(73.6)
Back/Buttock	105(26.4)
Have you had pain in the past few days?	
Yes	303(76.1)
No	95(23.9)
Do you feel pain in your physical activities?	
Yes	251(63.1)
No	147(36.9)
Does your pain reduce when you take rest/take off your bag?	
Yes	230(57.8)
No	168(42.2)
Do you take any medication/treatment for pain?	
Yes	204(51.3)
No	194(48.7)
If you have pain, then rate pain on VAS	
No Pain	79(19.8)
Moderate Pain	230(57.8)
Worst Pain	89(22.4)
Do you feel difficulty in walking?	
Yes	207(52.0)
No	191(48.0)
Concerning region of pain, Distribution of respondents:	
Feeling pain in Neck/Shoulder	293(73.6)
Back/Buttock	105(26.4)

Regarding uneven shoulder height, Distribution of respondents:	
Yes	95(23.9)
No	303(76.1)
Positive finding of Adam forward test	
Yes	98(24.6)
No	300(75.4)
With respect to difficulty in breathing, Distribution of respondents:	
Yes	30(7.5)
No	368(92.5)
Do you feel difficulty in standing up perfectly straight?	
Yes	97(24.4)
No	301(75.6)
Do you feel difficulty in walking?	
Yes	191(48.0)
No	207(52.0)
Do you feel difficulty in touching your toes?	
Yes	281(70.6)
No	117(29.4)

**Table 2: Comparison of variables based on School bag type**

Variable	Response	Single strapped bag N (%) 201 (50.5)	Double strapped bag N (%) 191 (48)	Trolley bag N (%) 6 (1.5)	P value
Do you feel pain in your ___?	Neck/Shoulder	152 (75.6)	138 (72.3)	3 (50.0)	0.003*
	Back/Buttock	49 (24.4)	53 (27.7)	3 (50.0)	
Uneven shoulder height?	Yes	53 (27.7)	43 (21.4)	2 (33.3)	0.000*
	No	138 (72.3)	158 (78.6)	4 (66.7)	
Do you feel any difficulty in Breathing ?	Yes	99 (49.3)	61 (31.9)	2 (33.3)	0.002*
	No	102 (50.7)	130 (68.1)	4 (66.7)	
Do you feel difficulty in standing up perfectly straight?	Yes	50 (26.2)	46 (22.9)	1 (16.7)	0.680
	No	141 (73.8)	155 (77.1)	5 (83.8)	
Do you feel difficulty in walking?	Yes	126 (62.7)	78 (40.8)	3 (50.0)	0.000*
	No	75 (37.3)	113 (59.2)	3 (50.0)	
Do you feel difficulty in touching your toes?	Yes	157 (78.1)	119 (62.3)	5 (83.3)	0.002*
	No	44 (21.9)	72 (37.7)	1 (16.7)	
Positive findings of Adam forward test	Yes	167 (83.1)	81 (42.4)	3 (50.0)	0.000*
	No	34 (16.9)	110 (57.6)	3 (50.0)	

was of 15kg weight. The percentages of 5kg, 10kg and 15kg weight were 47%, 40.2% and 12.8% respectively. The distance was categorized into steps as 50 steps by foot, 70 steps by foot and 90 steps by foot. Their frequency distributions were

found to be 227, 116 and 55 respectively with percentage of 57.0%, 29.1% and 13.8%. Those who used stairs to reach class were found with frequency distribution of 236 with percentage of 59.3%. While on the other hand, students who did not use stairs to reach class were found to have frequency distribution of 162 with percentage of 40.7%. The number of Students felt pain in neck/shoulder were 293 and in back/buttock were 105 with percentage of 73.6 to 26.4 respectively. Frequency of student who felt pain during physical activity was 250 and those who did not was 147 with percentage of 62.8 and 36.9 respectively. Frequency of taking leave was 179 and those who did not was 218 with percentage of 45.0 and 54.8 respectively. Frequency of taking medicine for pain was 204 and those who did not was 193 with percentages of 51.3 and 48.5 respectively. The number of students feeling moderate pain were higher i.e. 57.8% as compared to no pain and severe pain. Frequency of feeling difficulty in breathing due to pain was 162 and those who did not was 236 with percentages of 40.7 and 59.3 respectively. Frequency of difficulty in standing up perfectly upright was 97 and those who did not was 301 with percentage of 24.4 and 75.6 respectively. Frequency of difficulty in toe touching due to pain was 281 and those who did not was 117 with percentages of 70.6 and 29.4 respectively.

On assessing the students for scoliosis, we found that 24.6% have positive Adam forward test, 23.9% have uneven shoulder, 24.4% % students were not able to stand straight perfectly (Table 1) On visual analogue rating scale, 57.8% of the children reported the moderate level of pain. On comparison of VAS score among the students using single strapped and double strapped bags we found higher scores in students using single strapped bags (Table 1). Mean  $\pm$  SD of students using single strapped and double strapped bags were  $2.2438 \pm 0.579$  and  $1.7958$  and  $0.64497$ .

Table 2 shows comparison of sign and symptoms of scoliosis among the students carrying different types of bags. Results show that the students carrying single strapped bag have more pronounced sign and symptoms of scoliosis as compared to other types of bags which are double strapped and trolley type bags with significant p values. Adam forward test was also most frequently positive in students using single

strapped bag as compared to other types of bags (p value= 0.000)

## DISCUSSION

This study was conducted to describe the relationship between the spinal deformity i.e. scoliosis and school bag pack in school going children aged 8-16 years. Both male and female students were assessed for the scoliosis by performing Adam's forward bend test. Each of the student was asked to bend forward in horizontal plane and the spine of the student was assessed by standing behind the student and looking for any changes in the spinal curve. After assessing through forward bend test, we found a positive finding regarding scoliosis i.e. most of student were prone to scoliosis due to carrying heavy bags or other factors like bad posture. And it was supported by another study who reported that, basically it affected by carrying heavy bags as children are in growing age. 3.4% of students gave positive finding about scoliosis by Adam's forward bend test and were asked to go for referral physician.<sup>6</sup> Different studies showed different results of Adam's forward bend test for scoliosis. Some studies showed least percentage of prevalence of scoliosis i.e. 1.4% to 2.5% and on contrary, some depicted higher prevalence of scoliosis i.e. 26% to 66% by using Adam's forward bend test.<sup>7</sup> When students were asked for whether they carry bag on both shoulders or on one side of shoulder, then a greater frequency of 272 of those students was found who used to carry school bags on one side with average value of 68.3%. A lesser percentage value of 31.7% was found for those students who used to wear school bag packs on both sides of shoulders. On the other hand, a study reported different results which showed that the majority of the students carry double strapped bag packs, having symmetrical weight on both sides of shoulders with average percentage value of 58.4%.<sup>8</sup> Pain intensity was assessed using visual analogue scale (VAS) ranging from 0 (no pain) to 10 (worst pain). Pain was localized to the regions of neck/shoulder and back/buttock and students reported pain where they felt the pain over. The higher frequency distribution of 293 with average value of 73.6% out of 398 was found in the neck and shoulder region as compared to the back and buttock region

whose average percentage was 26.4% with frequency distribution of 105. A study reported pain intensity of back from 0.952-6.9, shoulder pain intensity ranging from 1.799-7.855 and neck pain severity was ranging from 0-5.166 out of 0-10 scale values.<sup>1</sup> Another study reported that low back pain is found primarily in the students and the decreased strength of abdominal muscles and back extensors with reduced flexibility of hamstrings muscles are the culprit. They supported their study with the research of Lopes who stated that the school bags cause the pain in various regions of the body including neck, shoulders and back with average value of 83%. Further Negrini and Carabona et al, reported that 46.1% of the school going students was found to have lumbar pain due to wearing school bags. The students in the present study also reported difficulty in the physical activities. A majority of students stated the difficulty in physical activities with average value of 62.8% with frequency of 250 out of 398 students. Present study is supported by Minghelli et al study reporting the relation of feeling difficulty while doing physical activity with prevalence of scoliosis.<sup>8</sup> Skaggs et al. estimated the association of school bag pack and pain with activity restriction and found that the 82% of the students reported their school bags as a factor for pain, 34% were forced to restrict their physical activities due to pain and 37% stated the low back pain. However, in the same study it was found that it was the exceeding weight who caused the pain.<sup>9</sup> Sheir-Ness et al, screened 1122 school students, between the ages of 12-18 years and concluded that weight of school bag packs is an important factor for causing low back pain. The back pain is mostly the consequence of wearing school bags incorrectly and it was supported by the statistical analysis which showed that such students were 1.83 times at the greater risk of developing low back pain as compared to those who used to wear their school bags correctly.<sup>10</sup> Korovessis et al, also supported the fact that carrying unequal load distribution results in the occurrence of low back pain and such students are five times more at danger of having low back pain than those who carry symmetrical loads on their back.<sup>11</sup> The study conducted by Mushtaq et al at Azad Jammu and Kashmir findings are in line with current finding, and reported that the weight of the bag affects students' health negatively and

backpack weight effect their gait, postures and attentiveness, students complain of aches, seems pale and may have lung and breathing problems.<sup>12</sup> Awareness campaign should be held with school management, parents and students for correct posture and allow weight bearing accordingly to age and weight prevent chronic disabilities of scoliosis and musculoskeletal pain.

**Limitations:** Cross sectional is the limitation of this study as casual inferences are not established. Study had the limited sample size due to short time frame conducted only in only one city, so results will not be generalized to whole population.

## CONCLUSIONS

Students majority who used to wear one side shoulder bag were prone to suffer scoliosis and pain in neck and shoulder region.

**Conflict of interest:** None

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### *Authors' Contribution*

<b>Dr. Amna Khalid</b>	Study design, Concept, literature search, data collection, data analysis, first draft write-up.
<b>Dr. Abid Rashid</b>	Study design, results interpretation, supervise and critically revise all intellectual content.
<b>Dr. Sultan Mahmood Khan</b>	Study concept and design, analysis, final review, overall supervision.
<b>Jawad Ahmad</b>	Data collection statistical analysis, revised and approved the manuscript.
<b>Dr. Sana Sarfraz</b>	Study design, Data collection, second draft write up
<b>Dr. Sultan Ayaz</b>	Concept, data analysis & approved the manuscript.
	All authors are equally accountable for research work and integrity and approved the manuscript.

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