

Musculoskeletal Pains Associated with Schoolbag Carriage in Children and Adolescents; a Cross Sectional Study in Twin Cities

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Abstract

Objectives: To determine the association of musculoskeletal pain in school-going children and adolescents with schoolbag carriage practices and certain sociodemographic variables.

Methodology: An analytical cross-sectional study involving parents of 256 school-going children in Islamabad and Rawalpindi was conducted after IRB approval. Online and in-field distribution of structured questionnaires was done. SPSS Version 23 was used for data entry and analysis. Descriptive analysis was done by calculating percentages, frequencies, and standard deviations, while inferential analysis was done by cross-tabulation and Chi-square testing.

Results: 253 students of mean age 12.50 ± 9.1 were studied, where 68.4% reported musculoskeletal pain due to schoolbag carriage. 78.9% female students and 74.4% government school students reported musculoskeletal pain due to increased duration and frequency of schoolbag carriage along with higher BMIs and bag weight. An increasing trend of pain was seen with increasing age, higher BMI, higher school grades, and increased waiting time for transport. A significant association was found between the development of musculoskeletal pain and gender (0.003), type of school (0.001), duration (0.000) and frequency of carriage (0.016), bag weight-to-body weight ratio (0.026), transport wait time (0.030) and postural changes (0.000).

Conclusion: An association between musculoskeletal pain in school-going children and schoolbag carriage practices as well as sociodemographic variables was observed.

Key Words: Musculoskeletal pain, school children, schoolbags, schoolbag weight, demographic factors

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Introduction

Musculoskeletal pains are described as any pain relating to the muscles, ligaments and tendons, and bones of the body.¹ Among musculoskeletal disorders, lower back pain causes the highest burden of musculoskeletal disability globally with a prevalence of 568 million people. Being the leading cause of disability in 160 countries, musculoskeletal pain attributed to back pain marks one of the largest reasons for the need of rehabilitation services among children, and account for approximately two-thirds of all adults in need of physical rehabilitation.² Musculoskeletal conditions also significantly limit mobility and dexterity, leading to early

retirement from work, lower levels of well-being, and reduced ability to participate in society.³ The overall prevalence of musculoskeletal pains and disorders in Pakistan seems to exist in 75.8% of the general workforce population, with a generalized prevalence of 57.3%. The most common reasons for such pains were found to be a lack of adequate rest and maintenance of unhealthy postures for prolonged periods of time.³ Additionally, there are reports of pain existing at earlier stages of life among schoolchildren age.⁴

Thus a relation between the usage of ergonomically mismatched schoolbags or the inappropriate usage of schoolbags and the early development of musculoskeletal pain and disorders seems to be significantly obvious. A

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noteworthy portion of the student distress is contributed to the usage of ergonomically mismatched and inappropriately used schoolbags.⁵ Since the 1980s, researchers have persistently informed anthropological and medical epistemology on the devastating long-term complications that may stem from the incorrect use of schoolbags in children and adolescents, such as postural & gait changes, prolonged somatic pain development, shifting of the musculoskeletal structure, and cardiopulmonary difficulties.⁶

Schoolbag weight itself does not contribute to the development of back pain in schoolchildren but instead involves interrelated factors such as the time spent carrying the schoolbag and fatigue and explained how a percentage ratio of school bag weight being 10% or above relative to the body weight acts as a significant risk factor for producing pain.^{1,7} Bad posture and coordination, distortion of body's natural curves of the back, tendency of forward lean and extension of neck etc are related to carrying of heavy school bags for long time.^{8,9}

Although the province of KPK has highlighted the importance of the weight of schoolbags according to the grade and age of the children by implementing the immediate practice of relevant policies, much work is still needed throughout the rest of the country.¹⁰ With the pre-requisite information being established, this study will aim to examine the overall association between schoolbags and musculoskeletal pain in school-going children and adolescents in an effort to contribute towards resolving this issue.

Since the inappropriate weight of schoolbags can affect the physical health of students to produce long-term complications and is a largely neglected area of focus throughout Pakistan, this study aimed to shed light on the importance of the weight of schoolbags according to the grade and age of the children, which has only recently been highlighted by relevant policies that have been implemented in Khyber Pakhtunkhwa through the KPK Schoolbags Limitation of Weight Act 2020.¹⁰ Additionally, recommendations included in this study can be utilized by local educational authorities who can further encourage government policy action regarding weight of schoolbags in accordance with the students' grade and age in an effort to contribute towards resolving this issue locally..

Materials and Methods

It was an analytical cross-sectional study conducted between the months of February to October 2021. This study was conducted in the twin cities of Islamabad and Rawalpindi.

Schools sought for data collection are as follows:

- Fazaia Education System School – Sector E-9/1, Islamabad
- Azaan Khan Shaheed Model School for Boys – Sector F-8/3, Islamabad
- Roots Millennium Schools – Sector E-11/4, F-10/2, G-13/4, Islamabad

The study population consists of 253 parents of school-going students aged 5 to 19. The sample size was calculated to be 200 using an online sample size calculator (Rao soft) by taking 95% confidence interval, 7% margin of error, and 57.3% prevalence of musculoskeletal pain on the basis of literature. A convenient sampling technique was adopted for this study, as SOPs in line with the prevailing COVID-19 pandemic prevented adequate accessibility and interaction with the target population. Structured questionnaires were used both in English and Urdu languages. The questionnaire was divided into four sections comprising of:

- A) Sociodemographic Information
- B) General Questions Pertaining to Musculoskeletal Pain
- C) Schoolbag-related Information
- D) Demographic-related Information

Such categorization was opted to evaluate a variety of factors that could contribute to the development of schoolbag-related musculoskeletal pains. Structured questionnaires were circulated online and distributed in-field. The online questionnaires consisted of Google Forms for English questionnaires and Jot Form for Urdu questionnaires, which were circulated during the months of July to mid-September via email and social media such as WhatsApp. In-field questionnaires were printed and distributed to students to take home via coordinators and supervisors of the aforementioned schools from mid-September to October after seeking approval from the schools' Administrative Board. A response period of two to four days was allowed, after which questionnaires were collected and used for data analysis.

The inclusion criteria were school-going children & adolescents aged five to 19. The exclusion criteria followed were:

- a. Children with pre-existing musculoskeletal disorders (i.e., scoliosis, neck/back/spinal pains, etc.)
- b. Children with genetic disorders and/or any diseases with complications of musculoskeletal disorders (i.e., haematological disorders, thyroid derangement, severe gastrointestinal diseases, etc.)
- c. Children with experience of trauma (i.e., accidents, surgeries, malnutrition, etc.)

d. Any respondents that were not willing to participate.

Data was entered and analysed using IBM Statistical Package for Social Sciences (SPSS) Statistics Version 23. Descriptive analysis was done by calculating frequencies, percentages, mean, and standard deviation from the collected data.

Inferential analysis was done by cross-tabulating certain variables. Chi-Square test and Fischer's Exact test with p-value of 0.05 or less was used.

Before commencement of the study, approval from the Institutional Review Board (IRB) of Fazaia Medical College, Air University was sought. Informed consent was obtained from the respondents.

Results

This study performed descriptive and inferential analysis on select sociodemographic variables and schoolbag carriage practices to determine their association with musculoskeletal pain incidence due to schoolbag carriage. 253 students of mean age 12.50 ± 9.1 were studied, where 68.4% reported musculoskeletal pain due to schoolbag carriage. 78.9% female students and 74.4% government school students reported musculoskeletal pain due to increased duration and frequency of schoolbag carriage along with higher BMIs and bag weight

Table shows a summary of the frequency distribution statistics of demographic data and determined characteristics of musculoskeletal pain, where frequency (n) and percentages (N) are calculated for each variable 47.43% of students were overweight, 45.06% were in normal range of BMI and 7.51% were underweight with maximum students from Grade 5 to Grade 9. Highest number of students were from Grade 8 and lowest from Grade 9 and above. The highest number of students are of 13 years of age, while the lowest are of 20 years. 41% students were from semi-government schools and about 29% each from private and government schools.

About 82% are residents were from Islamabad whereas 14% resided in Rawalpindi. 67.19% respondents denied any previous familial history of musculoskeletal pain.

23.75% denied any association of school bag carriage with postural change, whereas 46.67% confirmed forward lean and 11.25% sideways lean with discomfort.

26.87% complain of daily pains, 25.99% complain of suffering from pain 2-5 times a week and 20.70% confirm of pains on weekly basis. 73.93% respondents believed that the musculoskeletal pains of different body parts in children are, in fact, associated with the carriage of school bags, whereas

14.53% denied such association. Majority i.e. 73.01% respondents confirmed that there is no change in the pain with change in the weight of bag whereas 11.06% respondents think otherwise. 36.36% students suffered from pain for less than an hour/day, 30.74% suffered for a few hours/day and 9.96% suffered for up to a whole day.

An increasing trend of pain was seen with increasing age, higher BMI, higher school grades, and increased waiting time for transport. Significant associations are shown to exist with gender (0.003), type of school (0.001), duration (0.000) and frequency of carriage (0.016), bag weight- to-body weight ratio (0.026), transport wait time (0.030) and postural changes (0.000). Most female and semi-government school children report musculoskeletal pain incidence. A bag weight-to-body weight ratio of more than 10-15% resulted in higher pain incidence. Most children who carried backpacks report musculoskeletal pain. A forward lean postural change while carrying the schoolbag was most noted to be associated with musculoskeletal pain 80% students are worn out after carrying schoolbag.

Table 1: Frequency Distribution of Demography and Characteristics of Musculoskeletal Pain

		Frequency (n)	Percentages (%) [N]
Gender	Male	144	56.9
	Female	109	43.1
BMI	Underweight	120	47.4
	Normal weight	114	45.1
	Overweight	19	7.5
Type of School	Government	73	28.9
	Semi-government	104	41.1
	Private	75	29.6
Region of Musculoskeletal Pain	Neck	35	18.3
	Shoulders	45	23.6
	Upper Back	38	19.9
	Lower Back	29	15.2
	Arms	27	14.1
Bag Weight to Body Weight Ratio	Legs	17	8.9
	<10%	123	48.6
	10-15%	40	17.9
Type of Schoolbag	>15%	61	27.2
	Backpack	163	64.4
	Shoulder bag	53	20.9
Duration of Schoolbag Carriage (In a Day)	Trolley bag	10	4.0
	5-15mins	130	51.4
	15-30mins	85	33.6
	30-60mins	29	11.5
Frequency of Schoolbag Carriage (In a Day)	More than 1 hr.	6	20.4
	1-2x a day	175	69.2
	3-6x a day	70	27.7
Method of Transport	More than 6x	4	1.6
	Walk	37	14.6
	Motorcycle	18	7.1
	Car	113	44.7
	Van	76	30.0
	Bus	6	2.4

Wait Time for Transport	5-15mins	177	70.0
	15-30mins	48	19.0
	30-60mins	8	3.2
Postural Changes	Forward lean	112	44.3
	Sideway lean	27	10.7

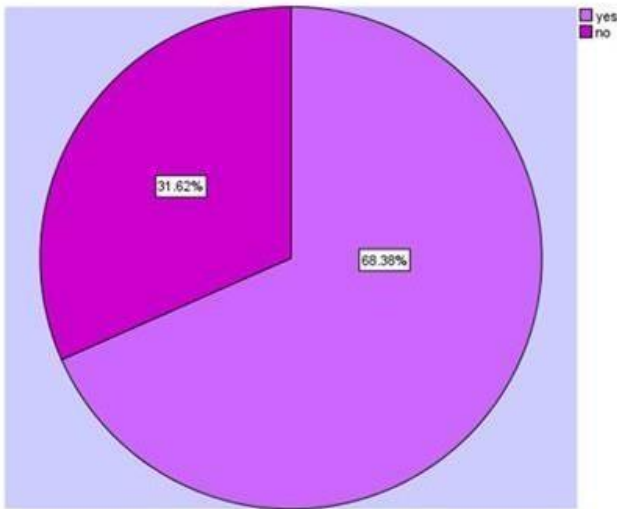


Figure 1. Demonstrates the association of pain with schoolbag usage in 68.38% students.

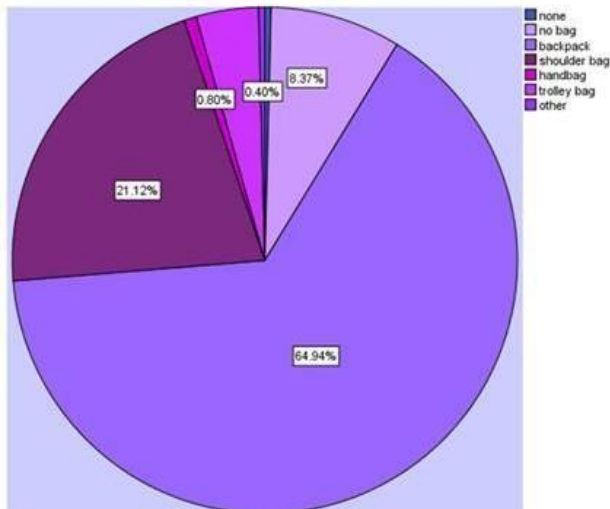


Figure 3.1.: Types of Schoolbags Carried by School-going Children

Figure 2. Shows association of type of school bag with the development of pain. Majority of students i.e. 64.94% students used backpacks, 21.12% used shoulder bags.

Variables		Musculoskeletal Pain Incidence		P-value
		Yes (N%)	No (N%)	
Gender	Male	87 (60.4)	57 (39.6)	0.003
	Female	86 (78.9)	23 (21.1)	
BMI	Underweight	84 (70)	36 (30)	.697
	Normal Weight	75 (65.8)	39 (34.2)	
	Overweight	14 (73.7)	5 (26.3)	
	Government	43 (58.9)	30 (41.1)	
	Semi-government	85 (81.7)	19 (18.3)	

Type of School	Private	44 (58.7)	31 (41.3)	0.001
Bag Weight to Body Weight Ratio	<10%	77(62.6)	46(37.4)	0.026
	10-15%	32(80)	8(20)	
	>15%	48(78.7)	13(21.3)	
Type of Schoolbag	Backpack	119 (73.0)	44 (27.0)	0.089
	Shoulder Bag	34 (64.2)	19 (35.8)	
	Trolley Bag	7 (70.0)	3 (30.0)	
Duration of Schoolbag Carriage	5 – 15 minutes	75 (57.7)	55 (42.3)	0.000
	15 – 30 minutes	72 (84.7)	13 (15.3)	
	30 – 60 minutes	20 (69.0)	9 (31.0)	
	> 1 hour	5 (83.3)	1 (16.7)	
Frequency of Schoolbag Carriage	1 – 2 times	110 (62.9)	65 (37.1)	0.016
	3 – 6 times	56 (80.0)	14 (20.0)	
	> 6 times	4 (100)	0 (0)	
Method of Transport	Walk	21 (56.8)	16 (43.2)	0.353
	Motorcycle	13 (72.2)	5 (27.8)	
	Car	83 (73.5)	30 (26.5)	
	Van	49 (64.5)	27 (35.5)	
	Bus	4 (66.7)	2 (33.3)	
Wait Time for Transport	5 – 15 minutes	116 (65.5)	61 (34.5)	0.030
	15 – 30 minutes	40 (83.3)	8 (16.7)	
	30 – 60 minutes	5 (62.5)	3 (37.5)	
Postural Changes	Forward Lean	93 (83.0)	19 (17.0)	0.000
	Sideways Lean	23 (85.2)	4 (14.8)	

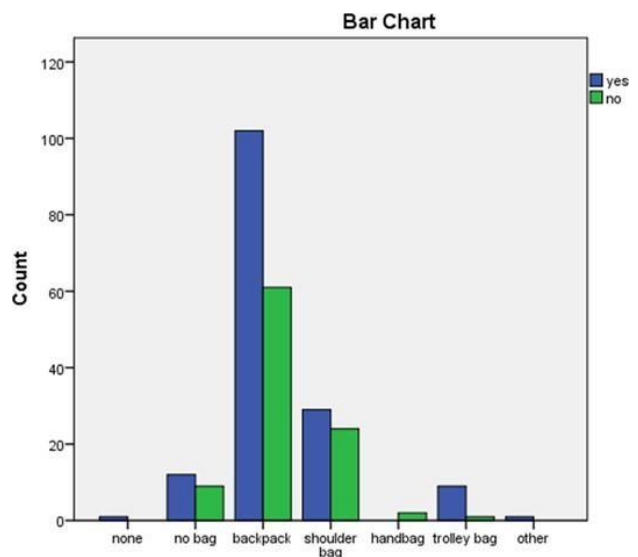


Figure 3. Shows the cross-tabulation association of musculoskeletal pain incidence against type of schoolbag, with backpacks showing the highest incidence, followed by shoulder bags and trolley bags.

Discussion

A study in Spirit School Children, Lahore showed results similar to our study of strong positive association of musculoskeletal pain with the weight of bag packs. Postural changes were highly similar in both the studies as forward lean was observed in 58.5% of the children in this study while in 83% of the children in ours. Shoulders were the region of most pain in 44.4% of the students in this study while 64% was the region of most pain in our study.⁶

Study in Karachi showed that shoulder pain was the most common in 93.8% of the children. The intensity of pain was moderate in 35% cases while in our study moderate pain was seen in 38% of the children. 36.52% of the students felt pain every day in that study while in our study 32% of students felt pain every day on schoolbag carriage.²

Study in Primary School Children, Islamabad showed 56.5% of the children were mostly in bent- over position which led to forward lean in 66.2% of the cases mostly similar to our study. The general perception about the weight of the backpack was 'heavy' in 59.7% of the children while in our study it remained in 60.2%. Another supporting factor in this study was that the females experienced more pain (76.35%) as compared to males (62%) which is just in accordance with our study of 83% in females and 62% in males. Both upper (39.8%) and lower back pain (37.4%) were most commonly observed in contrast to the shoulder pain 43% in our study.³

All females (100%) students in a school study showed musculoskeletal pain. Most of the children (57.6%) considered their backpacks to be of the "Normal" weight while in our study 56.3% students perceived their backpacks as "heavy".³

An international study in Puducherry showed that 27.3% of the students suffered from chronic (> 6 months) pain while our study 31.3% students suffered. Shoulders still remained the region of highest pain (27%).⁵

A significant flattening of lumbar lordosis and upper thoracic kyphosis was found with increasing backpack load as well as significant decrease in thoracolumbar and lumbar

repositioning consistencies in a study which is similar to our study showing increase in postural changes and back pain.¹⁰

Frequency of development of musculoskeletal pain in public schools and those walking longer duration for the school of Uganda was higher which is similar to our study where longer duration of bag carriage causes pain.¹¹

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