



PREVALENCE OF MUSCULOSKELETAL PAIN AMONG ELEMENTARY SCHOOL CHILDREN DUE TO TRADITIONAL HEAVY BACKPACKS

Dr Ghazala Langah¹, Dr Bushra Jamil², Dr Arhama Samad³, Dr Zain Ul Abdin⁴, Dr Manisha Kumari⁵, Dr Mamoona⁶

¹*Lecturer, Institute of Physiotherapy & Rehabilitation Sciences, Liaquat University of Medical & Health Sciences, Jamshoro, Hyderabad, Pakistan

²Physiotherapist, Institute of Physiotherapy & Rehabilitation Sciences, Liaquat University of Medical & Health Sciences, Jamshoro, Hyderabad, Pakistan

³Physiotherapist, Institute of Physiotherapy & Rehabilitation Sciences, Liaquat University of Medical & Health Sciences, Jamshoro, Hyderabad, Pakistan

⁴Physiotherapist, Institute of Physiotherapy & Rehabilitation Sciences, Liaquat University of Medical & Health Sciences, Jamshoro, Hyderabad, Pakistan

⁵Physiotherapist, Institute of Physiotherapy and Rehabilitation Sciences, Liaquat University of Medical & Health Sciences, Jamshoro, Hyderabad, Pakistan

⁶Physiotherapist, Institute of Physiotherapy & Rehabilitation Sciences, Liaquat University of Medical & Health Sciences, Jamshoro, Pakistan

***Corresponding author:** Dr Ghazala Langah,

*Lecturer, Institute of Physiotherapy & Rehabilitation Sciences,
Liaquat University of Medical & Health Sciences, Jamshoro, Hyderabad, Pakistan
Email: ghazalangah@gmail.com

Abstract

Background

An increasingly serious issue of significant concern revolves around the rising prevalence of musculoskeletal pain among school-going students, stemming from the burden of carrying backpacks.

Objective

The primary aim of this study was to assess the prevalence of musculoskeletal pain among elementary schoolchildren due to traditional heavy backpacks

Material and methods

This cross-sectional study was conducted among 100 students by using a non-probability convenient sampling technique. Students with acquired physical disabilities or recent surgeries were excluded. Data collection involved questionnaires and measurements of backpack weight. Statistical analysis was performed using SPSS version 23.

Results

The study highlighted that most of the participants were 13 years old, and carried school bags within the recommended weight range. Moderate pain was prevalent among participants, with bilateral shoulder pain being the most common, followed by mid-thoracic back pain. Many cases reported experiencing pain in multiple body areas, particularly bilateral shoulder pain and mid-thoracic back pain.

Conclusion

This study examines musculoskeletal discomfort in elementary students, with a focus on musculoskeletal pain from heavy backpacks. The study suggests a strong link between carrying backpacks over 10% of body weight and increased musculoskeletal discomfort.

Keywords

Bag packs, Heavy, Jamshoro, Musculoskeletal pain, School going children

Introduction

Concerns have been raised by various stakeholders, including parents, school administrators, and healthcare professionals, regarding the weight of school bags carried by children worldwide. The consensus among these groups is to adhere to the recommended bag-to-weight ratio of 10-15% for school-aged children (1). Musculoskeletal pain among school children is increasingly recognized as a significant global health challenge, with indications of a rising incidence (2). School-aged children represent a critical developmental stage where they may encounter various health issues, often influenced by lifestyle factors (3). Despite widespread acknowledgment among professionals from diverse fields regarding the detrimental impact of backpacks on children's backs, their ubiquitous use remains prevalent among students (4,5). Back pain, defined as incapacitating pain caused by a back injury or other disorders affecting the posterior region of the body extending from the shoulders to the hips, stands as one of the most prevalent sicknesses and sources of disability globally (6). The weight of school children's backpacks continues to be a persistent and divisive topic in the realms of education and health. Carrying excessive weight in school bags from childhood increases the likelihood of chronic back pain in adulthood. Studies indicated that children between the ages of 10 and 15 who attend school frequently experience low back discomfort, with prevalence rates ranging from 25 percent to 55 percent, often due to improper handling of schoolbags with excessive weight (7). Literature suggests that the total weight of the school bag should not exceed 10% of the body weight to prevent adverse effects such as increased muscle tension in the neck and back, linked to spinal column disease, and reduced lung volume (8). Carrying a backpack for elementary school students poses a significant risk to the musculoskeletal system and the preservation of a healthy body structure into adulthood (9). Children of school age undergo various stages in the development of their posture, and neglecting proper backpack design, padding, and overall weight can contribute to postural problems (10). The American Occupational Therapy Association (AOTA) highlights specific design characteristics of backpacks that impact posture, noting that many parents may not be aware of the recommended backpack weight and proper carrying techniques (11). Previous studies, such as one conducted in Kuwait, reported a lifetime occurrence of low back pain among high school adolescents to be 57.8%, with females more prone to this condition compared to males (12). Back pain among young people poses a significant concern as it increases the risk of persistent pain later in life (13). Factors associated with nonspecific musculoskeletal pain in school children include age, gender, heavy school bags, method of carrying, poor lifestyle habits, and prolonged poor posture (14). Research at Aurban University found that the average weight of backpacks was 17% of the child's weight, leading to back muscle soreness, pain, numbness, and shoulder pain among students (15). Studies have shown that both the amount of load carried and the placement of the backpack affect postural changes, with postural issues related to pain that can be prevented during the flexible spine development stage in children (16). A significant relationship was found between musculoskeletal pain, backpack weight, and carrying time in students of all age groups. Increased backpack weight increases stress on the backbone, leading to musculoskeletal pain in school children, highlighting the urgent need for awareness among school admissions and parents to reduce the prevalence of back pain. The purpose of the study is to observe the prevalence of musculoskeletal pain due to heavy backpacks in elementary school children, providing valuable data for preventive measures.

Objective of Study

To assess the prevalence of musculoskeletal pain among elementary school children due to traditional heavy backpacks

Materials and Methods

A cross-sectional study was undertaken in elementary private schools located in Jamshoro, Sindh, Pakistan, spanning six months. A total of 100 students were selected using a non-probability convenient sampling technique. The study encompassed elementary school children aged 10 to 14 years, of both genders, who carried backpacks. Exclusion criteria comprised students with any congenital or acquired physical disability or those who had undergone recent surgery. Data collection involved administering a questionnaire to all students. The process included measuring the weight of the school bags and querying them regarding back pain. Data analysis was conducted utilizing the Statistical Package for the Social Sciences (SPSS) version 23.

Results

The study findings indicated that the distribution of participants' ages varied, with the majority of students (32.0%) falling within the age bracket of 13 years, while the lowest representation was observed in the 10 and 16-year-old age groups, each comprising 2.0% of the sample population, as demonstrated in Figure-I. The analysis of participants' school bag weights revealed that the majority (68%) carried bags weighing between 1 to 15% of their body weight, while a minority (32%) bore school bags exceeding 15% of their body weight, as illustrated in Table I.

The analysis of pain intensity among students revealed that the majority, comprising 70 (70.0%) individuals, experienced moderate pain, as depicted in Table II. Moreover, when examining the distribution of pain across different body areas, it was found that the highest prevalence occurred in bilateral shoulder pain, affecting 56 (34.8%) students, followed by mid-thoracic back pain, observed in 34 (21.1%) students as shown in Table III.

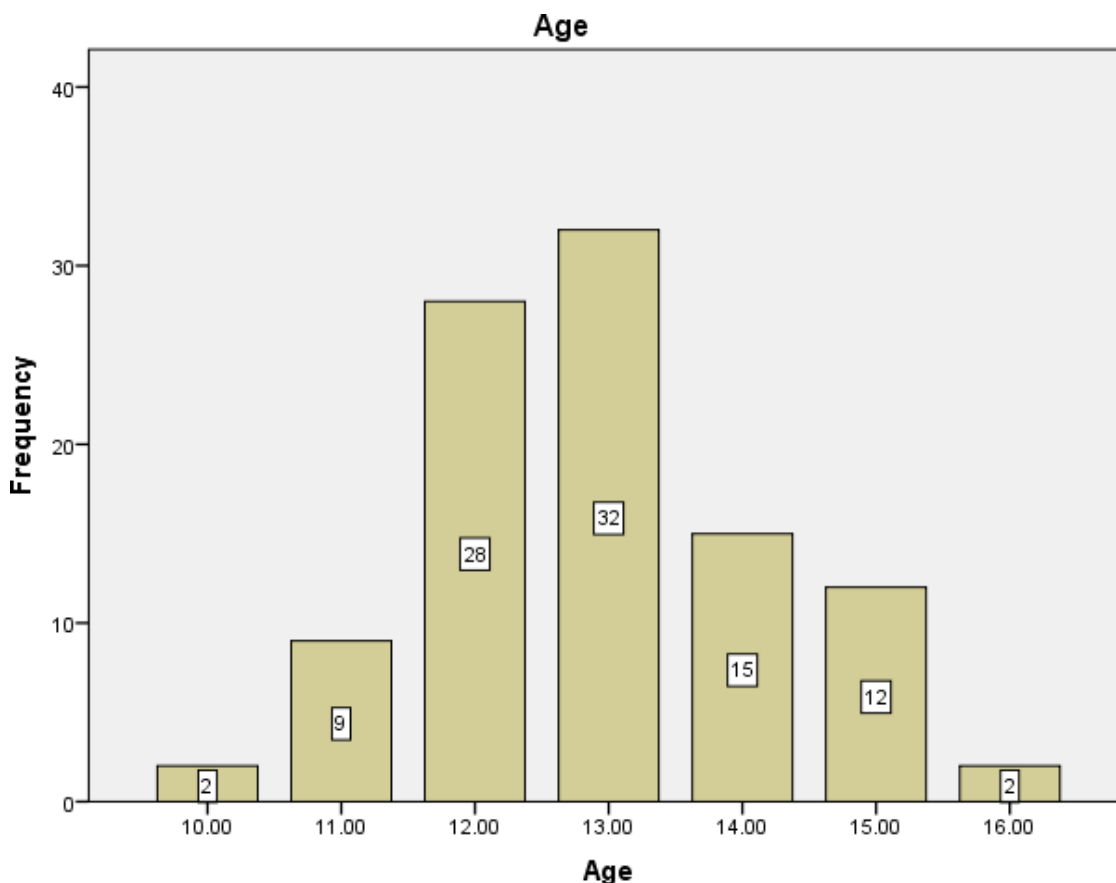


Figure I- Age Distribution of Participants (n=100)

Table I- Weight of School bag percent (n=100)

School Bag Percentage	Frequency	Percent
1 to 15 %	68	68%
more than 15%	32	32%

Table II -Intensity of Pain

Nature of pain	Frequency	Percentage
No pain	4	4.0
Mild pain	16	16.0
Moderate pain	70	70.0
Severe pain	6	6.0
Worst possible pain	4	4.0
Total	100	100.0

Table III- Area of Pain mentioned by the participants

Area of Pain	N	Percentage	Percentage of Cases
Unilateral Shoulder Pain	14	8.7%	14.9%
Bilateral Shoulder Pain	56	34.8%	59.6%
Upper back pain	21	13.0%	22.3%
Mid-thoracic back pain	34	21.1%	36.2%
Lower back pain	16	9.9%	17.0%
One leg pain	3	1.9%	3.2%
Both leg pain	7	4.3%	7.4%
One arm pain	1	0.6%	1.1%
Both arm pain	3	1.9%	3.2%
Neck pain	6	3.7%	6.4%
Total	161	100.0%	171.3%

Table IV- Association of school bag % with Upper back pain (n=100)

Weight of School Bag	Upper back pain		p-value
	Yes	No	
1 % to 15%	17	51	.152
More than 15%	4	28	

The chi-square test was applied

P-value < 0.05 considered as significant ** not significant at 0.05 level

Table V- Association of School bag weight % with thoracic back pain (n=100)

Weight of School Bag	Mid-thoracic back pain		p-value
	Yes	No	
1 % to 15%	28	40	.027
More than 15%	6	26	

Table VI- Association of School bag weight % with Lower back pain (n=100)

Weight of School Bag	Lower back pain		p-value
	Yes	No	
1 % to 15%	10	58	.607
More than 15%	6	26	

The chi-square test was applied

P-value < 0.05 considered as significant ** significant at 0.05 level

Discussion

In this research, a cross-sectional questionnaire was employed to evaluate the impact of carrying heavy school bags on the occurrence of musculoskeletal pain. Given the increasing prevalence of heavy school bag usage among school children, there is a growing concern regarding the long-term health implications, particularly concerning the prevention of musculoskeletal injuries. This study aimed to determine the prevalence of musculoskeletal pain attributed to heavy backpacks among in the Jamshoro region.

In the study, data was collected from a total of 100 students, revealing that 56 (34.8%) experienced bilateral shoulder pain, 34 (21.1%) reported mid-thoracic pain, 16 (9.9%) indicated lower back pain and 6 (3.7%) mentioned neck pain. A comparison with the findings of Rabia Sundas et al. exhibited similar trends, where neck pain was prevalent in 40.2% of students, shoulder pain in 47.4%, and lower back pain in 46.6% (17). Discussing posture-related issues, Ghousia Shahid et al. (2018) conducted a study on the Prevalence of Musculoskeletal Pain due to heavy backpacks in School-going Children of Karachi. Their results indicated a high prevalence of musculoskeletal pain, with 96 (83.5%) students affected, notably 90 (93.8%) reporting shoulder pain. Furthermore, the study highlighted that 93% of students carried a backpack weighing over 15% of their body weight (18).

Additionally, in 2018, Chowdhury MH et al. investigated the prevalence of physical stress on school-going students concerning their body weight and heavy backpacks. Their findings underscored that nursery to KG students experienced more back pain due to regularly carrying heavy school bags. The conclusion drawn was that younger students are at higher risk of developing back pain and other musculoskeletal disorders (19). In this research, a visual analog scale was used to gauge the intensity of pain, revealing that the majority of students experienced moderate levels of discomfort. On the contrary, a study conducted by Alberto et al., reported that the total number of individuals with low back pain, 36.9% of the boys and 63.1% of the girls reported a high frequency of pain, while 35.8% of the boys and 47.2% of the girls indicated a high severity of pain (20). In the research study, the ratio of school bag weight was analyzed to students' body weight to assess the extent to which students carry their bags relative to their body weight. The findings revealed that 68% of students carried their bags within the recommended range of 10%-15% of their body weight, indicating a balanced load. However, 32% of students were observed carrying bags exceeding the recommended ratio of >15%, indicating a heavier burden. Comparatively, the study by Ghousla Shahid et al. reported a significant proportion, with 93% of students carrying bags exceeding the recommended ratio of >15%, while only 7% adhered to the 11%-15% ratio. These findings underscore the increased risk of developing musculoskeletal pain in various parts of the body when students carry a load exceeding 10%-15% of their body weight (18).

The study demonstrated several strengths. Firstly, it heightened awareness about the appropriate weight of school backpacks to prevent back pain among students, contributing valuable insights for educators and parents alike. Secondly, the data collection procedure employed was both convenient and cost-effective, ensuring efficient acquisition of pertinent information. Thirdly, a standardized questionnaire was utilized, enhancing the reliability and validity of the findings. Lastly, the study shed light on the prevalence of bilateral shoulder pain, enriching the existing body of knowledge in this area, even though the primary focus was on back pain. In terms of recommendations, firstly, there is a pressing need for interventional studies to be undertaken on this subject matter, aiming to devise effective strategies to mitigate the impact of heavy backpacks on student health. Secondly, the findings indicated a higher prevalence of bilateral shoulder pain compared to back pain, suggesting the necessity for further investigation specifically focused on bilateral shoulder pain to unravel underlying causes and develop targeted interventions. Additionally, comprehensive studies are warranted to delve into the broader spectrum of musculoskeletal problems associated with carrying heavy backpacks, providing insights into preventive measures and treatment options for these issues. However, several limitations were evident in the study. Firstly, the selection of schools for data collection was limited, potentially impacting the generalizability of our findings. Secondly, the study solely focused on back pain, neglecting to explore other musculoskeletal issues that may arise from carrying heavy backpacks. Thirdly, it did not compare the prevalence of back pain between genders,

overlooking potential gender-specific differences in pain experiences. Lastly, the study was restricted to a specific age group and did not encompass primary and secondary school children, limiting the broader applicability of the results. Addressing these weaknesses in future research endeavors could offer a more comprehensive understanding of the impacts of backpack weight on student health.

Conclusion

This study aims to investigate the role of musculoskeletal discomfort in elementary school children. Shoulder pain and mid-thoracic pain emerged as the predominant types of discomfort experienced. Furthermore, moderate levels of pain were frequently reported among the children surveyed. Importantly, our findings suggest a significant association between carrying backpacks weighing more than 10% of body weight and an elevated incidence of musculoskeletal discomfort.

References

1. Spiteri K, Busuttill ML, Aquilina S, Gauci D, Camilleri E, Grech V. Schoolbags and back pain in children between 8 and 13 years: a national study. *British journal of pain*. 2017 May;11(2):81-6. <http://doi:10.1177/2049463717695144>. Epub 2017 Feb 1. PMID: 28491300; PMCID: PMC5405972.
2. Mansoorian M, Ghasemi MS, Forough B, Dehghan N. Evaluating the impact of a new ergonomic backpack designed on foot plantar pressure and perceived comfort by its users. *Iran Occupational Health*. 2018 Oct 10;15(5):59-68.
3. Zakeri Y, Baraz S, Gheibizadeh M, Saidkhani V. Relationship between backpack weight and prevalence of lordosis, kyphosis, scoliosis and dropped shoulders in elementary students. *International journal of pediatrics*. 2016 Jun 1;4(6):1859-66.
4. Kalhori RP, Ziapour A, Kianipour N, Foroughinia A. A study of the relationship between lifestyle and happiness of students at Kermanshah University of Medical Sciences over 2015– 2016. *Ann Trop Med Public Health*. 2017 Jul 1;10(4):1004-9.
5. Suri C, Shojaei I, Bazrgari B. Effects of school backpacks on spine biomechanics during daily activities: a narrative review of the literature. *Human factors*. 2020 Sep;62(6):909-18. <http://doi:10.1177/0018720819858792>. Epub 2019 Jul 12. PMID: 31298940.
6. Assiri A, Mahfouz AA, Awadalla NJ, Abolyazid AY, Shalaby M. Back pain and schoolbags among adolescents in Abha City, Southwestern Saudi Arabia. *International Journal of Environmental Research and Public Health*. 2020 Jan;17(1):5. <http://doi:10.3390/ijerph17010005>. PMID: 31861301; PMCID: PMC6981712.
7. Aprile I, Di Stasio E, Vincenzi MT, Arezzo MF, De Santis F, Mosca R, Briani C, Di Sipio E, Germanotta M, Padua L. The relationship between back pain and schoolbag use: a cross-sectional study of 5,318 Italian students. *The Spine Journal*. 2016 Jun 1;16(6):748-55. <http://doi:10.1016/j.spinee.2016.01.214>. Epub 2016 Feb 12. PMID: 26882858.
8. Lopez Hernandez T, Caparo Ferre M, Gine Marti S, Salvat Salvat I. Relationship between school backpacks and musculoskeletal pain in children 8 to 10 years of age: an observational, cross-sectional and analytical study. *International journal of environmental research and public health*. 2020 Apr;17(7):2487. <http://doi:10.3390/ijerph17072487>. PMID: 32260533; PMCID: PMC7177975.
9. Zakeri Y, Baraz S, Gheibizadeh M, Saidkhani V. Relationship between backpack weight and prevalence of lordosis, kyphosis, scoliosis and dropped shoulders in elementary students. *International journal of pediatrics*. 2016 Jun 1;4(6):1859-66.
10. Brzęk A, Dworak T, Strauss M, Sanchis-Gomar F, Sabbah I, Dworak B, Leischik R. The weight of pupils' schoolbags in early school age and its influence on body posture. *BMC musculoskeletal disorders*. 2017 Dec;18:1-1. <http://doi:10.1186/s12891-017-1462-z>. PMID: 28320364; PMCID: PMC5359953

11. Chalise GD, Sherpa S, Bharati M, Ambu KC. Parental awareness about school backpacks, weight carried by their children, and related musculoskeletal problems. *Medical Journal of Shree Birendra Hospital*. 2020 Jun 26;19(2):97-102.
12. Akbar F, AlBesharah M, Al-Baghli J, Bulbul F, Mohammad D, Qadoura B, Al-Taiar A. Prevalence of low Back pain among adolescents about the weight of school bags. *BMC musculoskeletal disorders*. 2019 Dec;20:1-9. <http://doi:10.1186/s12891-019-2398-2>. PMID: 30670005; PMCID: PMC6343268.
13. Al-Saleem SA, Ali A, Ali SI, Alshamrani AA, Almulhem AM, Al-Hashem MH. A study of school bag weight and back pain among primary school children in Al-Ahsa, Saudi Arabia. *Epidemiology (Sunnyvale, Calif.)*. 2016 Feb;6(1). <http://doi:10.1186/s12891-019-2398-2>. PMID: 30670005; PMCID: PMC6343268.
14. Mirza H, Arif M. Heavy backpacks & backache in school going children. *JPMA*. 2020 Mar 28;2020. PMID: 32794476.
15. Hadžiomerović AM, Jaganjac A, Avdic D, Pašalić A, Kaljić E, Domljan D, Omerović E. School bags and associated back pain. *Journal of Health Sciences*. 2018 Apr 2;8(1):10-9.
16. Rai A, Agarwal S, Bharti S, Ambedakar BB. Postural effect of backpacks on school children: its consequences on their body posture. *Int J Health Sci Res*. 2013;3(10):109-6.
17. Sundas R, Ghous M, Sehar S. Association of backpack loads and wearing time with musculoskeletal disorders in school children of Wah Cant Pakistan: Correlational study. *International Journal of Clinical and Medical Education Research*. 2022 Jul 1;1(1):1-6.
18. Shahid G, Aziz K, Arif A, Fahim MF. Prevalence of musculoskeletal pain due to heavy backpacks in school-going children of Karachi. *Int J Phys Med Rehabil*. 2018;6(3):2.
19. Chowdhury MH, Karim R, Barbhuiya AM, Rahman H. Prevalence of Physical Stress on the School Going Students about Their Body Weight and Heavy Backpack.
20. De Vitta A, de Oliveira Perrucini P, Bento TP, Cornélio GP, Felipe LA, Simeão SF. Factors associated with intensity and frequent low back pain in high school students. *ABCS Health Sciences*. 2021 Nov 8;46:e021223-. <http://doi:10.1016/j.amjms.2016.10.012>. Epub 2016 Nov 2. PMID: 28183408.