OPEN ACCESS

RESEARCH ARTICLE

Frequency of low back pain and its association with school bag weight in school children

Hamza Ahmed[1], Sana Shahzad[2], Ayesha Sonia[2], Samreen Iqbal[3], Om Perkash[4], Tabassum M. Zubair[2]

ABSTRACT

Background: Low back pain (LBP) is a common health concern among school-going children, often linked to carrying heavy school bags. Excessive backpain weight can contribute to musculoskeletal discomfort, poor posture, and long-term spinal issues. Despite growing awareness, there is limited region-specific data on this association.

Objective: This study aimed to determine the frequency and relationship of low back pain with the weight of school bags among school-going children.

Methods: A cross-sectional survey (ethical approval number (ERC #SBBDU-2020-135) was conducted between June and November 2020, involving 321 school children who met specific inclusion criteria. A self-administered questionnaire was used to collect data on demographic characteristics, backpain symptoms, and student's perception of their school bag weight. Statistical analysis was performed using SPSS version 22.

Results: Out of 321 school age children, 93.4% (n=300) reported low back pain (LBP), with 45.2% (n=145) experiencing it once a month frequently. LBP prevalence did not differ significantly by gender ($p > 0.05$), though higher in boys (54.52%, n=175) than girls (38.94%, n=125). Significant associations included carrying more than six books (93.14% of those with LBP, $\chi^2=273.6$, $p<0.001$), walking to school with a big bag (60.12% vs 33.33%, $\chi^2=45.1$, $p<0.01$), while study posture showed no significance ($p=0.136$).

Conclusion: According to the study, children enrolled in school experience low back discomfort frequently (93.4%), with the most frequent occurrence occurring once a month. Poor study postures, walking to school with large school bags, and carrying heavy school bags were found to be significantly associated with LBP.

Keywords: Children, ergonomics, low back pain, postures, school bags.

DOI: http://doi.org/10.33897/fujrs.v6i1.447

Introduction:

Globally, millions of students commute to and from school each day with school bags full of books and supplies. Backpacks serve as a practical means of transporting educational stuff (1), and excessive weight can contribute to musculoskeletal strain and discomfort. Low back pain (LBP) can be defined as pain occurring between the lower ribs and buttock folds that lasts for a day or more(2), has been increasingly reported among school-aged kid. A number of studies have suggested there are various predisposing factors that exist in the occurrence of LBP such as physical, anthropometric, psychosocial and emotional.(3) Among these, carrying a heavy backpack alters spinal posture due to the forward inclination of the trunk while carrying an overloaded backpack causes postural changes that contribute to pain and reduced functional ability in students, and lead to musculoskeletal discomfort and potentially long-term complications. (4) More than 2.5 million elementary school students wear school bags consistently for five days a week throughout the complete school year. Recognizing that children embody the future underscores the importance of providing them with proper education and nurturing. (5)

Backpacks serve as transporting mediums to carry stuff among students and have become a necessity not only for school going kids but also adults or university

Affiliations: [1]United College of Physical Therapy, Karachi, Pakistan, [2]Ziauddin College of Physical Therapy, Ziauddin University, Karachi, Pakistan, [3]Jinnah Sindh Medical University, Karachi, Pakistan, [4]Al Shifa Physiotherapy and Rehabilitation Centre, Karachi, Pakistan.

Correspondence: Sana Shahzad

Email: sana.shahzad@zu.edu.pk

Received: October 17th, 2024; **Revision 1:** June 11th, 2025; **Revision 2:** December 16th, 2025; **Revision 3:** January 19th, 2026.

Acceptance: January 21st, 2026.

How to Cite: Ahmed H, Shahzad S, Sonia A, Iqbal S, Perkash O, Zubair TM. Frequency of low back pain and its association with school bag weight in school children. Foundation University Journal of Rehabilitation Sciences. 2026 January;6(1):4-10.

students.(6) Backpack weight recommendations vary across studies, but research consistently indicates that students frequently exceed safe weight limits.(7) While there is a lack of consensus regarding the causal relationship between heavy school bags and back pain, the American Academy of Pediatrics has provided guidance on their appropriate use, that suggests, backpacks should be limited to a weight that does not exceed 10 to 20 percent of a child's body weight.(8)

The American Occupational Therapy Association reports that more than 50% of students between the ages of 9 and 20 suffer from continual back pain, a condition often linked to improperly loaded or excessively heavy school bags.(9) During their school-age years, kids who encounter elevated levels of psycho-social challenges, conduct issues, or other somatic conditions are at a greater risk of experiencing low back pain.(10) Studies from India estimate a prevalence rate between 55% and 86%, highlighting the growing concern surrounding LBP in school-going children.(11) The occurrence of LBP also impact on normal daily life of individuals. (12)

As kids 's spines are still in the developmental stage, excessive strain from carrying heavy school bags may lead to long-term health consequences. Although LBP is becoming more common, parents and educators are still not well-informed about it. Numerous parents are unaware of the possible long-term hazards or that their kids may develop LBP at an early age. In this study, the prevalence of LBP in school-age kids was evaluated. And its relationship to school bag weight investigated. This study highlights how heavy bag packs affect spinal health, underscoring the need for policies and preventative measures to lessen the prevalence of flow back pain (LBP) in students and protect their health and academic performance.

Methods:

The cross-sectional survey was conducted in Karachi, Pakistan, across 7 schools from June to November 2020. Convenience sampling method was used. The sample size of 321 school-going children aged 10-18 years) was calculated using Open Epi software (prevalence estimate=72% from Sundas et al. 2019, 95% confidence interval, 5% margin of error, 80% power).(13,14)

Inclusion criteria: currently enrolled students aged 10-18 years. Exclusion: severe musculoskeletal/ oncological conditions (confirmed via self-reported clinical history and parental verification: mild/moderate conditions and ongoing minor injuries included if not contraindicating participation).(15)

Independent variables: gender, age, number of books carried (>6), bag carrying method, transportation mode (walking vs. other), study posture/location, perceived bag weight (rated as light/moderate/heavy via 3-point Likert scale). Dependent variable: LBP presence (self-reported via body diagram similar to Nordic Questionnaire: pain between lower ribs/ buttocks ≥1 day).

A structured questionnaire (25 items: 10 on LBP prevalence across lifetime/6-month/1-month periods; 15 on risk factors) was developed from literature review (16) and pilot-tested on 30 students (test-retest reliability r=0.82; content validity via 5-expert panel, CVR=0.85). No prior validated tool fit this population/ focus. Actual bag weights were not measured (feasibility constraints in schools); body weights unmeasured—instead used self-reported perceived heaviness and book count as proxies.

Data collection: Questionnaires self-administered in classrooms during school hours; teachers supervised without influencing responses. Ethical approval obtained from Shaheed Benazir Bhutto Dewan University Institutional Review Board (ERC #SBBDU-2020-135); parental informed consent and child assent secured prior.

Statistical analysis used SPSS v22.0 (α=0.05). Descriptive: frequencies/percentages (categorical), Mean±SD (continuous). Inferential: Chi-square tests (assumptions checked: expected frequencies >5); no multivariable adjustment for confounders (BMI, activity, stress) due to cross-sectional design and resource limits.

Results:

A total of 321 school-going children aged 10 to 18 years were enrolled in this cross-sectional study. Among them 57.32% (n=184) were male, and 42.68% (n=137) were female. The study aimed to assess the frequency of low back pain (LBP) and its association with the weight of school bags, walking habits, and study postures at home.

A significant proportion of participants, 93.4% (n=300/321.95% CI: 90.2-95.9%) reported experiencing episodes of low back pain, while only 6.6% (n=21) reported no instances of pain (high prevalence likely reflects sensitive self-report: measurement bias addressed in limitations). Gender-wise analysis showed that low back pain was reported by 95.1% of males (175/184) and 91.2% of females (125/137). Although a higher prevalence was observed among males, the difference was not statistically

significant (Fisher's exact test, p = 0.12; φ = 0.08). No adjustment for confounders was performed due to the cross-sectional study design.

The prevalence of LBP varied across school grades, as shown in Table 1 (χ^2=1.2, df=3, p=0.75, assumptions met: all expected >5), with 7th to 10th-grade students reporting varying degrees of LBP.

Among participants experiencing LBP (n=300), the frequency of pain varied. The most commonly reported frequency was once a month (45.2%, n=145), followed by four to six times a month (23%, n=74). (Figure 1)

A strong and statistically significant association was found between the number of books carried and the prevalence of LBP. Among those with LBP, 93.14% (n=299) carried more than six books. Only one participant carrying four to six books reported LBP, while none carrying one to three books experienced pain. Fisher's exact test was used due to zeros/<5 expected cells in >20% cells (χ^2 assumptions violated); confirmed highly significant (p<0.001, φ=0.92). (Table 1)

Walking to and from school was also significantly associated with LBP. Among participants who walked to school, 60.12% (n=193) reported LBP, while 33.33% (n=107) of those who did not walk also experienced LBP. The difference was statistically significant (χ^2=45.1, df=1, p<0.001, φ=0.38, assumptions verified), suggesting that carrying heavy school bags while walking may contribute to LBP. (Figure 2)

LBP prevalence was examined in relation to students' study posture at home. Among those with LBP, 34.57% (n=111) studied on their bed, 10.9% (n=35) used a desk, 32.4% (n=104) studied on the floor, and 15.6% (n=50) on a couch. However, the association between study posture and LBP was not statistically significant (χ^2=6.4, df=3, p=0.136), although higher prevalence was noted among those studying on beds and floors. (Figure 3)

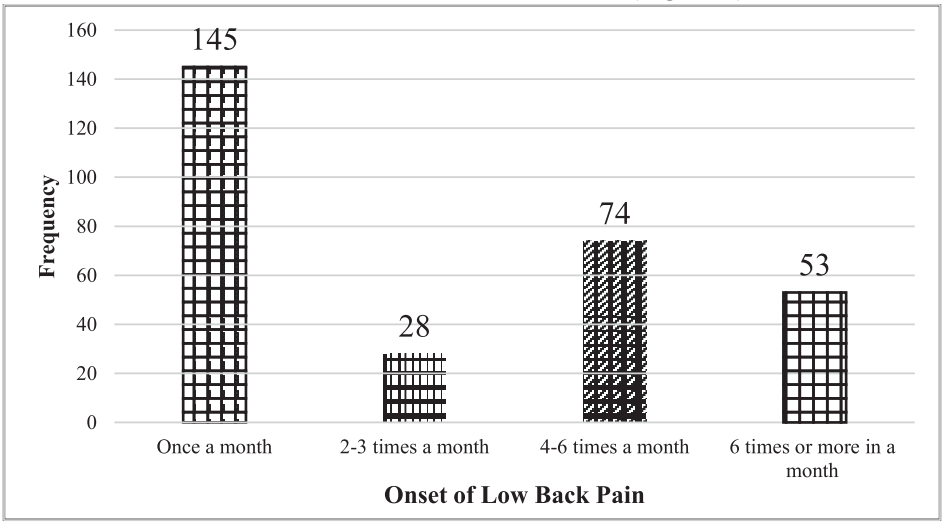

Figure 1: Frequency of the occurrence of low back pain in different time

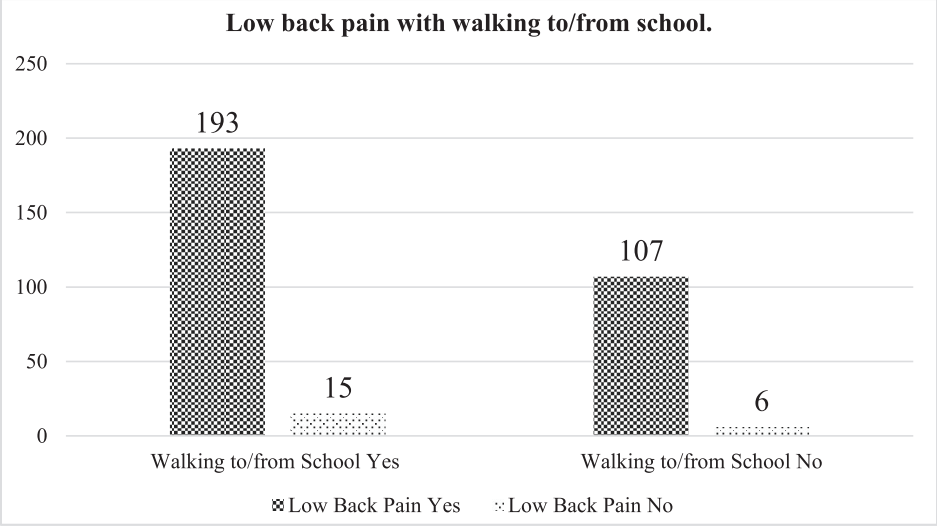

Figure 2: Association of low back pain with walking to/from school.

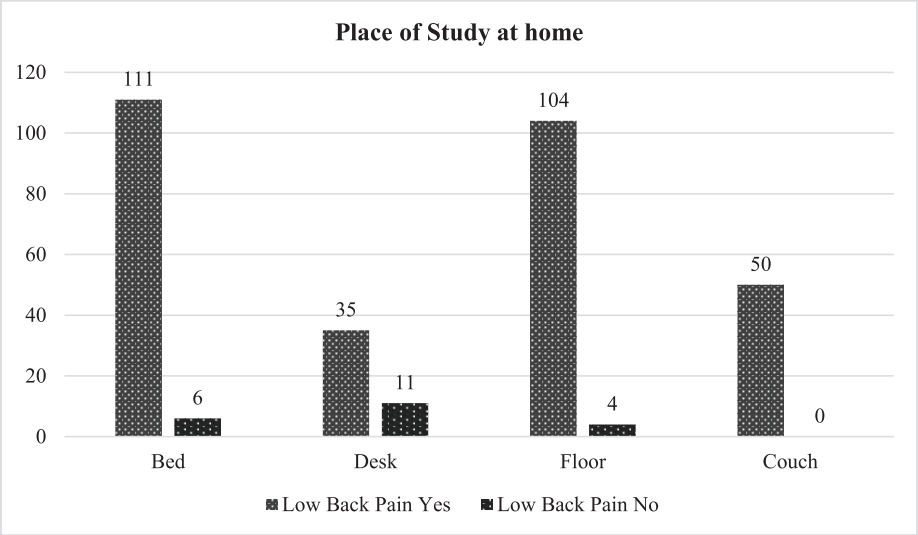

Figure 3: Association of low back pain with place of study at home.

Table 1: Association of Low Back Pain with Grade and Number of Books Taken to School

Variable	Category	Low Back Pain No	Low Back Pain Yes	Total
Grade	7th Standard	6	75	81
	8th Standard	5	65	70
	9th Standard	5	85	90
	10th Standard	5	75	80
Number of Books Taken to School	1–3 Books	6	0	6
	4–6 Books	15	1	16
	More than 6 Books	0	299	299
Total		21	300	321

Discussion:

The objective of this study was to assess the prevalence of low back pain (LBP) among school-enrolled children in Karachi and to examine its association with school bag weight. Our findings revealed that 93.4% of participants reported experiencing LBP, which is substantially higher than previously reported figures, including a lifetime prevalence of 57.8% (17) and 72% among children aged 8–13 years in a Maltese national study.(18) This increasing trend aligns with recent evidence suggesting that the prevalence of LBP in children is approaching adult levels.(19) The variation in reported rates may be attributed to differences in methodology, age groups studied, por increased recognitions of LBP as a legitimate health concern impacting school participation and daily functioning.(20,21)

Our study showed a higher frequency of LBP in male students (n = 175) compared to females (n = 125), although no statistical test was applied. This contrasts with some prior findings indicating that females may be more prone to LBP due to factor such as greater pain sensitivity (22) and body awareness.(23) Conversely, other studies, such ss Ayed et al., reported musculoskeletal pain in both genders, supporting the idea that multiple biomechanical and psychosocial contributors are involved regardless of sex.(24)

Importantly, our data showed no statistically significant association between the actual weight of school bags and LBP. However, we did find significant associations between LBP And carrying more than six books, perceived heaviness of bags, and walking to school with a large bag. These findings are supported by Yamato et al., who found in their systematic review that there is no clear or consistent link between schoolbag weight and back pain, suggesting that subjective perception may be more predictive than objective weight.(25) Furthermore, our results align with findings by Rodriguez-Oviedo

et al., who demonstrated that interventions aimed at reducing backpack weight and improving school ergonomics effectively decreased the incidence of LBP in adolescents.(26)

Overall, these findings highlight that modifiable behavioral and perceptual factor rather than bag weight alone play a key role in the development of LBP among school children. This emphasizes the need for ergonomics education, improved study environments, and school level strategies to reduce preventable risks.

The cross-sectional design makes it difficult to show causality, and reverse causation is still worry. Students with LBP may feel their school bags to be heavier. Furthermore, individual differences in physical capacity and pain perception influence subjective ratings, despite increased awareness of bag weight the findings imply that self-perceived weight should be addressed when developing weight guidelines. To avoid overloading, parents should address perceived weight with their children. Future research should prioritize longitudinal studies to demonstrate causality and investigate practical remedies such as lockers, digital textbooks, and ergonomic backpack to lessen students' workload.

Conclusion:

This study found a high frequency of low back pain (LBP) among school-age children, with 93.4% reporting discomfort, which was most commonly reported once a month. Although there was no statistically significant relationship between the actual weight of school bags and LBP, there were significant relationships with carrying more than six books, walking to school with heavy bags, and having bad study posture. Furthermore, LBP was more common in boys than in girls, while the difference was not statistically significant. These data suggest that behavioral and ergonomic factors, rather than the assessed weight of school bags, have a more important impact in the development of LBP in students. Implementing posture teaching, reducing the quantity of books carried, and encouraging ergonomic measures at school and home may help reduce the occurrence of LBP in children.

Disclaimer: None to declare.

Conflict of interest: None to declare.

Source of funding: None to declare.

References:

1. Minghelli B, Nunes C, Oliveira R. Back school postural education program: Comparison of two types of interventions in improving ergonomic knowledge about postures and reducing low back pain in adolescents. International Journal of Environmental Research and Public Health. 2021 Apr 22;18(9):4434.
2. Ferreira ML, De Luca K, Haile LM, Steinmetz JD, Culbreth GT, Cross M, Kopec JA, Ferreira PH, Blyth FM, Buchbinder R, Hartvigsen J. Global, regional, and national burden of low back pain, 1990–2020, its attributable risk factors, and projections to 2050: a systematic analysis of the Global Burden of Disease Study 2021. The Lancet Rheumatology. 2023 Jun 1;5(6):e316-29.
3. Robalo L: Epidemiology of Non-Specific Back Pain in Children and Adolescents: a Systematic Review of Observational Studies, vol. 05; 2015.
4. Smith, B. Ashton, K. Bohl, D. et al. Influence of carrying a backpack on pelvic tilt, rotation, and obliquity in female college students. *Gait &* Posture, (2006) 23, 263–267
5. Avantika Rai1, Shalini Agarawal2 Back Problems Due To Heavy Backpacks in School Children IOSR Journal Of Humanities And Social Science (2013) 2279-0837
6. Mughal ZU, Shafique MA, Aheed B, Khan NA, Syed N, Haseeb A. The burden of back and neck pain in the youth of Pakistan. Journal of Medicine, Surgery, and Public Health. 2024 Apr 1;2:100034
7. Cavallo CM, Hlavaty TM, Tamase MG. A pilot study for the development of a primary prevention program: What is the average weight of a fourth grader's backpack? Work. 20, 2002, 137-158
8. Voll HJ, Klimt F Strain in children caused by carryings schoolbag. Offentl Gesundheitswesen.; (1977 39:369-378
9. American occupational Therapy Association. Backpack Awareness: One of Many Ways That Occupational Therapists Serve Students. 2009 29:59-68

10. Lynch AM, Kashikar-Zuck S, Goldschneider KR, Jones BA. Psychosocial risks for disability in children with chronic back pain. J Pain 2006;7:244-51

11. Aundhakar CD, Bahatkar KU, Padiyar MS, Jeswani DH, Colaco S. Back pain in children associated with backpacks. Indian J Pain 2015;29:29.

12. Yao W, Mai X, Luo C, Ai F, Chen Q. A cross-sectional survey of nonspecific low back pain among 2083 school children in China. Spine (Phila Pa 1976). 2011;36(22):1885–90.

13. 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.

14. Potthoff T, de Bruin ED, Rosser S, Humphreys BK, Wirth B. A systematic review on quantifiable physical risk factors for non-specific adolescent low back pain. Journal of pediatric rehabilitation medicine. 2018 Jul 4;11(2):79-94.

15. Roberts SB, Calligeros K, Tsirikos AI. Evaluation and management of paediatric and adolescent back pain: Epidemiology, presentation, investigation, and clinical management: A narrative review. Journal of Back and Musculoskeletal Rehabilitation. 2019 Nov;32(6):955-88.

16. Calvo-Muñoz I, Kovacs FM, Roqué M, Fernández IG, Calvo JS. Risk factors for low back pain in childhood and adolescence: a systematic review. The Clinical journal of pain. 2018 May 1;34(5):468-84.

17. Minghelli B. Musculoskeletal spine pain in adolescents: Epidemiology of non-specific neck and low back pain and risk factors. Journal of Orthopaedic Science. 2020 Sep 1;25(5):776-80.

18. Spiteri K, Busuttil 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.

19. Jones GT, Watson KD, Silman AJ, Symmons DP, Macfarlane GJ. Predictors of low back pain in British schoolchildren: a population-based prospective cohort study. Pediatrics 2003;111 822-8

20. Natour J, Cazotti Lde A, Ribeiro LH, Baptista AS, Jones A. Pilates improves pain, function and quality of life in patients with chronic low back pain: a randomized controlled trial. Clin Rehabil. 2015; 29:59-68.

21. Jones GT, Macfarlane GJ. Epidemiology of low back pain in children and adolescents. Arch Dis Child. 2005;90(3):312–6.

22. Dockrell S, Simms C, Blake C. Schoolbag carriage and schoolbag-related musculoskeletal discomfort among primary school children. Appl Ergon. 2015;51:281-90

23. Shehab D, Al-Jarallah K, Al-Ghareeb F, Sanaseeri S, Al-Fadhli M, Habeeb S. Is low-back pain prevalent among Kuwaiti children and adolescents? A governorate-based study. Med Princ Pract. 2004;13(3):142–6.

24. Ayed HB, Yaich S, Trigui M, Hmida MB, Jemaa MB, Ammar A, Jedidi J, Karray R, Feki H, Mejdoub Y, Kassis M. Prevalence, risk factors and outcomes of neck, shoulders and low-back pain in secondary-school children. Journal of research in health sciences. 2019 Mar 26;19(1):e00440.

25. Yamato TP, Maher CG, Traeger AC, Wiliams CM, Kamper SJ. Do schoolbags cause back pain in children and adolescents? A systematic review. British Journal of Sports Medicine. 2018 Oct 1;52(19):1241-5

26. Rodríguez-Oviedo P, Santiago-Pérez MI, Pérez-Ríos M, Gómez-Fernández D, Fernández-Alonso A, Carreira-Núñez I, García-Pacios P, Ruano-Ravina A. Backpack weight and back pain reduction: effect of an intervention in adolescents. Pediatric research. 2018 Jul;84(1):34-40.

Authors Contribution:

Ahmed H: Substantial contribution to writing introduction, acquisition of data, has given final approval of the version to get published.

Shahzad S: Substantial contribution to study design, methodology, has given final approval of the version to get published.

Sonia A: Substantial contribution to methodology, data collection, has given final approval of the version to get published.

Iqbal S: Substantial contribution in guiding the literature search, writing discussion, has given final approval of the version to get published.

Perkash O: Substantial contribution in writing discussion and conclusion, has given final approval of the version to get published.

Zubair TM: Substantial contribution in finalizing work, formatting, alignment, has given final approval of the version to get published.