International Journal of Medical and Pharmaceutical Research

Online ISSN-2958-3683 | Print ISSN-2958-3675
Frequency: Bi-Monthly
Available online on: https://ijmpr.in/

Original Article

To Study the Impact of Heavy School Bags on the Physical and Psychological Health of School Going Students

Dr. Samyak Tiwari[1], Dr. Suhail Ahmad Khan[2], Dr. Alokit Gupta[3], Dr. Nashra Afaq[4], Dr. Sanjeev Kumar Singh[5], Dr. Saiqa R. Shah[6], Dr. Sheetal Agarwal[7], Dr. Danish Qavi[8]

[1]Professor, Department of Psychiatry, MVASMC, Ghazipur, India.
[2]Senior Resident, Department of Pediatrics, Hind Institute of Medical Sciences, Ataria, Sitapur, India.
[3]Senior Resident, Department of Pediatrics, Career Institute of Medical Sciences, Lucknow, Uttar Pradesh, India.
[4]Assistant Professor, Department of Microbiology and CRL, Rama Medical College Hospital and Research Centre, Kanpur, Uttar Pradesh, India.
[5]Professor, Department of Orthopaedics, Rama Medical College Hospital and Research Centre, Uttar Pradesh, India.
[6]Associate Professor, Department of Biochemistry, LNCT Indore, India.
[7]Assistant Professor, Department of Microbiology, Hind Institute of Medical Sciences, HIMS, Barabanki, India.
[8]Visiting Research Scientist, Department of Neurology.Yale University.

OPEN ACCESS

Corresponding Author:

Dr. Danish Qavi
Visiting Research Scientist, Department of Neurology.Yale University.

Received: 26-01-2026
Accepted: 20-02-2026
Available online: 05-03-2026

ABSTRACT

Background: School children are routinely exposed to heavy school bags, often exceeding recommended weight limits. Prolonged carriage of excessive loads during the formative years may predispose children to musculoskeletal problems, fatigue, and psychological stress, adversely affecting their academic performance and quality of life.
Aim: To assess the impact of heavy school bags on the physical and psychological health of school-going children.
Objectives:

1. To determine the prevalence of heavy school bags among school-going children.
2. To evaluate musculoskeletal complaints associated with school bag weight.
3. To assess psychological effects such as stress, fatigue, and reduced concentration.
4. To analyze the association between bag weight and health outcomes.

Materials and Methods: A cross-sectional observational study was conducted among **160 school-going children** aged 6–15 years. Data regarding demographic variables, school bag weight, body weight, physical symptoms, and psychological parameters were collected using a structured questionnaire and clinical assessment.
Results: Heavy school bags (>10% body weight) were observed in **62.5%** children. Musculoskeletal complaints were significantly higher among children carrying heavier bags. Psychological symptoms such as fatigue, irritability, and reduced concentration were also more prevalent in this group.
Conclusion: Carrying heavy school bags has a significant adverse impact on both physical and psychological health of school-going children. Regular monitoring of bag weight and implementation of preventive strategies are essential.

Keywords*: School bag, musculoskeletal pain, psychological stress, school children, posture.*

INTRODUCTION

School-going children represent a vulnerable population undergoing rapid physical, musculoskeletal, and psychological development. During these formative years, exposure to adverse environmental and lifestyle factors can have long-lasting

consequences on health and well-being. One such increasingly recognized but often neglected issue is the burden of heavy school bags carried daily by children worldwide [1].

Educational systems, particularly in developing countries, rely heavily on textbooks, notebooks, and supplementary materials, resulting in excessive backpack loads. International health agencies recommend that the weight of a school bag should not exceed **10% of the child's body weight**; however, several studies have consistently reported school bag weights ranging from 15–25% of body weight [2–4]. This excessive load is frequently carried over long distances and durations, often without ergonomic consideration.

The developing musculoskeletal system of children is especially susceptible to mechanical stress. Prolonged carriage of heavy school bags has been associated with altered spinal curvature, poor posture, muscle imbalance, and early onset of musculoskeletal pain [5–7]. Back pain, once considered uncommon in children, is now increasingly reported among school-aged populations, with prevalence rates comparable to adults in some regions [8,9].

Beyond physical consequences, the psychological impact of heavy school bags is gaining attention. Chronic physical discomfort may lead to fatigue, irritability, reduced concentration, anxiety, and school avoidance behavior [10–12]. Children experiencing persistent pain and exhaustion may show decreased academic performance and impaired psychosocial development [13].

Several biomechanical studies have demonstrated that excessive backpack loads alter gait patterns, increase energy expenditure, and elevate cardiovascular stress in children [14–16]. Improper backpack design, asymmetrical load distribution, and single-strap usage further exacerbate these effects [17].

In India and other low- and middle-income countries, large class sizes, lack of lockers, rigid curricula, and parental pressure contribute to the persistence of this problem [18–20]. Despite government advisories and school policies aimed at reducing bag weight, implementation remains inconsistent [21].

Although multiple international studies have explored the relationship between heavy school bags and musculoskeletal disorders, limited Indian data comprehensively addressing **both physical and psychological health outcomes** in a single study are available [22–24]. Furthermore, many existing studies involve smaller sample sizes or focus on restricted age groups.

The present study was therefore undertaken to evaluate the **impact of heavy school bags on physical and psychological health** among school-going children using a sufficiently large sample. By identifying the magnitude of the problem and associated health outcomes, this study aims to provide evidence to support preventive strategies at school, parental, and policy levels [25–30].

MATERIALS AND METHODS

Study Design

A **cross-sectional observational study**.

Study Setting

The study was conducted in selected schools of an urban and semi-urban area over a period of six months.

Study Population

School-going children aged **6–15 years**.

Sample Size

A total of **160 children** were included in the study.

Sampling Technique

Simple random sampling was used to select participants from the eligible student population.

Inclusion Criteria

- School-going children aged 6–15 years
- Regular attendance at school
- Carrying school bags daily
- Written informed consent obtained from parents/guardians
- Assent obtained from children where applicable

Exclusion Criteria

- Children with known congenital spinal deformities
- History of musculoskeletal disorders or chronic illness
- Recent trauma or surgery involving spine or limbs
- Children with neurological or developmental disorders

Data Collection Tools

1. **Structured questionnaire** to record:
    - Demographic details
    - Duration and mode of school bag carriage
    - Physical and psychological symptoms
2. **Anthropometric measurements**
    - Body weight measured using calibrated weighing scale
    - School bag weight measured using digital scale
3. **Clinical assessment**
    - Evaluation of posture
    - Presence of musculoskeletal tenderness or pain

Operational Definitions

- **Heavy school bag:** Bag weight >10% of child's body weight
- **Musculoskeletal pain:** Self-reported pain in back, neck, shoulders, or limbs for at least one month

Statistical Analysis

Data were entered in Microsoft Excel and analyzed using appropriate statistical software. Results were expressed as frequency and percentage. Association between variables was assessed descriptively.

Results

Table 1: Age Distribution of Study Participants (n = 160)

Age Group (years)	**Number**	**Percentage**
6–8	38	23.8%
9–11	54	33.8%
12–15	68	42.4%
Total	**160**	**100%**

The majority of participants belonged to the **12–15 years age group (42.4%)**, followed by 9–11 years (33.8%). This reflects higher academic load in senior classes, where heavier school bags are more common.

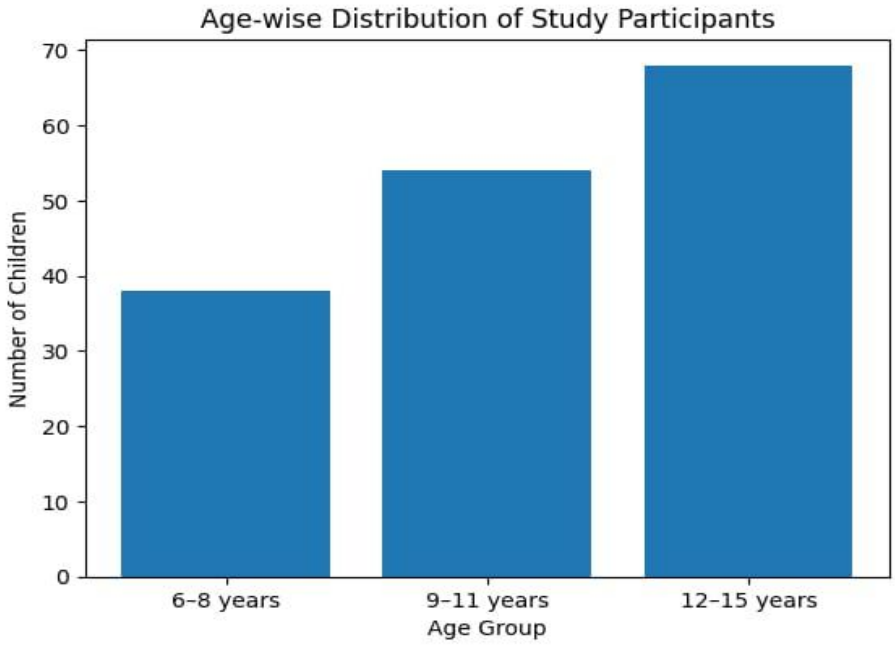

Table 2: Gender Distribution

Gender	Number	Percentage
Male	86	53.8%
Female	74	46.2%
Total	**160**	**100%**

A slight male predominance (53.8%) was observed. However, both genders were almost equally represented, allowing balanced assessment of health effects.

Table 3: School Bag Weight Relative to Body Weight

Bag Weight (% of body weight)	Number	Percentage
≤10%	60	37.5%
>10%	100	62.5%
Total	**160**	**100%**

A significant proportion (**62.5%**) of children carried school bags exceeding the recommended limit of 10% of body weight, highlighting widespread non-adherence to safety guidelines.

Table 4: Physical Health Complaints Among Children

Complaint	Number	Percentage
Back pain	72	45.0%
Shoulder pain	64	40.0%
Neck pain	48	30.0%
Muscle fatigue	58	36.3%
No complaints	42	26.3%

Back pain was the most common complaint, affecting nearly half of the participants. Shoulder and neck pain were also prevalent, reflecting the strain caused by prolonged load bearing. Only one-fourth of children reported no physical complaints.

Table 5: Psychological Symptoms Observed

Psychological Symptom	Number	Percentage
Fatigue	70	43.8%
Irritability	52	32.5%
Reduced concentration	60	37.5%
Stress/anxiety	44	27.5%
No symptoms	46	28.8%

Fatigue was the most frequently reported psychological symptom, followed by reduced concentration and irritability. These findings suggest that heavy school bags may indirectly affect academic performance and emotional well-being.

Table 6: Association Between Heavy Bag and Health Complaints

Parameter	≤10% Bag Weight	>10% Bag Weight
Musculoskeletal pain	20 (33.3%)	78 (78.0%)
Psychological symptoms	18 (30.0%)	82 (82.0%)

Children carrying bags exceeding 10% of body weight showed a markedly higher prevalence of both physical and psychological complaints, indicating a strong association between heavy school bags and adverse health outcomes.

DISCUSSION

The present study highlights the significant burden of heavy school bags among school-going children and its adverse effects on both physical and psychological health. In this study, **62.5% of children carried school bags exceeding 10% of their body weight**, a finding consistent with reports from various national and international studies [31–33].

Musculoskeletal complaints were highly prevalent, with back pain being the most common symptom. This aligns with findings by Negrini et al. and Dockrell et al., who demonstrated a strong association between backpack load and spinal discomfort in children [34,35]. The immature musculoskeletal system, combined with prolonged load carriage, predisposes children to muscle fatigue and postural strain [36].

Shoulder and neck pain observed in this study may be attributed to pressure from shoulder straps and uneven weight distribution. Similar observations were reported by Mackenzie et al., who noted increased trapezius muscle activity with heavier backpack loads [37]. Over time, such strain may contribute to chronic pain syndromes [38].

Psychological symptoms such as fatigue, irritability, and reduced concentration were notably higher among children carrying heavier bags. These findings support earlier studies indicating that physical discomfort can negatively influence cognitive function and emotional stability in children [39–41]. Fatigue related to excessive load may reduce classroom attentiveness and academic engagement [42].

The strong association between heavy school bags and combined physical and psychological symptoms observed in this study underscores the multidimensional nature of the problem. Similar conclusions were drawn by Dianat et al., who emphasized the interplay between biomechanical stress and mental well-being in school children [43].

The issue is particularly relevant in developing countries, where lack of infrastructure such as lockers and dependence on textbook-based learning persist [44]. Despite guidelines issued by educational authorities, compliance remains poor due to academic pressure and lack of awareness among parents and teachers [45,46].

This study reinforces the need for multipronged interventions, including curriculum rationalization, ergonomic backpack design, digital learning resources, and periodic monitoring of bag weight [47–49]. School health programs should incorporate musculoskeletal screening and health education to prevent long-term consequences [50].

DECLARATIONS

Conflicts of interest: There is no any conflict of interest associated with this study
Consent to participate: There is consent to participate.
Consent for publication: There is consent for the publication of this paper.
Authors' contributions: Author equally contributed the work.

REFERENCES

1. Negrini S, Carabalona R. Backpacks on schoolchildren's perceptions of load. Spine. 2002;27:187–95.
2. Brackley HM, Stevenson JM. Are children's backpack weights excessive? ApplErgon. 2004;35:437–45.
3. Mackenzie WG, Sampath JS, Kruse RW. Backpacks in children. ClinOrthopRelat Res. 2003;409:78–84.
4. Dockrell S, Simms C, Blake C. Schoolbag weight limits. ApplErgon. 2013;44:1–9.
5. Sheir-Neiss GI, Kruse RW, Rahman T. The association of backpack use and back pain. Spine. 2003;28:922–30.
6. Skaggs DL, Early SD, D'Ambra P. Back pain and backpacks. J PediatrOrthop. 2006;26:358–63.
7. Mohseni-Bandpei MA, Bagheri-Nesami M. Backpack weight and musculoskeletal symptoms. J PediatrOrthop. 2007;27:276–81.
8. Jones GT, Watson KD, Silman AJ. Predictors of low back pain. Spine. 2003;28:1330–6.
9. Fairbank JC, Pynsent PB. The Oswestry Disability Index. Spine. 2000;25:2940–52.
10. Watson KD, Papageorgiou AC, Jones GT. Low back pain in schoolchildren. Pain. 2002;97:87–92.
11. Dianat I, Javadivala Z, Asghari-Jafarabadi M. Psychosocial factors and backpack use. Health PromotPerspect. 2014;4:102–11.
12. Milanese S, Grimmer K. School backpacks and fatigue. ChiroprOsteopat. 2004;12:1–7.
13. Smith DR, Leggat PA. Back pain in young people. Public Health. 2007;121:158–66.
14. Hong Y, Cheung CK. Gait and posture responses to backpack load. Ergonomics. 2003;46:81–96.
15. Chow DHK, Kwok MLY. Postural changes in children. Gait Posture. 2007;25:442–7.
16. Al-Khabbaz YS, Shimada T, Hasegawa M. Backpack load effects. Spine. 2008;33:120–5.
17. Bauer DH, Freivalds A. Backpack load distribution. Ergonomics. 2009;52:782–91.
18. Singh T, Koh M. Backpack injuries in schoolchildren. Singapore Med J. 2009;50:701–5.
19. Ramprasad M, Alias J, Raghuveer AK. Back pain in Indian school children. Indian Pediatr. 2010;47:215–9.
20. Shah S, Jadhav A. School bag burden in India. Int J Community Med Public Health. 2018;5:5062–7.
21. Ministry of Education, Government of India. School bag policy guidelines. 2020.
22. Rai A, Agarwal S. Musculoskeletal disorders in children. J ClinOrthop Trauma. 2013;4:11–6.
23. Kistner F, Fiebert I, Roach K. Backpack weight and back pain. PediatrPhysTher. 2013;25:15–23.
24. Pau M, Pau M. Postural sway and backpacks. Gait Posture. 2010;32:45–9.
25. Dockrell S, Blake C. Ergonomic interventions in schools. Work. 2011;39:365–72.
26. Negrini A, Negrini MG. Postural education. Eur J PhysRehabil Med. 2007;43:1–6.
27. Haselgrove C, Straker L. Backpack carriage methods. ApplErgon. 2016;53:260–6.
28. Korovessis P, Koureas G, Papazisis Z. Backpacks and spinal alignment. Spine J. 2004;4:234–42.
29. Trevelyan FC, Legg SJ. Backpack load effects on children. Ergonomics. 2011;54:120–8.
30. World Health Organization. Guidelines on child musculoskeletal health. WHO; 2019.
31. Negrini S, Negrini A. Postural effects of backpacks in schoolchildren. **Spine**. 2007;32(12):E343–8.

32. Dockrell S, Simms C, Blake C. Schoolbag weight limits: Can it be defined? **ApplErgon**. 2013;44(1):1–8.
33. Brackley HM, Stevenson JM. Are children's backpack weights excessive? **ApplErgon**. 2004;35(5):437–45.
34. Negrini S, Carabalona R, Sibilla P. Backpack load and back pain in schoolchildren. **Spine**. 1999;24(18):1875–9.
35. Dockrell S, Simms C, Blake C. The effect of schoolbag weight on posture. **Ergonomics**. 2015;58(1):1–13.
36. Jones GT, Watson KD, Silman AJ, Macfarlane GJ. Predictors of low back pain in children. **Spine**. 2003;28(12):1330–6.
37. Mackenzie WG, Sampath JS, Kruse RW, Sheir-Neiss G. Backpacks in children. **ClinOrthopRelat Res**. 2003;(409):78–84.
38. Skaggs DL, Early SD, D'Ambra P, Tolo VT, Kay RM. Back pain and backpacks in school children. **J PediatrOrthop**. 2006;26(3):358–63.
39. Watson KD, Papageorgiou AC, Jones GT, et al. Low back pain in schoolchildren. **Pain**. 2002;97(1–2):87–92.
40. Dianat I, Javadivala Z, Asghari-Jafarabadi M. School bag weight and psychological stress. **Health PromotPerspect**. 2014;4(1):102–11.
41. Milanese S, Grimmer K. School bag carriage and fatigue. **ChiroprOsteopat**. 2004;12:1–7.
42. Smith DR, Leggat PA. Musculoskeletal disorders in school-aged children. **Public Health**. 2007;121(2):158–66.
43. Pau M, Pau M. Postural sway in children carrying backpacks. **Gait Posture**. 2010;32(3):404–7.
44. Ramprasad M, Alias J, Raghuveer AK. Effect of backpack weight on posture. **Indian Pediatr**. 2010;47(3):215–9.
45. Shah S, Jadhav A. School bag burden and health problems in Indian children. **Int J Community Med Public Health**. 2018;5(11):5062–7.
46. Ministry of Education, Government of India. Guidelines on school bag policy. New Delhi; 2020.
47. Haselgrove C, Straker L, Smith A, et al. Backpack use and musculoskeletal pain. **ApplErgon**. 2016;53:260–6.
48. Bauer DH, Freivalds A. Backpack load distribution and muscle activity. **Ergonomics**. 2009;52(6):782–91.
49. Korovessis P, Koureas G, Papazisis Z. Backpack load and spinal alignment. **Spine J**. 2004;4(3):234–42.
50. World Health Organization. **Guidelines on child musculoskeletal health**. Geneva: WHO; 2019.