

## Weight of Schoolbags Among Indian Schoolchildren in Pune and Hyderabad

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Received: April 15, 2019;

Initial review: September 19, 2019;

Accepted: July 06, 2020.

**Objective:** This study was done to determine proportion of children carrying heavy school bags and to compare new guidelines issued by Government of India on school bag weight limit, based on class of the child with previous guidelines based on child's weight. **Methods:** A cross-sectional study was done among students of schools from two cities of India – Pune and Hyderabad. Weight of school bag of 1321 children was measured and classified as 'heavy' or 'normal' based on existing as well as new guidelines. Agreement between two guidelines was also calculated. **Results:** In our study, 722 (77.2%) out of 935 students from class 1-10 were found to be carrying 'heavy' school bags. Kappa coefficient for agreement between two guidelines was 0.55 (0.47,0.60) indicating moderately strong agreement. **Conclusions:** Large proportion of school children are carrying school bags with weight beyond permissible limits. There is a need for all stake holders to take steps to reduce weight of school bags.

**Keywords:** Bags, Child, Education, India, School.

In present times, school children have to carry heavy schoolbags due to number of books, notebooks and variety of other materials they are required to bring in their school. Heavy school bags can lead to number of musculoskeletal problems like backache, shoulder pain, pain in hand and wrist, and spinal deformities among children [1-6]. Heavy school bags have also been found to be associated with poor educational outcomes and absenteeism. There are laid down guidelines that school bag should not be more than 10% of child's weight [2,7,8] and there shall not be any school bag for a child studying in nursery and kindergarten classes [9]. However, various studies carried out in India as well as in other countries have brought out that school children are carrying school bags with weight beyond permissible limits [1-6,10-12]. Recently, Ministry of Human Resource Development, Government of India issued new guide-lines for school bag weight [13]. According to these guidelines, maximum permissible weight of school bags has been specified according to the class in which a child is studying. We carried out this study on school bag weights of school children in India to estimate proportion of children carrying schoolbags heavier than recommended weight as per previous as well as newer guidelines. We also investigated level of agreement between these two guidelines in our study.

### METHODS

This cross-sectional study was done in selected schools

in Pune and Hyderabad city of India. School children studying in all grades of selected schools *i.e.* from Nursery to 10th standard were included in this study. Minimum sample size required to estimate proportion of school children carrying heavy school bags in our study, assuming that proportion to be 76% [10], with 95% confidence level and 2.5% error of margin was 1121. Assuming non-response rate of 15%, we planned to include 1325 students in this study. Simple random sampling was used to select the students for this study.

Administrative permissions were taken from respective school authorities to carry out this study. Institutional Ethics Committee approval was also obtained. Parents' consent and children assent was taken for participation in this study. Students particulars including date of birth were obtained from school records. A digital weighing machine was used to measure weight of students with bag and without bag. Difference in these two weights was used to calculate weight of school bag. Shoes of students were removed before measuring weight. We used two criteria to classify school bag as 'heavy': (i) Criterion 1 – According to child's weight - If school bag weight was more than 10% of child's weight [9]; and (ii) Criterion 2- According to class - If school bag weight was more than 1.5 kg for class 1 & 2, more than 3 kg for class 3-5, more than 4 kg for class 6-7, more than 4.5 kg for class 8-9, and more than 5 kg for class 10th [13].

*Statistical analysis:* Student t test was used to compare

continuous variables between two groups. Kappa coefficient was used to measure agreement between two guidelines regarding overweight of school bags. R software ver 3.2.0 was used for data analysis.

## RESULTS

A total of 1321 students (708 male) participated in this study, mean (SD) schoolbag weight was 3.81 (2.45) Kg. Distribution of students as per different classes is shown in **Table I**. Class 8 students had highest mean school bag weight [8.05 (2.87) kg]. However, class 6 students were found to be carrying highest school bag weight in terms of their body weight [21.65 (8.93)%]. Mean school bag weight as per different classes is shown in **Table I** and **Figs. 1** and **2**. There was no significant difference in mean (SD) school bag weight of boys and girls in our study [3.92 (2.67) kg vs 3.68 (2.17) kg,  $P=0.07$ ], or mean (SD) school bag weight as percentage of body weight [13.9 (6.55) vs 13.9 (5.95);  $P=0.9$ ].

According to guidelines, children studying in nursery and kindergarten should not be carrying any schoolbag. However, in our study we found that children studying in these pre-primary classes were also carrying school bags with weights as mentioned in **Table I**. Hence, we assumed that 100% of these pre-primary school children were carrying 'heavy' school bags. We excluded these children from further analysis.

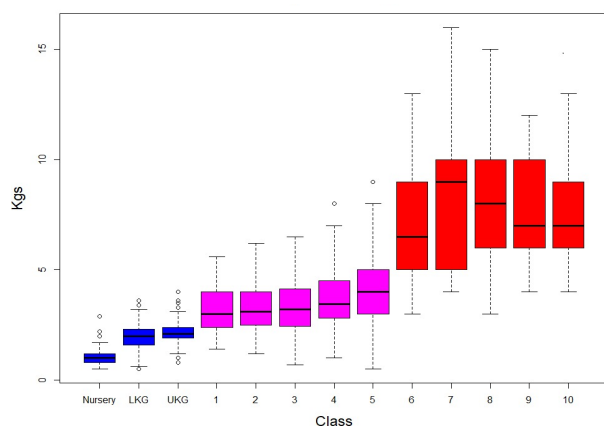
We used two criteria to classify school bag weight as 'high' for school children studying in grades 1-10. We found that more than 77% school children were carrying school bag with more than recommended weight. Distribution of these students as per their grade is shown in **Table II**.

**Table I Weight of Schoolbag in the Enrolled Children (N=1321)**

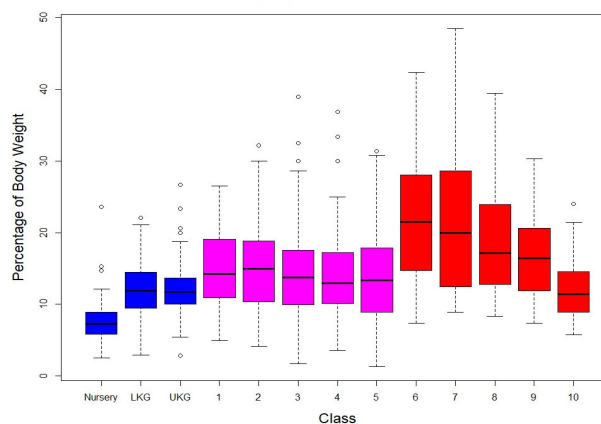
Grade	Number of children	Schoolbag weight (kg)	Schoolbag weight as body weight percentage (%)
Nursery	101	1.08 (0.40)	7.6 (2.9)
LKG	145	1.94 (0.58)	11.9 (3.92)
UKG	140	2.18 (0.54)	12.3 (3.78)
1	82	3.15 (0.91)	14.9 (5.37)
2	145	3.33 (1.12)	14.9 (5.55)
3	147	3.40 (1.21)	14.4 (6.11)
4	132	3.65 (1.26)	13.8 (5.76)
5	186	4.15 (1.44)	13.8 (6.12)
6	38	6.89 (2.53)	21.6 (8.93)
7	41	7.78 (2.86)	20.4 (9.14)
8	53	8.05 (2.87)	18.9 (7.86)
9	50	7.46 (2.38)	16.9 (6.02)
10	61	7.56 (2.15)	12.0 (4.0)

LKG: Lower kindergarten; UKG: Upper kindergarten; values in mean (SD).

Although Criterion 1 and Criterion 2 classified almost equal number of school bags (724 and 722, respectively) as 'heavy'; only 647 bags were classified as heavy by both criteria (**Table III**). Overall, agreement in these two criteria for classification of schoolbag weight as heavy or otherwise was 83.7% [Kappa co-efficient (95% CI): 0.55 (0.47, 0.60)] indicating moderately strong agreement in these two guidelines.



**Fig. 1** Boxplot showing weight of school bag (in kgs) for different grades.



**Fig. 2** Boxplot showing weight of school bag (as percentage of body weight) in students of different grades.

**Table II Distribution of Children Carrying Heavy School Bags in Pune and Hyderabad (N=935)**

Grade	No.			Number (%) carrying heavy school bags*	
	M	F	Total	Criterion I n=724	Criterion II n=722
1	35	47	82	67 (81.7)	79 (96.3)
2	80	65	145	111 (76.6)	138 (95.2)
3	79	68	147	108 (73.5)	78 (53.1)
4	77	55	132	102 (77.3)	82 (62.1)
5	103	83	186	129 (69.4)	131 (70.4)
6	22	16	38	35 (92.1)	31 (81.6)
7	21	20	41	38 (92.7)	36 (87.8)
8	26	27	53	49 (92.5)	50 (94.3)
9	28	22	50	46 (92.0)	47 (94.0)
10	29	32	61	39 (63.9)	50 (82.0)

\*Criterion I -Bag weight >10% of Bodyweight [9] and Criterion II – Bag weight more than guidelines issued by Government of India [13].

## DISCUSSION

In this study, we observed that weight of school bags was much higher than recommended weight-limit. Though pre-primary students should not carry schoolbags, in our study all pre-primary students were carrying school bags with books and note-books. We found that very high proportion of students in grades 1-10 were carrying heavy school bags, which should be a cause for concern. We also observed that problem of heavy weight of school bags increased from class 6 onwards. Similar proportion of children were classified as carrying heavy school bags by both the guidelines for school bag weights and there was moderately strong agreement between these two guidelines.

This is the first study to evaluate new guidelines issued by Government of India regarding schoolbag weight with previous guidelines and we included students from all classes of school in our study. However,

**Table III Agreement Between the Two Criteria for Classifying Schoolbag Weight as ‘Heavy’ or ‘Normal’**

		Criterion I	
		Heavy (n=724)	Normal (n=211)
Criterion 2	Heavy (n=722)	647	75
	Normal (n=213)	77	136

Criterion I -Bag weight >10% of Bodyweight [9] and Criterion 2 – Bag weight more than guidelines issued by Government of India [13].

major limitation of this study is that we have included selected schools from two cities only; hence, generalizability of study findings is limited.

Our findings are similar to study by Oka, *et al.* [10] in two urban areas which also found 76% of schoolchildren carrying heavy bags, though another study [12] in rural Maharashtra found less than 50% of students with heavy school bags. These variations indicate that there may be difference in number of books and notebooks being carried by students in urban and rural area schools. Few studies [5,6] had reported that boys carry heavier school bags as compared to girls; however, we did not find any significant difference in weight of school bags of boys and girls. Our finding of significant increase in school bag weight in higher classes of school is similar to previous studies [3,11].

Our findings highlight the need to implement Government guidelines regarding school bag weight in true spirit. Education department can make curriculum more practical problems oriented and less theory intensive, which will help in reducing the burden of books children have to carry. Schools can also make timetable for classes in such a way that students need to bring books related to few subjects only on a given day. Also, books and note books which students may not require at home, can be kept in school itself. Use of papers and files instead of notebooks can also help in reducing weight of school bags. Judicious use of computers and tablets in schools can also reduce the burden of books for students. Parents also need to ensure that their child carried minimum required books and notebooks to school, as many times children tend to take all books and notebooks to school.

*Contributors:* RKJ: study design, data collection and analysis, preparation of manuscript; SM: Data collection, analysis and manuscript preparation; AYR: study conceptualization, data collection and critical revision of manuscript; LP: study design, data collection and manuscript preparation; MK: Study conceptualization and design, data collection, interpretation and critical revision of manuscript. All authors approved the final version of manuscript and agree to be accountable for authenticity and integrity of the work.

*Funding:* None; *Competing interest:* None stated.

## REFERENCES

1. Aundhakar C, Bahatkar K, Padiyar M, Jeswani D, Colaco S. Back pain in children associated with backpacks. *Indian J Pain.* 2015;29:29-31.
2. Janakiraman B, Ravichandran H, Demeke S, Fasika S. Reported influences of backpack loads on postural deviation among school children: A systematic review. *J Educ Health Promot.* 2017;6:41.
3. Balamurugan J. School bags and musculoskeletal pain among elementary school children in Chennai city. *Int J*

### WHAT THIS STUDY ADDS?

- New guidelines regarding schoolbag weight based on class of child have moderately strong agreement with previous guidelines based on child's weight.

- Med Sci Clin Invent. 2014;1:302-9.
- Ramprasad M, Alias J, Raghuveer AK. Effect of backpack weight on postural angles in preadolescent children. *Indian Pediatr.* 2010;47:575-80.
  - Brzek A, Dworak T, Strauss M, Sanchis GF, Sabbah I, Dworak B, *et al.* The weight of pupils' schoolbags in early school age and its influence on body posture. *BMC Musculoskelet Disord.* 2017;18:117.
  - Mandic S, Keller R, Bengoechea EG, Moore A, Coppel KJ. School bag weight as a barrier to active transport to school among New Zealand adolescents. *Children.* 2018;5:129.
  - Bauer DH, Freivalds A. Backpack load limit recommendation for middle school students based on physiological and psychophysical measurements. *Work.* 2009;32:339-50.
  - Department of Education Maharashtra State Government. Government resolution regarding reducing bag-weights among school 2016. Available from: <https://www.maharashtra.gov.in/Site/Upload/Government%20Resolutions/Marathi/201507171135220721.pdf>. Accessed July 15, 2019.
  - Government of India. The Children School Bags (Limitation on weight) Bill 2006. Available from: [http://164.100.24.219/billtexts/rsbilltexts/AsIntroduced/LXXXVI\\_%202006.pdf](http://164.100.24.219/billtexts/rsbilltexts/AsIntroduced/LXXXVI_%202006.pdf). Accessed September 17, 2019.
  - Oka GA, Ranade AS, Kulkarni AA. Back pain and school bag weight - a study on Indian children and review of literature. *J Pediatr Orthop B.* 2019;28:397-404.
  - Mohan M, Singh U, Qudus N. Effect of backpack loading on cervical and shoulder posture in Indian school children. *Indian J Physiother Occup Therapy.* 2007;1:3-12.
  - Ashtekar SV, Powar JD, Aqsa S, Padhyegurjar SB, Padhyegurjar MS, Banginwar A. Schoolbag-weights and musculo-skeletal complaints in three schools in rural Maharashtra. *Natl J Community Med.* 2017;8:572-8.
  - Directorate of Education, Government of National Capital Territory of Delhi. Reducing the weight of school bags in primary and secondary schools. Available from: [http://www.edudel.nic.in/upload/upload\\_2017-18/1667dt\\_30112018.PDF](http://www.edudel.nic.in/upload/upload_2017-18/1667dt_30112018.PDF). Accessed January 25, 2020.