



Original Research Article

Burden of Heavy Schoolbag among High School Students and Its Relation with Their Physical Growth in Mysore and Chamarajanagar District

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ABSTRACT

Background: Adolescent age group which has its own health issues, are carrying schoolbags weighing more than the recommended cut off of 10%. This in long term will effect on their vertebral column, shoulders as indicated by low back aches, discomfort in shoulder and rounding of shoulders.

Objectives: 1) To find out average school bag weight of the high school children **2)** To find out its relation with physical growth of the children.

Methodology: This cross sectional study in Govt. Aided and private high schools of Mysore and Chamarajanagar districts was done during July to December 2013 covering 1,981 students. School bags including books, lunch box, and water bottle of students of class 8th to 10th were weighed using Salter's baby weighing scale one time between Mondays to Friday on non-exam days.

Results: Mean school bag weight of the high school children was 5.85 ± 1.67 Kg. Rural children carried heavier bags (6.17 ± 1.61) than the urban children (5.53 ± 1.63). For 8th, 9th and 10th standards the bag weighed 6.08 ± 1.60 , 5.65 ± 1.68 and 5.90 ± 1.62 respectively on an average. Heaviest bag weighed upto 11.7 kg of a 9th standard student, with a median value of 6Kgs. Girls carried comparatively heavier bags than the boys in 8th and 9th classes. 86% of the children were carrying bags heavier than the cut off value 10% of the body weight. On an average rural children's bag was heavier by 2% of their body weight compared to urban children. 61.03% of the children carried bags weighing more than 15% of the body weight.

Conclusion: 86 % children were carrying bags heavier than recommended.

Keywords: Schoolbag weight, high school, physical growth

INTRODUCTION

With the growing population of India, there is competition in every field of the society. Education sector is well known for its healthy competition from ancient times. But, in recent years this competition is taking quantitative form rather than quality of the learning. In an effort to make

the child more and more capable for getting the desired positions in life, the syllabus and curriculum in most schools are so designed that they are trying to flood the child's brain with the known facts as soon as possible. In this process child is made to mug up information from the text books, notes and reports. Children are assigned with projects

which are done most of the times by their parents. Every day they carry textbooks, notes, lunch boxes, water bottle and other accessories which weigh upto or more than 25% of their bodyweight. ^[1]

Preschool and primary school kids in urban area are suffering more from this 'educational load' compared to rural areas because of the 'convent culture'. The difference narrows down when it comes to high school. Adolescents in high school are also suffering from this new form of 'child labour' along with age related health and behavioral challenges related to their age. The national survey conducted in 10 cities by business chamber Assocham including Delhi, Kolkata, Chennai, Bangalore, Mumbai, Hyderabad, Pune, Ahmedabad, Lucknow, Jaipur and Dehradun says nearly 58 per cent children below the age of 10 suffer from mild back pain. ^[1] This can develop into chronic pain and later a hunchback. Excessive and uneven loads have been linked to an increased risk of back problems and deformation of the spine. Stress from excess weight may harm and affect growth of musculo-skeletal system. School bags weighing more than 15 % of body weight are likely to cause back, neck and shoulder pain, numbness of hands and fatigue. Due to undue stress on muscles and ligaments of the spine, it causes the spine to bend forward or sideways. In the long run, this may cause damage to spine and muscle spasms. ^[1] 60% of the primary school children in India being thin for their age, ^[6] the chances of these deformities increase further.

Delhi is leading in this culture among metros where many children are forced to carry as much as over 35 per cent of their own weight on their back. Another survey revealed that 82% of the children suffer from backaches, the highest number being from Delhi. ^[1]

Considering the hazards related, the Ministry of Human Resource & Development (MHRD) has been issued guidelines to limit the load but that seems to fail in bringing considerable change in the system. ^[2] As a result of efforts from people's campaign, in 1993 Prof. Yashpal Committee first recommended reduction in the weight of school bags. Based on its report, MHRD asked the NCERT (National council of Education Research and Training) to rework school syllabus in order to reduce the load of books. The Central Board for School Education (CBSE), too, framed relevant guidelines for its schools. But they were not being made mandatory as there is no regulatory mechanism.

As per the Children's Schoolbag Act of 2006, schoolbag should not weigh over 10% of the body weight. Nursery and kindergarten students should carry no schoolbag. The state government should provide appropriate lockers at schools. Schools violating such provisions are liable to face a penalty of up to Rs3 lakh; a subsequent violation may lead to de-recognition (School bag act 2006). ^[3]

But the reality is, children carry over 35% of their weight on their backs. Most of the schools don't have appropriate lockers. They have no guidelines on bags and no school violating the provisions has faced the action. ^[3]

To assess the status of this burden this study was conducted with the objectives to, find out average school bag weight of the high school children 2) to find out its relation with physical growth of the children.

MATERIALS AND METHODS

Study setting: Government aided and Private high schools under a private organization in Mysore and ChamaraJanagara District of Karnataka, India.

Study population and period: Students studying in these high schools (class 8th, 9th and 10th) during July to September 2014

Study design: Cross sectional facility based survey.

Sample size: Totally 1981 children which included 1003 urban and 978 rural children were covered from fifteen schools. This was a whole sample study as all children in the selected schools were included.

Sampling Technique: Systematic random sampling method was applied for the selection of the schools. Schools visited on every third day of the school health check up schedule were included in the study. All the children present on the day of visit were included.

Exclusion Criteria: Schools which had academic or cultural events, exams or any social event on the day of visit.

Data Collection: Department of Community Medicine, JSS Medical College, JSS University conducts school health check up for its sister institutions every year. As a part of this, school bag weight assessment was done. On visiting selected school, the objectives of the study were explained to the Head master / Principal of the school and informed verbal consent was obtained. Children in each class were instructed to put the books and other materials like water bottle, Tiffin box which they usually bring from home in the school bag. The weight of the bag was recorded using validated Salter's baby weighing scale with an accuracy of ± 100 gm weight, by a trained group D worker. Later bare foot height of the child was recorded against the wall marked with centimeter readings and weight with minimal clothing (school uniform) were recorded by trained interns, along with other routine medical examination under the supervision of an Assistant Professor. Children and teachers were educated regarding the effects of the heavy bag weight on physical growth of the child.

Statistical analysis: Data was entered in excel sheet and analyzed for the distribution of school bag weight according to the class and sex of the child separately for urban and rural areas using mean and standard deviation. Growth pattern in terms of BMI of the child was compared in acceptable and heavy bag weight categories using student t test. Institutional ethical committee clearance was obtained for the study.

RESULTS

Totally 1981 students were included in the study from 15 schools. From the urban area 1003 children (6 schools) and 978 from the rural area (9 schools) were assessed. 1075 students were boys and 906 girls. 626, 846 and 509 children were from 8th, 9th and 10th standard respectively.

As seen in table 1, mean school bag weight of the high school children was 5.85 ± 1.67 Kg. Rural children carried heavier bags (6.17 ± 1.61) than the urban children (5.53 ± 1.63). Heaviest bag weighed upto 11.7 kg of a 9th standard student; with a median value of 6Kgs. 8th standard students carried the heavier bags which went on reducing in 9th and 10th classes. Girls carried comparatively heavier bags than the boys in 8th and 9th classes.

As seen in table 2, 86% of the children were carrying bags heavier than the cut off value 10% of the body weight. Heaviest bag weighed 35% of the child's weight. On an average rural children's bag was heavier by 2% of their body weight compared to urban children. 61.03% of the children carried bags weighing more than 15% of the body weight which is known to affect their musculoskeletal growth.

Significant moderate negative correlation was observed between physical growth in terms of BMI and schoolbag weight in terms of proportional body weight (Pearson correlation coefficient -0.474, $p < .001$). As seen in table 4, there was a

difference of 2.3 Kg/mtr² [2] between children carrying bag weighing more than cut off. Among boys and girls this difference was 2.4 and 2.6 Kg/mtr² respectively. As seen in

table 3, there was statistically significant lag in physical growth of the children carrying bags heavier than 15% of their body weight.

Table 1: Distribution of school bag weight and bag weight as proportional body weight according to sex, class and locality of the high school students.

Class	Sex	Urban			Rural			Total		
		No. of students	Mean bag weight(SD)	Mean%body weight(SD)	No. of students	Mean bag weight(SD)	Mean%body weight(SD)	No. of students	Mean bag weight(SD)	Mea%body weight(SD)
8th	Male	188	5.20(1.67)	14.47(4.98)	160	6.59(1.25)	21.86(5.77)	348	5.84(1.64)	17.87(6.50)
	Female	154	6.15(1.56)	16.34(5.16)	124	6.65(1.3)	20.00(5.09)	278	6.37(1.50)	17.98(5.44)
	Total	342	5.63(1.69)	15.32(5.14)	284	6.62(1.31)	21.05(5.55)	626	6.08(1.60)	17.92(6.05)
9th	Male	240	5.00(1.67)	12.71(4.72)	249	5.76(1.60)	16.57(5.42)	489	5.38(1.68)	14.68(5.44)
	Female	201	5.80(1.42)	14.64(4.26)	156	6.29(1.81)	16.79(5.24)	357	6.02(1.62)	15.58(4.82)
	Total	441	5.36(1.61)	13.59(4.61)	405	5.96(1.70)	16.66(5.35)	846	5.65(1.68)	15.06(5.20)
10th	Male	86	5.73(1.91)	12.49(4.78)	152	6.25(1.62)	16.16(4.71)	238	6.06(1.74)	14.83(5.04)
	Female	134	5.72(1.30)	13.68(3.70)	137	5.78(1.67)	14.93(4.87)	271	5.75(1.50)	14.32(4.37)
	Total	220	5.72(1.56)	13.22(4.18)	289	6.03(1.66)	15.58(4.81)	509	5.90(1.62)	14.56(4.70)
Total	Male	514	5.19(1.73)	13.32(4.90)	561	6.13(1.55)	17.97(5.88)	1075	5.68(1.70)	15.75(5.90)
	Female	489	5.89(1.44)	14.92(4.54)	417	6.23(1.68)	21.86(5.77)	906	6.05(1.56)	15.94(5.10)
	Total	1003	5.53(1.63)	14.10(4.79)	978	6.17(1.61)	20.00(5.09)	1981	5.85(1.65)	15.83(5.55)

Table 2: Distribution of mean BMI of the highschool children, according to their school bag weight as percentage body weight.

class		Bag weight as %body weight	Urban			Rural			Total		
			N(%)	Mean BMI	Std. Deviation	N(%)	Mean	Std. Deviation	N(%)	Mean	Std. Deviation
8th	Male	Upto 10%	38(20.2)	17.38	3.08	2(1.3)	18.55	0.80	40(11.5)	17.44	3.01
		More than 10%	150(79.8)	16.30	2.04	158(98.7)	15.02	2.50	308(88.5)	15.64	2.37
		Total	188	16.52	2.32	160	15.06	2.52	348	15.85	2.51
	Female	Upto 10%	16(10.4)	20.55	4.28	1(0.8)	20.25	-	17(6.1)	20.53	4.14
		More than 10%	138(89.6)	17.22	2.93	123(99.2)	16.03	2.55	261(93.9)	16.66	2.81
		Total	154	17.57	3.24	124	16.06	2.56	278	16.90	3.05
	Total	Upto 10%	54(15.8)	18.32	3.73	3(1.1)	19.11	1.13	57(9.1)	18.36	3.64
		More than 10%	288(84.2)	16.74	2.54	281(98.9)	15.46	2.57	569(90.9)	16.11	2.63
		Total	342	16.99	2.82	284	15.50	2.58	626	16.31	2.81
9th	Male	Upto 10%	74(30.8)	17.96	3.51	22(8.8)	17.81	2.93	96(19.6)	17.92	3.37
		More than 10%	166(69.2)	16.21	2.35	227(91.2)	15.58	2.26	393(80.4)	15.85	2.32
		Total	240	16.75	2.87	249	15.77	2.41	489	16.25	2.69
	Female	Upto 10%	32(15.9)	19.75	4.06	8(5.1)	16.29	2.02	40(11.2)	19.06	3.98
		More than 10%	169(84.1)	17.56	2.70	148(84.9)	16.72	2.61	317(88.8)	17.17	2.69
		Total	201	17.91	3.06	156	16.70	2.58	357	17.38	2.92
	Total	Upto 10%	106(24.0)	18.50	3.76	30(7.4)	17.40	2.77	136(16.1)	18.26	3.58
		More than 10%	335(76.0)	16.89	2.62	375(82.6)	16.03	2.46	710(83.9)	16.44	2.57
		Total	441	17.28	3.01	405	16.13	2.51	846	16.73	2.84
10th	Male	Upto 10%	32(28.0)	19.64	3.78	15(9.9)	19.49	4.02	47(19.7)	19.59	3.82
		More than 10%	54(72.0)	17.16	2.67	137(90.1)	15.75	1.99	191(80.3)	16.15	2.29
		Total	86	18.08	3.33	152	16.12	2.52	238	16.83	2.99
	Female	Upto 10%	20(13.9)	21.16	3.69	18(13.1)	18.77	2.97	38(14.0)	20.03	3.53
		More than 10%	114(86.1)	18.22	2.51	119(86.9)	16.80	2.42	233(86.0)	17.50	2.56
		Total	134	18.66	2.90	137	17.06	2.57	271	17.85	2.85
	Total	Upto 10%	52(23.6)	20.22	3.78	33(11.4)	19.10	3.45	85(16.7)	19.79	3.68
		More than 10%	168(76.4)	17.88	2.60	256(88.6)	16.24	2.26	424(83.3)	16.89	2.53
		Total	220	18.43	3.08	289	16.57	2.58	509	17.37	2.95
Total	Male	Upto 10%	144(28.0)	18.18	3.54	39(7.0)	18.49	3.37	183(17.0)	18.25	3.50
		More than 10%	370(72.0)	16.39	2.30	522(93.0)	15.45	2.29	892(83.0)	15.84	2.33
		Total	514	16.89	2.82	561	15.66	2.50	1075	16.25	2.72
	Female	Upto 10%	68(13.9)	20.35	3.99	27(6.5)	18.09	2.89	95(10.5)	19.71	3.84
		More than 10%	421(86.1)	17.63	2.75	390(93.5)	16.53	2.55	811(89.5)	17.10	2.71
		Total	489	18.01	3.10	417	16.63	2.60	906	17.37	2.96
	Total	Upto 10%	212(21.1)	18.88	3.82	66(6.7)	18.33	3.17	278(14.0)	18.75	3.68
		More than 10%	791(78.9)	17.05	2.62	912(93.3)	15.91	2.46	1703(86.0)	16.44	2.60
		Total	1003	17.43	3.01	978	16.08	2.58	1981	16.76	2.89

Table 3: Association of school bag weight with physical growth of the students.

class		Mean value		't' score	p' value
		<15% of body weight	≥15% of body weight		
8th	Height	150.03	145.44	6.71	<0.001
	Weight	40.70	32.96	12.53	<0.001
	BMI	18.02	15.49	11.66	<0.001
9 th	Height	153.99	149.65	7.99	<0.001
	Weight	41.98	35.10	13.12	<0.001
	BMI	17.64	15.61	11.05	<0.001
10 th	Height	155.79	153.90	2.55	0.011
	Weight	44.48	38.19	8.73	<0.001
	BMI	18.28	16.09	8.83	<0.001

DISCUSSION

Present study was conducted in schools which are governed by a private institution. In rural areas these schools were the only option for surrounding villages. Thus all the students came to these schools for high school education. In urban area also these schools attracted students from all socioeconomic strata because of nominal fees and discounts for the poor children.

In the present study, 86% of the high school students carried bags heavier than permitted legal cut off(10% of body weight) and 51% carried bags heavy enough(>15%of body weight) to damage their spine and shoulders. Many other studies in India have also observed this burden ranging from 68% [4] to 82%. [1] All the students were carrying backpack type school bags carried over both the shoulders.

Rural children comparatively carried heavier bags, because they had to carry most of the books as they had to finish most of the work at school because they could not get notes once they return to their village. Other reasons told by teachers and students were, 'they had no option but to carry all the subject books as in cases of change of subject on the day they could not go back to bring books from home'. To add to the weight of the books, in all the schools most of the children carried water bottles from home. In most of the government aided schools, mid day meal was served and this had reduced the burden of lunch boxes for rural children. In urban areas though food

was served, most of the students brought food from home in lunch boxes.

Because of the improvement of transportation facility, the actual time for which the children carry these bags on their back is difficult to ascertain. Rural children got them on bicycles and urban in autos. But, there were children who did not have these options and children coming from a distance less than one kilometer carried them on their back.

In Delhi, a student had fallen to his death while leaning to a railing because of getting overbalanced due to the overweight of his school bag. [2] No such incidents were observed in the study area, but many schools which had two or more storied buildings and chances of such incidents could not be ruled out in our area.

It was observed that children carrying heavier school bag (>10% of body weight) had lower physical growth in terms of BMI. On individual comparison basis, moderate negative correlation was observed (R= -0.45). In brainstorming sessions held on this issue, many parents have reported that, due to overburdening in schools, children are in no mood to play or eat after coming from school. [5] This physical fatigue can be attributed to school bags to some extent. Heavy school bag blunting the crave of a child for play can hamper its physical and mental growth. Though there could be other reasons for slower growth, both the categories showed difference in growth of

children of all classes and gender groups. This needs to be investigated further.

Limitations: Present study was carried out in private schools under one institution. Representation from government schools and schools which attract students from higher socioeconomic strata is desired. Effect of heavy bags on physical growth of the student is based on single observation, which has to be investigated further by taking various determinants into account.

CONCLUSION

86% of high school students were carrying school bags heavier than permitted. There was no provision of lockers for the books at the school. Significantly less physical growth was observed in the students carrying heavy bags, which needs to be investigated further.

Implications for the school health:

To reduce the burden of heavy school bags, schools can adopt following measures,

- a) Advise the students to pack school bags every day, so that students bring to school only those textbooks, exercise books and stationery items which are definitely required. Encourage them to use school bags, pencil cases and other stationery items which are made of durable but light-weight materials; and show them the correct manner and posture in carrying school bags and explain the adverse effects that overweight schoolbags will bring about.
- b) Obtain co-operation of parents by urging to select school bags and items which are made of light-weight materials, to remind and help their children to pack school bags every day according to the timetable and to discourage their children from bringing magazines, toys and unnecessary items to school.
- c) Review timetable to minimize the number of subjects for each day and design the timetable in such a way that

child need not bring more than three subject books per day.

- d) While choosing textbooks, schools should take the weight and size into account. Avoid using too many supplementary workbooks or additional exercises.
- e) Provide storage facilities and ensure proper usage in schools, which will obviate the need for students to carry certain textbooks, exercise books, stationery items, instruments, water bottles and other articles to and from school every day.
- f) The following practices adopted by schools are found effective to help reduce the weight of school bags:
 - Conducting campaign on reducing the weight of school bags to draw the attention of teachers, parents and pupils to the issue.
 - Conducting random check on the weight of school bags and informing parents if bags are found overweight.
 - Motivating parents to help weighing school bags to arouse awareness of the issue.
 - Reducing the use of workbooks and replacing them by loose-leaf worksheets.
 - Allotting a tutorial period in the timetable for pupils to complete part of their homework at school.
 - Scheduling Physical Exercise and Art and Craft lessons for different days.
 - Installing drinking water facilities and advising pupils not to bring drinking water to school.

Institutional ethical committee clearance was taken before starting the study.

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