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Health Problems in Schoolchildren Due to Backpacks: A Cross Sectional Study in Two Schools of a Town in North Karnataka

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ABSTRACT

Background: It is a common sight to see school children carrying a schoolbag on their backs that are too heavy for their body frames. Carrying heavy backpacks causes heavy load on the developing spine resulting in postural problems, back pain and discomfort.

Objectives: The study was conducted to measure the schoolbag weight and its percentage to the bodyweight of schoolchildren and to study the health problems in schoolchildren due to heavy backpacks and factors influencing it.

Methods: This cross sectional study was carried out in two schools for a period of two months among children studying in 7th to 10th standard. Children filled a pretested questionnaire and were weighed with and without schoolbag. Data was entered in MS Excel and analysed using Epi info7.

Results: Out of 277 children 132 belonged to CBSE and 145to state syllabus, 68.6% children were carrying heavy backpacks.52.7% children complained of pain; majority had pain in leg, shoulder and back. CBSE students and those carrying loaded backpacks reported more pain.

Conclusion: Children need to be taught packing bag the right way to avoid health problems.

Key words: School children, backpacks, health problems, pain

INTRODUCTION

It is a common sight to see school children carrying a school bag on their backs that are too heavy for their body frames. Carrying heavy backpacks causes significant forward leaning of head and trunk, heavy load on the developing spine results in postural problems, back pain and discomfort.[1-3]Apart from these heavy back packs are also the reason behind a bunch of other problems like pain in the neck, shoulder, hands, wrist, ankle and feet. They are also reported to cause headache and fatigue.[3]As per the recommendations made by America Occupational Therapy Association (AOTA), a child's back pack should not be more than 10% of his body weight.[4]But with the changing curriculum, the growing need to cope up with the vast syllabus and exhaustive assignments the students receive, often reflect on their backs as loaded back packs, which might be too heavy for their small body frames, especially young children and girls. Despite the sight we see every morning; we turn a blind eye to this serious problem. Hence with the intention to shed light on the topic we carried out this study with the objectives to measure school bag weight and its percentage to the bodyweight of school children and to study health problems in schoolchildren due to heavy backpacks and the factors influencing it.

METHODS

This Cross sectional study was carried out among the students studying in 7th to 10th standard of two schools in Raichur, Karnataka. Two different schools were chosen, One with CBSE syllabus and one with State syllabus.

Permission was taken from the Institutional ethical committee of our Medical College. After taking prior permission from the school authorities, a feasible time and schedule for interviewing the children and examining them was planned. Consent was taken from the school children before administering questionnaire. All the children studying in 7th to 10thstandard, who were willing to participate and who were present on the day of study were included. The study was conducted on weekdays for a period of two months.

A self- administered, predesigned, pretested structured questionnaire was used to collect data on age, gender, class, mode of transportation and duration required to reach school, type of school bag worn, perception of the child about the weight of the school bag, whether he climbs the stairs carrying the backpack. The students were asked to rate the pain they experienced in the past three months on a visual analogue scale[5,6] (figure 1), from an intensity of zero to ten.

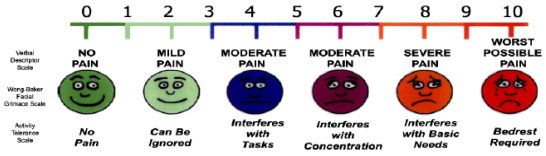

Figure 1: Visual analogue scale

The children were explained all the variables in the questionnaire clearly. Weight of the child with and without school bag was measured using a bathroom weighing scale, calibrated to the nearest 0.1kg.

Statistics: The data was entered in Microsoft Excel 2010 and analysed using Epi info 7. The results were expressed in percentage and proportions. Chi square test was used to test the significance of association between two variables.

RESULTS:

Out of 277 students who participated in the study, 132(47.7%) belonged to CBSE and 145 (52.3%) to state syllabus. The mean age of the students was 13.5+1.2 years. More than half of the students (65.7%) were boys and 34.3% were girls. As seen in Table 1, 27.1% of students belonged to 7th standard, 30.7% to 8th standard, 22.4% to 9th standard and 19.8% to 10th standard.

The mean weight of the students was 45.2+12.2 Kg, while the mean school bag weight was 5.9+2.1Kg, ranging from a minimum of 1Kg to a maximum of 13 Kg. The mean of percentage of body weight constituted by the school bag was 14+6.4%, ranged from a minimum of 1.9% to a maximum of 41.7%.

Table 1: Distribution of students based on class and syllabus

Class	CBSE syllabus (n=132) (%)		State syllabus (n=145) (%)		Total (n=277) (%)
	Boys	Girls	Boys	Girls	
7th	26 (31.7)	12 (24)	26 (26)	11(24.4)	75 (27.1)
8th	30 (36.6)	13 (26)	27 (27)	15(33.3)	85 (30.7)
9th	9 (11)	14 (28)	27 (27)	12 (26.6)	62 (22.4)
10th	17 (20.7)	11(22)	20 (20)	7 (15.5)	55 (19.8)
Total	82 (100)	50 (100)	100 (100)	45(100)	277 (100)

Table 2: Characteristics of the students based on their bag pack (n=277)

Variable	Students (%)
% of backpack weight to the weight of student	
>1% to <10 %	87 (31.4)
>10% to <20%	155 (56)
>20%	35 (12.6)
Perceived weight of School bag	
Normal	131 (47.3)
Heavy	119 (43)
Very heavy	27 (9.7)
Type of School bag	
Bag with two strap	274 (98.9)
Roller trolley	3 (1.1)
How they carry school bag	
One shoulder	8 (2.9)
Both shoulder	266 (96)
Roller trolley	3 (1.1)
Books carried in School bag	
Carry all the books they have	53 (19.1)
Randomly	14 (5.1)
As per Timetable	210 (75.8)
Mode of transportation	
Auto	89 (32.1)
Bike/ two wheeler	23 (8.3)
Car	12 (4.3)
Cycle	34 (12.3)
School bus	93 (33.6)
Walk	26 (9.4)
Duration to reach school	
Less than 15 Minutes	139 (50.2)
15 to 30 minutes	126 (45.5)
More than 30 minutes	12 (4.3)
Provision of Lockers in school	
Yes	152 (54.9)
No	125 (45.1)
Climbing stairs with school bag	
Yes	103 (37.2)
No	174 (62.8)
Who chose school bag	
self	176 (63.5)
Parents	101 (36.5)
Carry more books than required	
Yes	114 (41.2)
No	163 (58.8)

Table 3: Characteristics of students based on the presence of pain (n=277)

Variable	Students (%)
Perception of Pain in past three months	146 (52.7)
Site of pain	
Back	32(11.6)
Neck	16 (5.8)
Shoulder	61 (22)
Hand	17 (6.1)
Leg	62 (22.4)
Pain restricted from daily activity (n=146)	71 (48.6)
Medication Taken for pain (n=146)	48 (32.9)

As seen in Table 2, majority of the students (56%) were carrying back packs which were more than the 10% of their body weight, while 12.6% students were carrying more than 20% of their body weight on their backs as bag packs. Though only 31.4% were carrying back packs which were upto 10% of their body weight as per AOTA recommendations, 47.3% students felt they perceive the school bag weight as normal. Majority (98.9%) students carried bags with two straps, most (96%) wearing it on both their shoulder. Though majority of the students (75.8%) said they carry books as per time table, 41.2% students still said they carry more books than required when we asked them if they felt so. Majority of the students used to come in school bus or other vehicles, 12.3% came by cycle and only 9.4% came by walk to school. Most students (50.2%) said it took them less than 15 minutes to reach school. About 37.2% students had to climb stairs while carrying their bags. These were mainly 7th standard students, where classes were located on first floor.

Table 4: Determinants of Percentage weight of school bag to body weight

Variable	Percentage weight of school bag to body weight			Total (n=277 (%)	χ^2 Value	P value
	Up to 10% (n=87)	10 to 20% (n=155)	> 20% (n=35)			
Syllabus						
CBSE	26 (29.9)	79 (51)	27 (77.1)	132(47.7)	23.89	<0.001
State	61 (70.1)	76 (49)	8 (22.9)	145(52.3)		
Class						
7th	1 (1.1)	53 (34.2)	21(60)	75 (27.1)	71.97	<0.001
8th	22 (25.3)	54 (34.8)	9(25.7)	85 (30.7)		
9th	34 (39.1)	26 (16.8)	2(5.7)	62 (22.4)		
10th	30 (34.5)	22 (14.2)	3(8.6)	55 (19.9)		
Gender						
Male	62 (71.3)	99 (63.9)	21 (60)	182 (65.7)	1.93	>0.05
Female	25 (28.7)	56 (36.1)	14 (40)	95 (34.3)		
Books carried in bag						
Carry all books	6 (6.9)	36 (23.2)	11(31.4)	53 (19.1)	15.94	<0.05
Randomly	3 (3.4)	8 (5.2)	3 (8.6)	14 (5.1)		
Timetable	78 (89.7)	111 (71.6)	21 (60)	210 (75.8)		

Table 5: Factors influencing occurrence of pain among students

Variable	Presence of Pain		Total (n=277) (%)	χ^2 Value	P value
	No (n=131) (%)	Yes (n=146) (%)			
Syllabus					
CBSE	49 (37.4)	83 (56.8)	132(47.7)	10.46	<0.001
State	82 (62.6)	63 (43.2)	145(52.3)		
Class					
7th	36 (27.5)	39 (26.7)	75 (27.1)	2.67	>0.05
8th	39 (29.8)	46 (31.5)	85 (30.7)		
9th	34 (26)	28 (19.2)	62 (22.4)		
10th	22 (16.8)	33 (22.6)	55 (19.9)		
Gender					
Male	90 (68.7)	92 (63)	182 (65.7)	0.99	>0.05
Female	41 (31.3)	54 (37)	95 (34.3)		
Duration to reach school					
Less than 15 min	77 (58.8)	62 (42.5)	139 (50.2)	8.4	<0.05
15 to 30 minutes	51 (38.9)	75 (51.4)	126 (45.5)		
More than 30 min	3 (2.3)	9.0 (6.2)	12 (4.3)		
Percentage of body weight carried as backpack					
Up to 10%	37 (28.2)	50 (34.2)	87 (31.4)	10.87	<0.05
10% to 20%	85 (64.9)	70 (47.9)	155 (56)		
More than 20%	9 (6.9)	26 (17.8)	35 (12.6)		

As seen in Table 3, 52.7% students reported experiencing any kind of pain in the past three months. There were multiple responses when asked about the site of pain. Majority of the students reported pain in leg (22.4%), shoulder pain (22%), back pain (11.6%). Few students (5.8%) reported pain in the neck. When they were asked to report the intensity of pain on Visual analogue scale ranging from 1 to 10, majority (25.7%) rated it as 2 indicating mild but tolerable pain, 18.4% students rated it as 4, indicating pain interferes with tasks, and a few students (4.7%) rated it as 6. Among the 146 students who complained of pain, though 48.6% said the pain restricted them from daily activities and interfered with concentration, only 32.9% students had taken medications for pain.

Table 4 shows that, CBSE students were carrying more weight than recommended when compared to state syllabus students ($p<0.01$). Students studying in 7thand 8thstandard were carrying more weight when compared to others which was statistically significant ($p<0.01$). It was observed that backpacks weighing up-to 10% of body weight were carried by most students (89.7%) who carried books as per time table ($p<0.05$).

As seen in Table 5, CBSE students reported more pain when compared to state syllabus students ($p<0.01$). Pain was reported more by students of 7th and 8th standard when compared to those in 9th and 10th ($p>0.05$). Pain was reported more among boys, but it was not statistically significant. Pain was more among those who took longer to reach school (15-30 minutes) and by those carrying 10- 20% of body weight on their backs ($p<0.05$).

DISCUSSION

This cross sectional study was carried out among students of 7th to 10th standards of CBSE and State syllabus school in Raichur, Karnataka. Out of 277 students who participated in the study, 132(47.7%) belonged to CBSE and 145 (52.3%)to state syllabus.The mean age of the students was 13.5+1.2 years and more than half of the students (65.7%) were boys.The mean weight of the students was 45.2+12.2 Kg, while the mean school bag weight was 5.9+2.1Kg. The percentage of body weight constituted by the school bag ranged from a minimum of 1.9% to a maximum of 41.7%.

Majority of the students (56%) were carrying back packs which were more than the 10% of their body weight, while 12.6% students were carrying more than 20% of their body weight on their backs as bag packs. Our study tried to find out the determinants of heavy back pack usage among children. It was found that CBSE students were carrying more weight than recommended when compared to state syllabus students, which was statistically significant ($p<0.01$). This might be explained by the vast syllabus in CBSE and assignments which make the student carry more books.

Students studying in 7thand 8thstandard were carrying more weight when compared to others which was statistically significant ($p<0.01$). This might be because they tend to carry all the books or carry books randomly and not as per the time table as other children in higher standards were doing. Hence parents need to supervise the child while he packs the bag. It was observed that backpacks weighing up-to 10% of body weight were carried by most students (89.7%) who carried books as per time table ($p<0.05$).Among those who were found to carry 10-20% and more than 20% of the body weight on their backs, 71.6% and 60% said they carry books as per timetable respectively. This makes us reflect on the need to revise the Timetable of children, so that they will not have to carry a heavily loaded pack on their tender backs. This should be kept in mind by the school authorities and teachers while planning syllabus and timetable. Hong Y et al[7] in their study suggested the need to reduce the school bag weight as back pain is a cause of growing concern among students.

In our study 52.7% students reported experiencing any kind of pain in the past three months. Majority of the students reported pain in leg (22.4%), shoulder pain (22%), back pain (11.6%). Few students (5.8%) reported pain in the neck. Among the 146 students who complained of pain, 48.6% reported the pain restricted them from daily activities and interfered with concentration, but only 32.9% students had taken medications for pain. A study carried out by Rai A et al among 11-14 year old children showed that children reported pain in shoulder, back, neck, arms, fingers, leg, knees and toes, but only a few sought medical care.[1]In a study by Skaggs DL et al in 11-14 year old school children, 37% of the children reported back pain which is almost three times as seen in our study. Out of the children who reported back pain, 34% limited their activity due to the pain and only 14% had used medication for pain relief.[8]We can see that medication use reported for any kind of pain was higher in our study.

CBSE students reported more pain when compared to state syllabus students ($p<0.01$). Pain was reported more by 7thand 8thstandard students ($p>0.05$) and they were also found to carry heavier backpacks. In our study, pain was reported by boys (63%) comparatively more than girls (37%), but it was not statistically significant. However a study by Farhood H.F carried out in Iraq showed a significant association between low back pain and gender ($p<0.0001$), where (41.3%) of females had

pain when compared to (31.1%) males.[9]

Most students (50.2%) said it took them less than 15 minutes to reach school. Pain was reportedly more among those who took longer duration to reach school ($p<0.05$).Pain was reported to be more among those (47.9%) carrying 10-20% of body weight on their backs ($p<0.05$) when compared to those who carried up to 10% (34.2%) of body weight. A study carried out in Malta among children aged 8 to 13 years showed a strong link between the prevalence of back pain in children and carrying heavy back packs.[10]Brackley HM and Stevenson JM in their critical review suggested a backpack weight of 10-15% as acceptable.[11]A study by Cupryś KW et al carried out among seven year old children showed that wearing a backpack heavier than 10% of one's body weight can affect the curvature of the spine and can also lead to degenerative changes.[12] Abbas et al showed that the straps of a heavy backpacks can apply pressure to the blood vessels and nerves in shoulder and neck resulting in pain and tingling in arms, hands, legs and neck. The study suggested that well-padded straps can prevent such harm. The kids were found to lean in front to maintain balance while carrying a heavy backpack resulting in changes in posture and the forward inclination consequently leading great stress on vertebral column.[13]

CONCLUSION

Our study shows that nearly three fourth of the students were carrying more than 10% of their body weight on their backs in the form of loaded backpacks and half of the students reported of pain in the past three months. CBSE syllabus, carrying heavier backpacks, young children of 7th and 8th standard, longer duration to reach school was found to be the important determinant for occurrence of pain. The school management and teachers need to reflect on revising the curriculum and timetable, provision of lockers in school to keep books, hence reducing the need to carry so many books daily. Parents need to supervise when the child is packing the bag and children need to be taught the right way of wearing a backpack. Hence this simple preventive strategy can help us prevent a serious health problem among children that might continue in their adulthood causing disability.

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