



BACK PAIN AND SCHOOL BAG USE: A CROSS-SECTIONAL STUDY AMONG SCHOOL CHILDREN IN KASHMIR VALLEY

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ABSTRACT

Background: Many studies present evidence to support backpack load limits for children, but the suggested limits have been based on percentage of the body weight with discrepancies. While some researchers proposed 10 % of body mass, another research works proposed 15 % of body mass. Brackley and Stevenson recommended that backpacks weight should be between 10-15% of a child's body mass. Considering the fact that in spite of many studies have being carried out on influence of school bag carrying in India, no such study has been conducted in Kashmir valley to see the effect of heavy school bag. **Methodology:** This was a cross-sectional descriptive study carried out among children from both government and private school of Kashmir Division. The study was carried out in the month of March 2017. Sample size was calculated using openepi software with 95% confidence limits and 80% power. The sample size came out to be 500 school going children in the age group of 6-15 years. Participants were enrolled from both government and private school. Those in the age group of 6-15 years, studying in 1st to 10th standards, ability to ambulate independently, and ability to wear a school bag while standing on a weighing scale were included in the study. All children with pathological causes of back pain were excluded from the study. **Results:** A total of 2005 school children were included in the study. The sample comprised of 1067 male and 938 female school children. 51.6% students belong to private schools and rest to government schools. The mean age of the pupil was 11.03 for male and 9.98 for female. The overall mean body weight for pupils was 31.79 (kg). The pupils carried an average school bag weight of 4.85(kg) \pm 2.05, ranging from 2 kg to 9 kg. Seven hundred seven of the students reported having had pain or discomfort in the body over the previous 2 weeks out of which 317 (44.83%) carry bag load of >15% of their body weight. **Conclusion:** The growing prevalence of musculoskeletal pain among children is a worrying fact. Policy makers, Health care professionals and teachers should apply the available resources and man power for information, early diagnosis, prevention and treatment of this grave problem in a school setting and should come up with some law against heavy bag pack use in children.

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INTRODUCTION

Often there has been outcry by media, parents and health professionals concerning the carrying of heavy backpack loads by school going children beyond the recommended safe load limits of 10% to 15% of body weight^[1-2] The carrying of recommended school bag by children based on their body mass index and age is a topic of debate. This bodily stress on the shoulders of the children may cause problems like musculoskeletal and spinal pain and a reason to visit health care professionals. Maximum growth of the appendicular skeletal system occurs during childhood especially around puberty and ceases around 18 years of age for males and few

years earlier in females. In these years, the process of secondary ossification transforms a simple cartilage into bones through several stages making it more susceptible to injury for a greater length of time.^[3-4] It is recommended to establish standard backpack weight for children of this age group so that morbidity from heavy bag packs can be avoided on time. Many studies have been conducted in the past to see the affect of school bag pack on school children, and these studies recommend different school bag weight percentage and carrying methods to avoid bodily stress.^[5] The symptoms of back pain in children appear to be more common nowadays. Literature review from India had reported 10-30% prevalence of back pain in school going children.^[6-7] Educational failure, lack of concentration, lack of learning has been linked to heavy bag packs in many studies, but no definite results have been confirmed.^[8] School children

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sometimes carry bags as much as >30% of their bodyweight at least once a week.^[9]Evidences from the literature support backpack load limits for children, but the suggested limits have been based on percentage of the body weight with discrepancies. While some researchers proposed 10 % of body mass,^[10-11] another research works proposed 15 % of body mass.^[12] Brackley and Stevenson recommended that backpacks weight should be between 10-15% of a child's body mass.^[13-14] Considering the fact that in spite of many studies have being carried out on influence of school bag carrying in India, no such study has been conducted in Kashmir valley to see the effect of heavy school bag. With this view, we conducted a study in both government and private schools of Kashmir division to explore and exhibit the prevalence of Heavy bag weight & musculoskeletal pain and its association with school bag use in school going children.

METHODS

This was a cross-sectional descriptive study carried out among children from both government and private school of Kashmir Division. Kashmir division has total of 10 districts and we selected 4 major districts to carry out the study namely district Srinagar, district Baramullah, district Anantnag and district Budgam, Kashmir division. After taking the ethical clearance from the institutional ethical committee and permission from the Director of education department, J&K the study was carried out in the month of March 2017. Sample size was calculated using openepi software with 95% confidence limits and 80% power. The sample size came out to be 500 school going children in the age group of 6-15 years. Participants were enrolled from both government and private school. Those in the age group of 6-15 years, studying in 1st to 10th standards, ability to ambulate independently, and ability to wear a school bag while standing on a weighing scale were included in the study. All children with pathological causes of back pain were excluded from the study.

The school children had their weights measured on the weighing scales which were placed on a flat surface and set to zero. Children dressed in their uniforms were then weighed using a weighing scale. The weight was first measured when carrying the school bag and then without the school bag and the difference between the two weights was recorded as the weight of the school bag. All values were documented on the recording sheet. The weighing scales were recalibrated after each measurement. Questionnaires regarding back pain were asked to each participant. Low back pain was operationally defined as pain or discomfort in the lower back region, from the lower rib curvature to the lower part of the seat region, and recorded as absent and present. Data was entered on Microsoft Excel 2007 spreadsheet and analyzed using SPSS version 20.0. The outcome variable was low back pain while predictor variables included body weight, school bag weight, school bag weight as a percentage of body weight and type of school. Chi-square tests were used for characteristics like gender, class grades, and private and government schools. p value <0.05 was considered statistically significant.

RESULTS

A total of 2005 school children were included in the study. The sample comprised of 1067(53.2%) male and 938 (46.7%) female school children. 1035 (51.6%) students belong to

private schools and rest to government schools. The mean age of the pupil was 11.03 for male and 9.98 for female. The overall mean body weight for pupils was 31.79 (kg). The pupils carried an average school bag weight of 4.85(kg) \pm 2.05, ranging from 2 kg to 9 kg [Table I].

Table I Demographic characteristics of school children

Variable	Number (Frequency)	Percentage (%)
Gender		
Male	1067	53.21
Female	938	46.78
Total	2005	100
SCHOOL		
Government	970	48.37
Private	1035	51.62
Total	2005	100
Class Grades/Age		
1st/6 Years	228	11.37
2nd/7 Years	195	9.72
3rd/8 Years	227	11.32
4th/9 Years	294	14.66
5th/10 Years	343	17.1
6th/11 Years	234	11.67
7th/12 Years	362	18.05
8th/13 Years	41	2.04
9th/14 Years	41	2.04
10th/15 Years	40	1.99

The mean bag weight as a percentage of the body weight was 6.89 % \pm 2.31 (range 3.14- 9.13%). There were 1678/2005 school children (83.69%) carrying bags which were more than 10% of their body weight and of these 762/970 (78.55%) students were from government schools and 915/1035 (88.40%) from private schools. [P-value <0.05] Statistically significant [Table II]. It can also be noticed in Table 2, that there was no difference in gender as 417 (44.45%) of female children were carrying bags >15% of their body weight as compared with 480 (44.98%) of male children carrying bag weight of >15% of their body weight [P value 0.683] statistically no significance. Further it is observed, students from standard 3rd to 5th have substantial percentage of students with bag packs > 15% of their body weight 53.74%, 44.55% and 36.73 % respectively [P value <0.05] statistically significant. Seven hundred seven (707, 35.26 %) of the students reported having had pain or discomfort in the body over the previous 2 weeks out of which 317 (44.83%) carry bag load of >15% of their body weight as shown in Table III. Distribution of bag weight to body weight ratio in different districts of Kashmir Valley is tabulated in Table 4. The pattern in all the district is more or less same with 26.8% school children carrying recommended bag packs for school in district Budgam. It has being observed that most of the students in all the district carry bag packs >10% of their body weight and notable the percentage of children carrying bag packs >20% of body weight in district Anantnag was 25.5% and district Baramullah was just 2%.

DISCUSSION

The Purpose of the study was to explore and exhibit the prevalence of heavy bag weight & musculoskeletal pain and its association with school bag use in school going children. The students from government and private schools were also compared. The prevalence of reported low back pain among students was 35.26% out of which 317 (44.83%) carry bag load of >15% of their body weight. The findings of our study are consistent with rates reported by Balague F *et al* ^[15],

Table II Distribution of bag weight to body weight ratio according to different characteristics among school children

VARIABLE	UPTO 10% OF BODY WEIGHT	11-15% OF BODY WEIGHT	16-20% OF BODY WEIGHT	>20% OF BODY WEIGHT	p value
GENDER					
Male	182	405	339	141	0.683
Female	145	376	292	125	
SCHOOL					
Government	207	434	243	85	<0.001
Private	120	346	388	181	
SCHOOL GRADES					
1 ST	17 (5.19%)	93 (11.90%)	82 (12.99%)	35 (13.15%)	<0.001
2 ND	27 (8.25%)	70 (8.96%)	73 (11.56%)	25 (9.39%)	
3 RD	24 (7.33%)	81 (10.37%)	97 (15.37%)	25 (9.39%)	
4 TH	37 (11.31%)	126 (16.13%)	98 (15.53%)	33 (12.40%)	
5 TH	70 (21.40%)	147 (18.82%)	102 (16.16%)	24 (9.02%)	
6 TH	55 (16.81%)	62 (7.93%)	62 (9.82%)	55 (20.67%)	
7 TH	58 (17.73%)	143 (18.30%)	95 (15.05%)	66 (24.81%)	
8 TH	1 (0.30%)	16 (2.04%)	21 (3.32%)	3 (1.12%)	
9 TH	18 (5.50%)	22 (2.81%)	1 (0.15%)	0 (0.00%)	
10 TH	20 (6.11%)	20 (2.56%)	0 (0.00%)	0 (0.00%)	
TOTAL	327 (16.30%)	781 (38.95%)	631 (31.47%)	266 (13.26%)	

Table III Distribution of pain among school children with different bag weight to body weight ratio

HISTORY OF BACK ACHE	<10% OF BODY WEIGHT	11-15% OF BODY WEIGHT	16-20% OF BODY WEIGHT	>20% OF BODY WEIGHT
PRESENT	98 (29.96%)	292 (37.38%)	214 (33.91%)	103 (38.72%)
ABSENT	229 (70.03%)	489 (62.61%)	417 (66.08%)	163 (61.27%)
TOTAL	327	781	631	266

The mean bag weight as a percentage of the body weight was 6.89% ± 2.31 (range 3.14- 9.13%) however about 83.7% of school children had bags above the recommended limit of 10% with the private school children carrying heavier bags. Previous studies by Negrini S^[21], White L J^[22] and AlHazzaa HM^[23], report rates between 15%- 50% but in our study, the rates are far higher.

Table IV Distribution of bag weight to body weight ratio according to different characteristics in study Districts

DISTRICT	Variable ANG	Upto 10% of body weight	Upto 11-15% of body weight	Upto 16-20% of body weight	Upto >20% of body weight	Total
ANANTNAG	Gender	Male 23(4.5%) Female 25 (5%) Total 48 (9.5%)	78 (15.5%) 79 (15.7%) 157 (31.2%)	90 (17.8) 80 (16%) 170 (33.8%)	60 (12%) 68 (13.5%) 128 (25.5%)	251 (49.9%) 252 (50.1%) 503 (100%)
	School	Private 27(5.4%) Govt 21 (4.1%)	87 (17.2%) 70 (14%)	99 (19.7) 71 (14.1%)	89 (17.8%) 39 (7.7%)	302 (60%) 201 (40%)
	Gender	Male 55 (18.58%) Female 19 (9.31%) Total 74 (14.80%)	136 (45.94%) 105 (51.47%) 241 (48.20%)	99 (33.44%) 76 (37.25%) 175 (35.0%)	6 (2.02) 4 (1.96%) 10 (2.0%)	296 (59.20%) 204 (40.80%) 500 (100%)
BARAMULLA	School	Private 30 (13.45%) Govt 44 (15.88%)	103 (46.18%) 138 (49.81%)	86 (38.56%) 89 (32.12%)	4 (1.79%) 6 (2.16%)	223(44.60%) 277 (55.40%)
	Gender	Male 71 (26.3%) Female 63(27.2%) Total 134 (26.8%)	108 (40.1%) 98 (42.4%) 206 (41.2%)	56 (20.8%) 46 (19.9%) 102 (20.4%)	34 (12.6%) 24 (10.3%) 58 (11.6%)	269 (53.80%) 231 (46.20%) 500 (100%)
	School	Private 56(22.4%) Govt 78(31.2%)	99(39.6%) 107(42.8%)	61(24.4%) 42(16.8%)	34(13.6%) 23(9.2%)	250(50%) 250(50%)
BUDGAM	Gender	Male 33(13.1%) Female 38(15.1%) Total 71(14.1%)	83(33.06%) 94(37.4%) 177(35.2%)	94(37.4%) 90(35.8%) 184(36.6%)	41(16.3%) 29(11.5%) 70(13.9%)	251(50%) 251(50%) 502 (100%)
	School	Private 79(2.6%) Govt 65(26.8%)	46(17.6%) 119(49.1%)	64(24.6%) 41(16.9%)	64(24.6%) 17(7.02%)	260(51.7%) 242(48.2%)
	Gender	Male 182 (17.05%) Female 145 (15.45%) Total 327 (16.30%)	405 (37.95%) 376 (40.08%) 781 (38.95%)	339 (31.77%) 292 (31.13%) 631 (31.47%)	141 (13.21%) 125 (13.32%) 266 (13.26%)	1067 (53.21%) 938 (46.78%) 2005 (100%)
SRINAGAR	School	Private 120 (36.69%) Govt 207 (63.30%)	335 (42.89%) 446 (57.10%)	389 (61.64%) 242 (38.35%)	191 (71.80%) 75 (28.19%)	1035 (51.62%) 970 (48.37%)
	Gender	Male 182 (17.05%) Female 145 (15.45%) Total 327 (16.30%)	405 (37.95%) 376 (40.08%) 781 (38.95%)	339 (31.77%) 292 (31.13%) 631 (31.47%)	141 (13.21%) 125 (13.32%) 266 (13.26%)	1067 (53.21%) 938 (46.78%) 2005 (100%)
TOTAL						

Taimela S *et al*,^[16] Burton KA *et al*^[17] and Wedderkopp N *et al*^[18] who reported back pain prevalence of 32%-38% in school children due to heavy bag packs. Chronic use of the heavy school bag results in repetitive stress and shifts the center of gravity of the child in the direction of the load.^[19,20] The child usually leans forward to the opposite direction to compensate the backward pull. Maintaining such a posture hampers the physiological shock absorption abilities of the lumbosacral spine and causes long term postural changes. Children carrying heavy bag packs often complaint of back pain and easy fatigue.

This may be due to changing trends over time, growing academic competition among children, and increase in study syllabus over years. There has been a continuous debate about the recommended bag weight to body weight ratio for school children. Hong Y *et al*,^[24] in their study conducted among school children demonstrated an increased energy demand by the body if they carry bags >10% of their body weight. Hong Y *et al*,^[25] in another study held heavy bags responsible for postural changes in children. Many experts recommend limiting of school bag load to 10%-15% of body weight so to prevent long term postural changes and back pain among

children.^[21,26] In our study, we found the pattern of carrying heavy bags almost equal in all the districts of Kashmir division with the exception of district Anantnag where the number of students carrying bag packs >20% of body weight exceeds 25%.

Time has come and we can foresee our future where the younger generations suffer from postural defects and other musculoskeletal disorders. If we try to find the root cause of the heavy bag weight problem, several factors contribute to this. For example Pressure on the students to attain higher academic grades, increase in syllabus over years, Books with hard binding covers and plenty full of homework. Furthermore, the weight of lunch box and water bottles adds to the burden.

CONCLUSION

The growing prevalence of musculoskeletal pain among children is a worrying fact. Policy makers, health care professionals, and teachers should direct the available resources and manpower for information, early diagnosis, prevention and treatment of this grave problem in a school setting and should come up with some law against heavy bag pack use in children.

Recommendations: 1) Choosing the right size bag packs. 2) Choosing the bag pack with internal compartments so that weight is equally distributed. 3) Choosing the bag packs with posterior padding so as to prevent stress on the spine. 4) Wearing bags with bilateral straps 5) Dividing books into volumes 6) use of light binding covers for the books and notebooks 7) Use of smart Tablets by school children 8) Two sets of books for children, one for home and another for school.

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