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Original Article

Assessment of School Backpack Weight and Other Characteristics in Elementary Schools, Yazd, Iran

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Abstract

Introduction: The carry of heavy backpacks by school children may be associated with several potential health consequences. The aim of this study was to determine the percentage of body weight represented by school backpacks and other related factors.

Materials and Methods: The cross-sectional study has been done in eight primary schools in Yazd city in which a total of 783 students' boys (217 subjects in boys' private schools and 566 ones in boys' governmental schools), grades 1 to 5, were studied. Measures included body mass and school bag weight of students and then the relative backpack weight (RBW) was calculated as percentage of body weight.

Results: The average backpack weight was 4.6 kg (range, 1.3 kg to 20.6 kg) and represented 12.9% (range, 5.5% to 37%) of the subjects' body weights. In private schools, about 43.7% of the students carried backpacks weighing less than 10 percent, 38.4% between 10 – 14% and 17.9% of the students 15 percent or more of their body weights versus 66.2%, 23.5% and 10.3% in governmental schools, respectively. The majority of students carried their bags over one or two shoulders and only 4% used roller bags. The contents of backpacks were mainly text books, exercise books or test books.

Conclusion: In conclusion the result of this study indicated that the students of private schools carried heavier backpacks than those of governmental ones and therefore it appears to be reasonable to lighten the load of backpacks and educate students for carrying correctly school backpacks.

Keywords: Backpain; Equipment Safety; Schools; Students, Public Health; Students, Health Occupations

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Introduction

A large number of grade school children and adolescents are reported to have upper limb including back, neck, and shoulder pain [1-2]. Heavy backpacks which carried improperly on the backs or shoulders of school children can put pressure on their joints and ligaments and may be associated with several potential health consequences including bad posture, back strain, and eventual low back pain [3-13]. Back and neck pain have a substantial economic impact either direct medical care costs or indirect costs of disability [14]. Goh et al were studied backpack use in children and observed that all students while carrying heavier backpack load adopted a compensatory trunk flexion posture [11].

Limon et al indicated that between 30% and 54% of students carried backpack greater than15% of their body weight [13]. Another study revealed that fifty-five percent of all subjects carried a load greater than 15% of their body weight [15].

Negrini et al investigated the backpack load in schoolchildren and pointed out that the average of backpack weight and relative backpack weight (RBW) were 8.75 kg and 19.9%, respectively [14]. One study in Saudi Arabia showed that school bag averaged 3.2 kg in absolute weight and 10.7% relative to student's body mass. Nearly 50% of the sample carried backpacks weighing more than 10% of their weight [15]. The results of another study showed that a large number of students (61.4%) had backpacks exceeding 10% of their body weight [8]. Although a safety limit of 10% relative backpack load for adolescents suggested by Cheung but it is recommended that school bags be limited to no more than 5-10% of student's body weight [16].

To our knowledge, there have been few scientific studies on backpacks and the prevalence of backpack-related problems in Iran. We conducted this study to determine the average weight of backpacks carried by school children, to determine the percentage of body weight represented by school backpacks, to identify the types of backpacks carried and to assess parental knowledge of the contents and weights of the backpacks in private and governmental schools.

Materials and Methods

This is a cross sectional study carried out in Yazd city. A total of 783 students boys grades 1 through 5, were choosen from eight primary schools using a multistage random sampling technique. Measures included body weight and school bag weight. Students were also asked to respond to questions related to how they travel to and from school and how they carry their bags.

The relative backpack weight (RBW) was also calculated (bag weight*100/body weight) as percentage of body weight [17]. All students whose backpacks weighed 10% or more of their body weights were studied further about the contents of their backpacks and also the knowledge of their parents about the contents and weight of their child's backpacks. To collect such these data, a simple questionnaire was sent to parents and were asked to answer

described above questions. The data were analysed using SPSS software (version 15) applying T-student and Chi square test different variables. The level of significance was set at 0.05.

Results

The study participants (*n*=783) included 217 (28%) in boys' private schools and 566 (72%) in boys' governmental schools. The subjects were in Grade 1 (21.6%), in Grade 2 (20%), in Grade 3 (21.2%), in Grade 4 (17.2%) and in Grade 5 (20%). The average backpack weight was 4.6 kg (range, 1.3 kg to 20.6 kg) and represented 12.9% (range, 5.5% to 37%) of their body weights. The overview of results is shown in Figure 1.

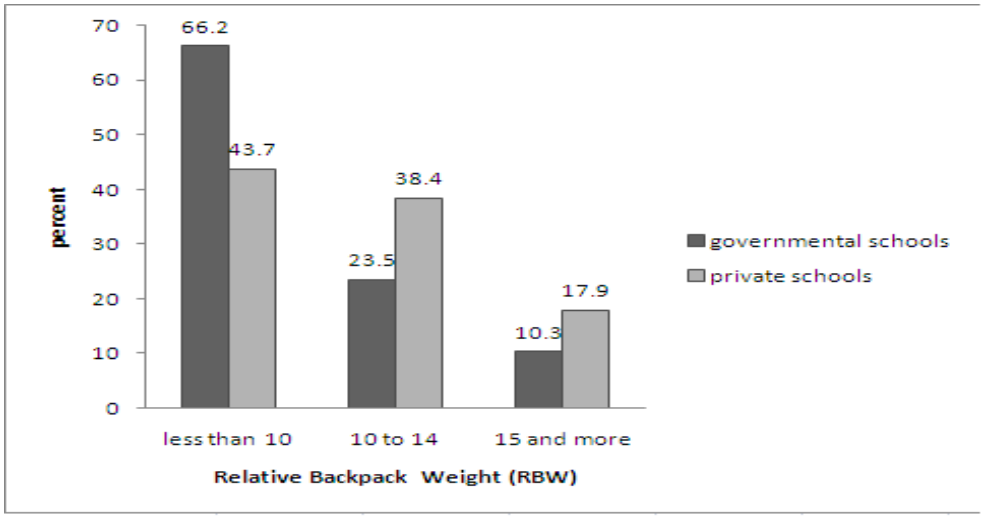

Figure 1. The relative backpack weight (RBW) of school boy students

According to the results, there was significant difference between the RBW in private and governmental schools in which RBW in the former was significantly higher than the latter one. (P=0.025) In private schools, about 56.3% of the students carried backpacks weighing more than 10% of their body weights versus 33.6% in governmental schools. There was significant difference between grade one and five in which the average RBW increased from 8.2% in the first grade to 10.7% in the fifth grade of government schools (P=0.04) and 10.8% to 16.2% in private schools (p=0.03). No significant difference was identified between 2nd, 3th and 4th grade. (p>0.05) The majority of students (83.4%) carried their bags over two shoulders, 12.6% used single strap bags carried by one hand and 4% had bags with wheels. Items carried in students' backpacks were mainly included text books, exercise book, folders, small instruments, lunch boxes and electronic devices but, the most common items were text and exercise books. Although 38.7.3% of overall parents had at some point checked the contents of their child's backpack but this rate for private school (76.8%) was higher than that of governmental schools

(27.6%). However, only 23.3% of parents had ever weighed their child's backpack. Parents of Grade 1 students were more likely to check the contents of their children's backpacks than those of grade 5. Parents of private schools had the most knowledge of the contents of their children's backpacks. Students, whose parents had never checked the contents of their backpacks, carried more reading and exercise books than those whose parents had checked their backpack contents before.

Discussion

A musculoskeletal disorder in school-aged children is highly prevalent and contrary to what one might be assumed, back problems are not confined to the adult population.[1] While there are many potential factors relating to these discomforts, one unexplored factor is the ergonomic mismatch [18]. Daily backpack carrying is a frequent cause of musculoskeletal discomforts [19]. Percentage of body weight carried by students can be considered as a key factor of safety and health of schoolchildren. According to the literature a prominent school health issue in some countries including the United States is the use of backpacks [20]. The load of student's backpacks has raised questions over the safety and health of schoolchildren everywhere. Despite comprehensive study of backpack weight and backpack safety programs in other countries, little attention paid on about this matter in Iran [20]. A problem with these studies is that investigators used different definitions of RBW, different population sizes, setting, methods, and various confounding factors measured in each study and therefore limiting the opportunities for direct comparison. A number of studies have reported high RBW but they did not distinct differences between private and governmental schools and also did not clear that results are related to boys' or girls' schools [8, 13, 15, 21-22]. Because of this, the reported RBW are varied in previous studies. Generally backpacks weight carried by private schools was heavier on average than those carried by governmental schools. Our finding in private schools is nearly in agreement with the finding of Rodriguez et al [8], Limon *et al* [13] and Al-Hazzaa et al [15] who showed that more than 50% of students carry backpacks exceeding 10% of their body weight but inconsistent with our findings in governmental schools.

As results show the majority of students in both schools carry their bags over two shoulders which is almost consistent with the finding of Al-Hazzaa who reported that more than 65% of the sample carried their bags over one or two shoulders but more students in their study had bags with wheels [15, 23-24]. In comparison with private schools, few parents check the contents of their child's backpack in governmental ones.

A number of studies have shown that many parents probably give little or no attention to backpack design, padding and about their child's backpack weight or contents, or even how their child lifts, carries or wears their backpack [25]. However the results of this study support the previous data indicating that school

students are being injured due to backpacks either by overloading with weight greater than their percentage body weight or carrying them incorrectly.

In conclusion the result of this study indicated that student of private schools carry heavier backpacks than those of governmental ones and therefore it appears to be wise to lighten the load of backpacks and educate students for correct carrying of them.

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