

## Awareness of Parents about Characteristics of a Healthy School Backpack

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### ABSTRACT

**Background:** The issue of knowledge on school backpacks among parents has received little attention. The objectives of this study were to assess school backpack carriage and its consistency with parents' knowledge about children friendly school backpacks.

**Methods:** This was a randomized cross-sectional study. Totally 307 elementary school children and 250 parents were recruited to assess parental knowledge about standard school backpacks in 2010. Data collection were carried out on an unscheduled day in order to, children and their parents prepared school backpacks based on their own previous habits and behaviors. All statistical analyses were performed using version 16.0 of the statistical software package SPSS

**Results:** Approximately, 132 (51.6%) of the parents were not aware of the recommended weight limit for carrying school backpacks and 144 (56.3%) were not aware that the size of the backpack must be proportionate to the upper back region. Significant difference was found for the mean score of awareness of a safe and standard school backpack between fathers and mothers: fathers had more knowledge about school backpack carriages in comparison with mothers ( $P < 0.001$ ).

**Conclusion:** Children, parents and teachers should be educated about the characteristics of a standard backpack, different strategies. Parents are the best advocates for safety promotion and should represent the group most likely to help to significantly reduce backpack related injuries among school children by selecting safe school backpacks, supervising school backpack carrying and checking backpack weights.

**Keywords:** School backpack, Child health, School health, Awareness

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### Introduction

Carrying heavy backpacks have raised concerns regarding the side effects of prolonged or habitual carriage of heavily loaded backpacks among school age children [1]. Backpacks carried by school children, are known as daily task in their life, and may be associated with some potential health threatening consequences, including altered gait, bad posture and discomfort [2]. School

health providers and researchers have expressed concern about the long term impacts of carrying excessive loads by children on a daily basis [3]. Spinal curvature occurs when the backpack is loaded to 15% of body weight [3]. Variety of risk factors including total weight carried, duration and frequency of carriage and the manner in which the weight is carried affect the muscu-

loskeletal system and may affect the incidence of musculoskeletal pain or discomfort [4].

Numerous studies have estimated that the maximum mean weights of school backpacks in children should be 10% of the body weight [5, 6]. Evidences from epidemiologic, physiologic, and biomechanical studies suggest that school backpack weight would be healthy and standard when it is 10% to 15% of body weight [7]. In 1998 alone, according to the Consumer Product Safety Commission, backpack-related symptoms among children caused over ten thousand visits to clinics, and therefore this needs to be considered in the school health promotion activities. In addition, children who experience back pain are at increased risk of having back pain in the adult ages [4]. Shruti suggests that pain experience is a personal one, and varies from child to child, although one simple approach can possibly solve this safety issue when we emphasize preventive programs [8].

Backpacks are a convenient way for children to carry essential educational materials to school, but they insert other materials which increases the weight of backpack. Additionally, when purchasing a backpack, many parents probably give little or no attention to backpack design, padding and overall weight. Moreover, many parents are not insight about their child's backpack weight or contents or even how their child lifts, carries or wears his/her backpack [9]. Most parents (96%) had never checked their child's backpack weight and 34% had never checked the backpack contents [10]. Numerous studies have reported carrying heavily loaded school backpacks in term of the percentage of the children's body weight including 17.7% in the United States [2], 20% in Italy [11] and 20% in Hong Kong [12]. Findings of a study amongst 558 children aged 7-12 years in Hamadan showed that the average load carried by schoolchildren was 12.0% of body weight [13]. In addition, the mean school backpack weight for all the children in another study conducted in Tabriz was 10.1% (SD = 3.55) of their body weight [14].

Many of the published reports on backpack safety have focused on adolescents and adults who use backpack in the work place or for recreational hiking, and military personnel [10, 15], while a few reports have focused on young children who are in the growth age [16]. Moreover, in spite of emphasizing appropriate weight limits for children's packs, little research has been conducted on parents' knowledge about school backpacks' standard weight, choosing proper backpacks, and using backpack correctly. In addition, there is no study in Iran on the knowledge of parents about standard backpacks, carrying school backpacks and backpack related musculoskeletal pain or discomfort. Based on the above mentioned background, we decided to design this study to assess parents' knowledge on school backpacks.

## **Materials and Methods**

### *Participants and Procedure*

This descriptive cross-sectional study was performed with a random sample of 20 schools selected from all 200 elementary schools in the city of Tabriz, located in North West of Iran in 2010. Participants were 307 elementary school children including 154 (50%) girls and 154 (50%) boys, aged between 7 and 12 years, registered in the grades one to fifth (based on Iran's primary education system) and their parents who were invited to contribute as participants. Of all 307 elementary schools students, 250 parents participated in this study to assess parental knowledge about standard school backpack. They were given a written consent form to be approved by their parents. To obtain a representative sample of school children, 20 schools were selected randomly from all five educational districts in the study region, comprising four elementary schools (two boy's schools and two girl's schools) from each educational district. Then, within each school, 15 children were selected randomly including three children from each grade.

Data were collected on an unscheduled day in order to children and their parents prepared school backpacks based on their own

previous habits and behaviors. In other words, participants did not change school backpack weight intentionally. This study was approved by Tabriz University's Institutional Review Board.

### ***Demographics and school backpack characteristics***

The questionnaire contained 22 items including socio-demographic factors (e.g. age, gender, educational grade in school, level of literacy of parents), anthropometric dimensions (e.g. Body weight, height, and weight of school backpacks), and type of school backpacks, duration and frequency of carriage and the manner in which the weight is carried including: “how long do you carry school backpack daily?”, “Who carries your school backpack?” (Parent /student), and “who selected school backpack?” (Parent/student). The height and body weight of students were measured, as were the weight of their school backpacks (including any additional items carried separately from their school backpack). The standing height of each student was also measured (in cm) to one decimal place.

### ***Knowledge of Parents about school backpack***

Knowledge of parents about school backpack was classified in three domains including: standard school backpack, correct carrying of school backpack and musculoskeletal disorders related to the use of school backpack. A 10 item written questionnaire measured knowledge of parents about standard school backpack (e.g. “the best school backpack is ” or “the standard pack weight must be up to 10-15% of the students’ body weight ”). A 12 item questionnaire measured knowledge of parents about correct carrying of school backpack (e.g. “wear both straps for proper carrying of backpack ” or “wear the backpack over the strongest mid-back muscles ”). Finally, A 10 item questionnaire measured knowledge of parents about musculoskeletal disorders related to the use of school backpack (e.g. “warning sign of heavy backpack is tingling

or numbness in arms or shoulder or neck or back” or “warning sign of heavy backpack is struggling when putting on or taking off the backpack”). Responses for all items were “yes/no” or “I don’t know” choices; “yes” answers received a score of 1 and “no” and “I don’t know” were scored 0. Higher scores on the scales indicated a greater knowledge. The reliability coefficients for each of the variables were: standard school backpack (Cronbach’s  $\alpha = 0.64$ ); correct carrying of school backpack (Cronbach’s  $\alpha = 0.78$ ); musculoskeletal disorders related to of use school backpack (Cronbach’s  $\alpha = 0.84$ ), indicating internal consistency.

### ***Data analysis***

All statistical analyses were performed using version 16.0 of the statistical software package SPSS (SPSS Inc., Chicago, Illinois, USA) and an alpha level of 0.05 for all statistical tests. A series of descriptive analyses were computed to determine awareness of parents about standard school backpack.

## **Results**

Parents of 250 (56.1%) students provided written questionnaires from a total of 307 students enrolled in the twenty schools included 176 mothers (68.8%) and 80 fathers (31.3%). 58 (18.8%) mothers were employed and 250 (81.2%) were housekeeper. Of fathers, 10 (3.3%) were unemployed, 174 (57.4%) manual worker, 103 (34%) office worker and 16(5.3%) were employer. Parents' level of literacy was illiteracy [M:17(6.1%), F:12(4.4%)], primary [(M:61(21.8%), F:71 (25.8%)), secondary [(M:155(55%.3), F:134(48.7%)), University [(M:17(16.8%), F:58(21.1%)). Only in 26 (10%) of school backpacks were selected by contribution of both parents and children. Most school backpacks were selected by children 139 (54%), 54 (21%) followed by mothers and 30 (12%) by fathers (12%); 228 (89%) of the students carried their school backpacks to/or from school, whereas 29 (11%) parents carried the school backpacks for their children. Additionally 126 (49%) of the students 126 (49%) walked to/from school and 158(51%) carried their

school backpacks for more than 15 minutes a day.

As shown in Table 1, there was a significant difference for the mean score of awareness

of safe and standard school backpack between fathers and mothers: fathers had more knowledge about school backpack carriage in comparison with mothers ( $P < 0.001$ ).

**Table 1:** Mean score of parents’ knowledge about standard school correct carrying of the backpack and muscular-skeletal disorders associated carrying school backpack

Parents’ awareness of	Fathers	Mothers	t	Sig
	[Mean +_SD]	[Mean +_SD]		
Standard school backpacks	7.43(1.41)	6.79(1.66)	2.54	0.12
Carrying school backpacks	9.74(1.40)	8.98(1.68)	3.57	<0.001
Muscular-skeletal disorders	8.60(1.39)	8.42(1.61)	0.821	0.412

Parental awareness regarding characteristic of a standard school backpack are presented in Table 2. Findings indicate that although there was a proper knowledge of

parents about standard school backpack, 228 (89.1%) of parents were not aware that the size of the backpack must be proportionate to upper back.

**Table2:** Parental awareness of standard school backpack

Parental awareness questions about standard school backpack	Correct n(%)	Incorrect n(%)
Type of school backpack	214(83.6)	42(16.4)
Lightweight backpack	240(93.8)	16(6.3)
Backpack with padded shoulder straps	229(89.5)	27(10.5)
backpack with wide shoulder straps	195(76.2)	61(23.8)
backpack with waist strap	182(71.7)	74(28.9)
Backpacks with different parts for distribution of weight	222(86.7)	34(13.3)
Using rolling backpack If he/she is forced to carry heavy equipment	193(75.4)	63(24.6)
Size of the backpack should be fit for child	28(10.9)	228(89.1)

**Table 3:** Parental awareness of correct carrying of school backpack

Parental awareness of carrying school backpack	Correct n (%)	Incorrect n (%)
Balancing the weight of backpack in different parts of the backpack	245(95.7)	11(4.3)
To lift the backpack it is better to bend their knees, then take it	171(66.8)	85(33.2)
Wear a backpack after putting it on a table ,at waist level	205(80.1)	51(19.9)
The shoulder strap should be firm and sufficiently fastened.	88(34.4)	168(65.6)
Use both shoulder straps on the backpack to prevent damage to the spine	234(91.1)	23(8.9)
Proper size of shoulder straps is required should	247(96.5)	9(3.5)
Backpack is better be placed in the middle of the back	251(98)	5(2)
Filled backpack should not weigh more than 15 percent of body weight	124(48.4)	132(51.6)
Backpack should not be above the top of the shoulders	112(48.3)	144(56.3)
Bottom of a backpack should not be lower than the waist	201(78.5)	55(21.5)
Don’t Carry backpack on one shoulder	231(90.2)	25(9.8)

Table 3 shows parental awareness of correct carrying of school backpack. Approximately, 132 (51.6) of the respondents

in this study were not aware about the recommended weight limit for school backpacks and 144 (56.3%) were not aware about

the importance of fitness between school backpack and upper back region. The necessity of proper fastening of shoulder straps on the backpack to prevent damage to the spine was another subject that 168 (65.6%) of parents had no information about it. In addition, knowledge of parents about mus-

culoskeletal disorders related to the use of school backpack was another aspect the findings (Table 4). A considerable number of parents had no enough information about hand pain [144(53.6%)] or shoulder pain [62(24.2%)].

**Table 4:** Parental awareness of musculoskeletal disorders related to use school backpack

<b>Parental awareness of side effects of miscarrying school backpack</b>	<b>Incorrect n(%)</b>	<b>Correct n(%)</b>
Shoulder pain because of thin foam without the shoulder strap	233(91.4)	22(8.6)
Lean forward because of carrying heavy backpack	233(91)	22(8.6)
With a waist strap, weight is distributed more evenly to the back and hips	198(77.3)	58(22.7)
Fatigue because of carrying heavy backpack	253(98.8)	3(1.2)
Muscular - skeletal pain because of carrying heavy backpack	243(94.4)	13(5.1)
<b>Wearing the wrong and non Standard backpack schools cause</b>		
Low back pain	218(85.2)	38(14.3)
Neck pain	227(88.7)	29(11.3)
Shoulder pain	194(75.8)	62(24.2)
Hand pain	112(43.8)	144(56.3)

## Discussion

Consistent with aged school children population's health promotion, this study investigated parental awareness about facts that professional organizations recommend about the safe use of school backpacks. Parental awareness and their supervision can help students of elementary school age who are not informed enough about choosing their backpack carefully and carrying it correctly. More importantly, it seems that they are not aware about the side effects of inappropriate school backpack carriage. One previous study that had focused on parental knowledge of school backpack weight and contents [10], did not provide any information on the above mentioned issues. The recommended weight limit for a healthy and standard school backpack carriage is the load of 10% to 15% of body weight [7]. However, our findings indicated that 51.6% of parents in this study were not aware about the recommended weight limit for school backpacks. In addition, the findings of the current study showed that the majority of parents, whose children's backpacks

weigh was equal or more than 10% of their body weights, did not know about the standard backpack weight and contents as well as its consequences [10].

Several studies reported heavy school backpack carrying by pupils [9, 10, 17]. There are evidences that show a non-significant increase in the risk for future low back pain due to carrying a heavy backpack weight [17]. The relative weight for school backpacks of first graders was 11.1% of body weight, 12.5% for the second graders, and for the third and fourth graders between 12.5% and 14.3% [18].

The school backpack weight and the weight of tools added to school backpack are such important considerations that parents need to be informed about and control on a daily basis. Additionally, it seems that school backpack factories need to improve their knowledge to manufacture healthy and standard products.

As indicated by the findings, 144 (56.3%) of parents were not aware of the relation between standard school backpack and reduction or prevention of upper back pain. As the result, health promoting in

schools needs to be supported by health sectors and media and it is crucial to develop programs to increase awareness of parents and also legislation policies to design and manufacture standard and healthy backpacks in proper sizes.

In spite of instructing students about the correct use of each backpack, when they actually walked on the treadmill they acted free to adjust the backpack as they pleased [19]. On the other hand, our findings also revealed that parents did not have sufficient knowledge about signs and symptoms of musculoskeletal disorders resulting from incorrect use of school backpack and about the necessity of using both shoulder straps. These findings highlight the need for elaborately designed educational programs for both children and their parents to change the behavior of school children when using backpacks. In addition, awareness of school backpack carriage among parents was significantly higher in fathers than in mothers. Since among Iranian families, mothers seem to be more engaged than fathers in children daily activities and have more responsibility to communicate to elementary school teachers. As a result, it is necessary to focus on empowering mothers for all aspects of school aged children health. Overall, total weight carried, duration and frequency of carriage of school backpack and the manner in which the weight is carried all have an effect on the musculoskeletal system and may lead to increased incidence of musculoskeletal pain or discomfort which parents need to be informed about [19]. Lai and Jones emphasized the important role of the health-care professionals as community educators, in promoting normal posture in children, parents and teachers [20].

## **Limitations**

Although this study makes a number of important contributions, the findings are subject to several limitations. Firstly, data on parental awareness in this study were based on self-report questionnaires, which may be subject to recall and other biases. Another

limitation is the cross-sectional nature of the study, and therefore an experimental trial is what is needed to assess the influence of parental awareness of school backpack, carrying, and related symptoms. Finally, the current study was performed in only one city of Iran, thus the findings may not be generalizable to the other parts of the country.

## **Conclusion**

Behavior changes necessitate multiple approaches. Children, parents and teachers should be educated using different strategies. Additionally, the need for modeling a healthy school backpack is imperative. A healthy school backpack adapted for Iranian children need to be modeled by the principal investigator according to ergonomic standards of Iranian children. Parents remain the best advocates for safety promotion and should represent the group most likely to help to significantly reduce school backpack related injuries among school children by selecting safe school backpack, supervising school backpack carrying and checking backpack weights. A second line of prevention should focus within the school. School health teachers should inform children, parents and other teachers in schools. Lockers are also needed in the classrooms to avoid transportation of extra loads by students to or from school. A third line of prevention should focus within the market to produce and offer safe school backpack in markets. The fourth line of prevention should focus on community pediatricians and public health practitioners for available educational opportunity programs through mass media or other medium.

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