



# Backpack using among Adolescent Students studying in Ardabil, Iran

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## ABSTRACT

**Aim:** Nowadays, schoolbags are considered to be resulted in musculoskeletal discomforts among students. This study set out to determine this health problem due to carrying school bag in students studying in high schools of Ardabil, Iran.

**Method and Materials:** This study was carried out among adolescent students in Ardabil city, Iran, in 2019. To collect data a socio-demographic questionnaire was used to complete demographic variables. Furthermore, standard scales were applied to measure weight and height of the students as well as weight of their school backpack. All data entered into the SPSS statistical software and analysed through descriptive analysis tests to determine the status of backpack among secondary high school students in Ardabil, Iran.

**Findings:** A total of 474 adolescent students with mean age of (13.51±1.13 years) were assessed in this study. According to the findings, more than half of studied students used backpack while going to school. This study revealed the mean weight of studied students and their backpacks were 52.38 ± 12.34 kg and 3.57± 1.18kg respectively. Body Mass Index (BMI) was found to be 23.56. ± 6.84. The average weight of the backpack of first-year students was 3.45±1.25 kg, in second-year students, it was 3.55± 1.08 kg, and in third-year students, it was 3.69±1.21 kg.

**Conclusion:** As most of adolescent students used backpack in the way to school, complying with standard rules of backpack use is strongly recommended.

**Keywords:** Backpack, Adolescent Student, High School, Iran.

## Introduction

The back bag is one of the most common tools for carrying the daily supplies [1]. Today, a majority of people use backpack for different purposes [2, 3]. Since backpack is one of the most important causes of musculoskeletal injuries among adolescents, it was paid attention by many researchers [4,5]. It has been discussed that using heavy backpack can impact on body structure of adolescents and cause some biomechanical, physiological disorders [6]. In addition to daily textbooks, students may carry other tools and equipment by backpack [7], so the weight of tools, the manner, and the time span of carrying backpack are properties that can influence on the direction and curvature of spine, musculoskeletal disorders and pains in back and

shoulder [8]. In the previous study the committed nations called on a declaration to identify and address these needs [9].

It has been argued that the students may not be educated regarding the physical and psychological effects of improper backpack carrying [10]. Previous studies showed that many students reported pain different parts of their bodies due to carrying backpacks and majority of them believed that carrying their backpack caused musculoskeletal pain [11].

Learning how to use a backpack is one of the most important approaches in controlling the pain caused by using it [12]. So promoting knowledge, attitude and behavior improvement during interventional-training process is strongly recommended [13]. To

assess these challenges, this study aimed to determine the status of musculoskeletal discomforts and backpack use among adolescent's students in Ardabil, Iran.

### Method and Materials

A descriptive study was conducted among adolescent students. To do this study, the ethical approval was obtained from Rheumatic Research Center (RRC) affiliated to Tehran University of Medical Sciences (TUMS). This study was conducted among adolescent students (10–14 years old) in Ardabil city of Iran. Ardabil is an ancient city in northwestern of Iran which is the capital of Ardabil Province. To obtain the data, the city was firstly divided into five regions of North, South, East, West and Center, and then through randomly selection, a number of clusters (high schools) proportional to the population of each region were selected. Finally, 474 students were selected randomly. The sample was determined based on inclusion/ exclusion criteria and sample size formula.

In this study, the same electronic scale which placed on a flat and hard surface was applied to measure the students' weight and backpack weight. Thus, the weight of each student was measured without backpack, then after carrying it, the total weight were obtained. The difference of the two weights were reported as the backpack weight and then the percentage of backpack weight compared to body weight was determined. The height was measured using a standard scale.

### Findings

A total of 474 students were assessed in the present study. The studied students consisted of 239(50.4%) male while the rest of them were female. Mean age of the students were  $13.51 \pm 1.13$  with the range of 12- 14 years. Average school bag weight in the students studying in first year of the high school was  $3.45 \pm 1.25$  kg, in second year students,

$3.55 \pm 1.08$  kg and in the third year students  $3.69 \pm 1.21$  kg. Body Mass Index (BMI) was found to be  $23.56 \pm 6.84$ . Mostly Students 256 students (54%) carried backpack while going to school (Table 1). To examine the way of carrying, the students were divided into two groups, one who carried the backpack over one shoulder and another group that carried the backpack over two shoulders. Of 255 students who responded to this question, 129 students (50.4%) students carried backpack on two shoulders and 126 students (49.6%) students carried backpack on one shoulder. Table 1 shows the type of carrying school bag.

In this study ratio of bag weight to body weight was calculated in terms of percentages. A minority of students (N=33 ; 7%) were observed in 11-15% ratio while the majority of students (N=138; 29%) were found in the ratio of 26-30%. The rest of students compiled with normal ratio of 10 percent.

**Table 1)** Demographic characteristics of the studied students

Variables	Mean $\pm$ SD
Age (Yrs)	13.51 $\pm$ 1.13
Height of the students (Cm)	150.00 $\pm$ 11.88
Weight of the students (Kg)	52.38 $\pm$ 12.34
BMI (Kg/M <sup>2</sup> )	23.56 $\pm$ 6.84
Gender	N (%)
Male	239 (50.4)
Female	235 (49.6)
Type of school bag carrying	N (%)
Backpack carrying	256 (54)
Side carrying	65 (14.3)
Bilateral carrying	99 (20.9)
Hand carrying	51 (10.8)

**Table 2)** Distribution of students' characteristics in each grade of secondary school

Studied variables	First year (N=140) Mean (SD)	Second year (N=153) Mean (SD)	Third year (N=181) Mean (SD)
Age (Yrs)	12.79 ± 0.55	13.26 ± 0.70	14.28 ± 1.29
Average height (Cm)	149 ± 1.17	151 ± 1.17	150 ± 1.21
Average weight (kg)	53.09 ± 1.28	50.83 ± 1.25	53.15 ± 1.17
Weight of school bag (Kg)	3.45 ± 1.25	3.55 ± 1.08	3.57 ± 1.18

Table 2 shows the characteristics of the studied students in each grade of secondary high school.

### Discussion

The present study revealed the majority of the studied students reported that they were carrying backpack while going to school that is consistent with the previous study [14]. Furthermore, in this study it was revealed that near half of students carried heavy backpack while the previous studies showed nonstandard backpack caused musculoskeletal complaints in different parts of body [16, 17]. Although in this study the musculoskeletal discomfort were not assessed and so it is unable to judge regarding the relationship between backpack weight and these discomfort, but, there are several studies which verified more percentage of due musculoskeletal pain among students [16, 19, 12]. Furthermore, there are many studies that argued regarding musculoskeletal complaints in shoulders and neck area of adolescent students who carry backpack for going to school. In these researches, it has been discussed that, use of double or single band of backpack caused more load on shoulders area which has been led to due discomfort. In present study about half of students carried backpack on one shoulder that is a high risk behavior for shoulder and neck pain. Although, there are existed studies that showed, more musculoskeletal pain were reported in

female students. Consistent with the present study, a previous study revealed that upper and lower back pain are mostly occurred in the female students rather than the male students [21], but an existed evidence verified that female students have lower muscle which is a predisposing factor for female to suffer from musculoskeletal pain more than male [22-23].

However, in present study the rate of musculoskeletal pain in the studied students were not assessed, so there is a need for further research to investigate the effect of backpack carrying on musculoskeletal system among adolescents. In addition, more studies are needed to determine guidelines for acceptable weight of backpack which carried by adolescents' students who are in their development age. Although, this study has its' own limited points which could be considered in future studies, collecting data through standard scales and observation of the measured weight and height is a strong points of the study which verified the accuracy of the findings. However, doing more researches in this regard is strongly recommended.

### Conclusion

According this study, it is recommended that adolescent students, specially who carry backpack be fully trained about the standard weight and the right behavior of backpack carrying.

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**Authors' Contribution:** NN was the main investigator and did all stages of the manuscript. SST was supervisor of the study. ARJ was advisor of the study.

**Conflict of Interest:** There is no conflict of interest for this study.

**Ethical Permission:** All principal ethical permissions were considered in this study. Ethical approval was received from RRC of TUMS.

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