

# Prevalence of Kyphosis in School Going Children with Heavy Backpack Usage

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Received: 29-Apr-2022,

Manuscript No. AMHSR-22-66947;

Editor assigned: 03-May-2022,

Pre QC No. AMHSR-22-66947(PQ);

Reviewed: 13-May-2022,

QC No. AMHSR-22-66947;

Revised: 23-May-2022,

Manuscript No: AMHSR-22-66947(R);

Published: 30-May-2022,

DOI: 10.54608.annalsmedical.2022.42

## Abstract

**Background:** Kyphosis is a therapeutic condition in which an excessive outward curve of the spine results in an abnormal rounding of the upper back. The condition is sometimes known as “roundback” or in the case of a severe curve as “hunchback”. **Objective:** The aim of this study was to determine the prevalence of Kyphosis in school going children with heavy backpack usage. **Methods:** An observational cross-sectional study was carried out on a sample of 150 students selected through non-probability convenience sampling. Data was collected from four schools in Jampur and all the students who used backpacks were included in the study. Duration of study was approximately 6 months. Kyphosis was measured by using authorized flexi curve ruler. **Results:** Out of 150, 90(60%) were girls and 60(40%) were boys. The mean age of students was 11.28 yrs. The mean backpack weight was 3.53 kgs. The mean weight of the students was 38.70 kgs. Out of 150 children, 58(38.7%) children were diagnosed with kyphosis and 92(61.3%) children showed normal curve. Significant relationship were found between backpack weight and the prevalence of kyphosis(0.00). **Conclusion:** Increased backpack weight can increase the prevalence of kyphosis in elementary school students that can endanger the physical health of the children in growing age. Therefore, parents, teachers and health care workers must give close attention to students the ways for safely carrying the backpack. The student backpack weight should be less than 10% of their body weight.

**Keywords:** Kyphosis; Students; Backpack

## Introduction

Kyphosis is a therapeutic condition in which an excessive outward curve of the spine results in an abnormal rounding of the upper back. The condition is sometimes known as “roundback” or in the case of a severe curve as “hunchback”. Hunchback could be a spinal disorder in which the spine ends up in an abnormal rounding error of the higher back. Kyphosis will occur at any age, however is common throughout adolescence. Normal angle of kyphosis is 20°-40° [1]. Almost all school going children use backpacks to carry books. The daily physical stresses associated with carrying backpacks cause significant forward lean of the head and trunk. It is assumed that daily intermittent abnormal postural adaptations could result in pain and disability in school going children [2]. Chao concluded that sporting heavy and non-widespread backpacks creates sizable changes in spinal curvature and may cause permanent deformity. It additionally causes stretches in the neck, bending the chest and trunk ahead, and increases the spinal curvature. It probably causes numerous troubles such as changes in head/neck and spinal posture, growth in neck and trunk muscle. To minimize musculoskeletal problems, the schoolbag weight should be of 10%–15% of student’s body weight [3]. Milanese study show the effects of school backpacks on the posture of students. The finding supports earlier work by Chansirinukor, et al. As noted by the authors, it has been widely recommended that the maximal safe limit for percentage body weight (%BW)

carried in a backpack was 10% BW, although to date this value has not been substantiated scientifically. Of particular interest in this study is that a postural effect can be seen from the application of a backpack load as low as 5% BW [4]. Negrini in 2007 investigated the carry-over load carriage effect on spinal curvature. In their study, 43 school children (average age of 12.5 years old) were recruited and they were asked to walk with an 8 kg backpack for 7 min on a treadmill at self-preferred speed. Increased trunk forward lean with thoracic kyphosis were observed immediately after carrying the backpack [5]. The present study takes a look at evaluated the affiliation among backpack weight with the prevalence of dropped shoulders, kyphosis even as a few other research examined the relationship between backpack weight and spine curvatures. This triggered the researchers to observe the connection among backpack weight and occurrence of dropped shoulders, kyphosis in primary school students in Abadan [6]. In developing year of children i.e. mostly early school going age, the bones and physical structure is not fully developed. Children cannot bear heavy weight because of their body composition. So, carrying backpack heavier than 10% of

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**How to Cite this Article:** Hassan Z, et al. Prevalence Kyphosis in School Going Children with Heavy Backpack Usage. Ann Med Health Sci Res. 2022;12:172-174.

body weight is not prescribed [7]. Heavy weight of the bag effect the children health [8]. Unusual bag weight creates the student at risk of musculoskeletal problem and fatigue. It is necessary to but the backpack on both shoulders for distribution of weight and avoidance of musculoskeletal problem [9]. With the best of researcher knowledge, limited studies have been conducted regarding importance of kyphosis with usage of heavy backpack weight. The purpose of this study is to develop awareness regarding safe load carriage of school children for avoidance of kyphosis [10].

The study aim is that to identify the risk factor associated with Musculoskeletal disorder by comparing the prevalence of Musculoskeletal pain among the students, so that in the future the community can be benefited.

### Objective

To determine the prevalence of kyphosis among school children with heavy backpack usage.

### Materials and Methods

A cross-sectional study was conducted to rule out the prevalence of Kyphosis in school going children with heavy backpack usage. Duration of study was six months. Data was collected from different registered schools of Jampur (Govt. girls Elementary school No.4 Jampur, Govt. boys Elementary school No.1 Jampur, Govt. girls Elementary school Tattarwala Jampur. Govt. boys Elementary school No.3 Jampur). Sample size of 150 was selected and calculated by using the following formula

$$n = \frac{z^2 p(1-p)}{d^2}$$

(Sample size determination in health studies version 2.0.2 WHO).

where **P** is the proposed proportion of children with kyphosis is 13.3%, **d** is margin of error *i.e.* 5% and **Z**  $1-\alpha/2$  is the desired level of significance *i.e.* 95% [11]. The children between age group 7-14 were included in the study and participants having any congenital deformity or any history of fracture or dislocation in the past year were excluded from the study. Non-convenient sampling technique was used. The study protocol was approved by the local ethics committee, written and oral consent was obtained from participants. Demographic Questionnaire was used. Flexi curve ruler was used to diagnose (posture) kyphosis [12]. Weight of the student was measured using a digital scale (GLAMOR BS-807) and weight of backpack was measured using a kitchen scale (Oasis, Tefal). Data was then entered to SPSS version 20.1. The quantitative variables were elaborated by means and standard deviation while variables of qualitative nature by formulating frequency charts, tables and bar graphs.

### Results

Results showed that among 150 participants, 90(60%) were girls and 60(40%) were boys. The mean age of students was 11.28 years. The mean backpack and student weight was 3.53 kgs and 38.70 kgs respectively. The mean kyphotic angle of students was 38.06°. Figure 1 showed the prevalence of kyphosis due to heavy backpack usage stating that 58(38.7%)

students were having kyphosis whereas 92(61.3%) were free from this musculoskeletal change. Table 1 showed p-values of different variables showing a significant relationship of kyphotic angle with backpack weight and bag to weight ratio. However the relationship between age and kyphotic angle was also considered but no significant association was found between the two variables with a p value of 0.195 using chi-square test. Figure 2 showed that out of 58 children with kyphosis,

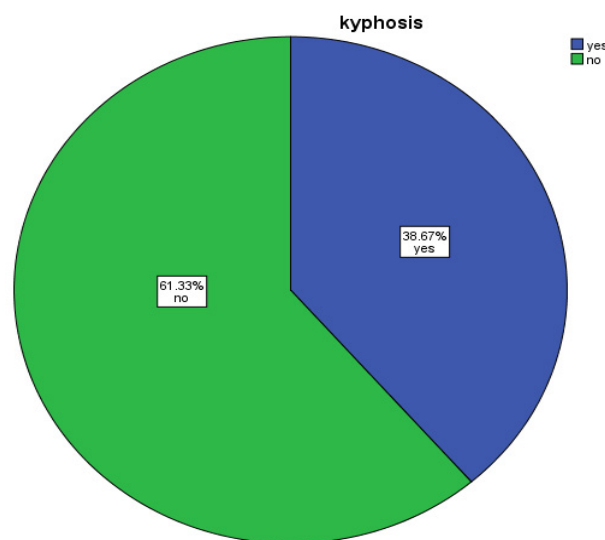


Figure 1: Prevalence of kyphosis.

Table 1: Kyphotic angle with backpack weight and bag to weight ratio.

	Kyphosis	N	p-value
Back pack weight	Yes	58	<0.001
Student weight	Yes	58	0.006
Bag to student weight ratio	Yes	58	<0.001

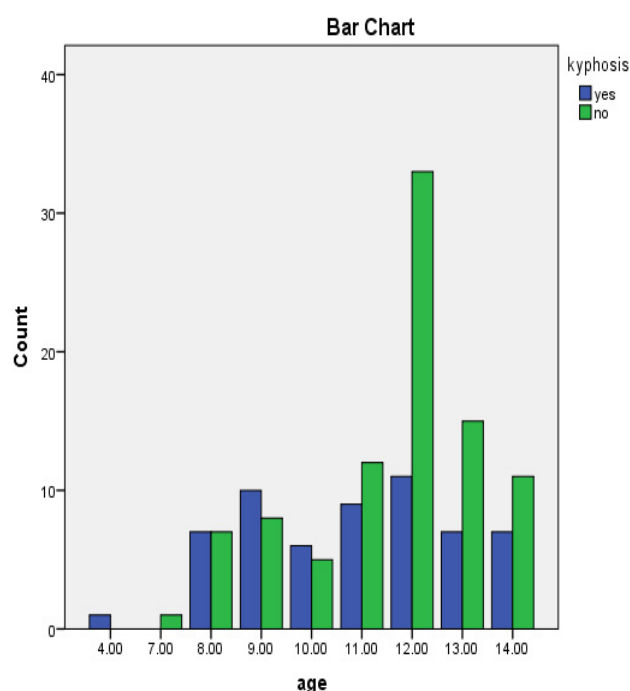


Figure 2: Kyphosis\*backpack weight.

6(4%) participants had a lighter backpack and 52(34.67%) participant's bag was heavy. A p value of 0.00 association was found between kyphosis and backpack weight in students which showed a significant relationship between the two variables. In other words, the prevalence of kyphosis was found to be higher in students who used heavy backpacks.

## Discussion

Findings showed a significant relationship between backpack weight and prevalence of kyphosis among students. In other words the prevalence of kyphosis was higher in the students who used heavy backpacks. In recent study the prevalence of kyphosis was 38.7%. Finding were in agreement with studies concluded that non-standard backpack weight increased the prevalence of kyphosis ( $p=0.008$ )<sup>[6]</sup>. Ilic concluded that carrying heavy weight cause the postural deformity (33.3%) prevalence of kyphosis which was quiet similar to recent study<sup>[11]</sup>. Rai stated that carrying a heavy backpack can be a source of back pain and spinal deformity and to prevent this issue, one should reduced the number of items which were of no need for that day such as laptop or any other electronic device, extra books or notepad<sup>[13]</sup>. Ramprasad stated that backpack weight cause the increase the size and angle of spinal curvature (0.001)<sup>[14]</sup>. Milanese state that postural angle increases with increase of weight of backpack which was also quiet similar to recent study<sup>[4]</sup>. In recent study all the students had backpack and all students were from public school. No of girls were greater than boys and more students used bagpack with regular weight. Barkhordari check the weight and other characteristics of backpack in 783 elementary school students in Yazd-Iran and reported that most of students had standard backpack. More students used regular backpack, and only 4% of them use wheel backpack which is consistent with the result of this study<sup>[15]</sup>.

## Conclusion

The study concluded that prevalence of kyphosis is significantly higher in students with heavy backpack usage. This issue is very significant and if not prevented, can cause serious complications in future. So, focused attention should be paid to prevent this problem in students. So parents, teachers and health care workers must teach the students about correct methods of sitting, standing and carrying adequate weight in the school bag.

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