

*Original Article*

# Schoolbag weight and its relationship to the occurrence of pain among schoolchildren in the western region of Libya

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## ABSTRACT

This study investigated the relationship between the schoolbag weight, and factors related to schoolbag carriage and occurrence of pain among primary school children in western part of Libya. 2371 students (1212 male and 1159 female) in grades 1 - 4 (6-9 years) were selected. Weight, tall and schoolbag weight were measured and questionnaire was used to collection the data. During the interviewing period children were classified as having pain or none. ANOVA, T-test and Logistic regression were used for analysis the data. Among participants, (96.25%) of students were used two-strap backpack with general mean weight was 3.85 kg. (91.40%) of students carried more than 10% of their body weight. Of 2371 children, neck 1137 (47.90%), Shoulder 1481 (62.60%), back 1179 (49.70%) were classified as having pain while, neck 1234 (52.10%), Shoulder 890 (37.40%), back 1192 (50.30%) were classified as having no pain respectively. The bag weight was significantly associated with occurrence of pain in primary school children.

**Key words:** Musculoskeletal pain, Schoolbag weight, Libya.

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## Introduction

The weight of bags carried by school children in Libya has increased due to the change in the school curriculum. The loads of school bag are reported to cause many problems in children such as postural changes, cardio-respiratory changes, balance impairment and cervical and shoulder posture of school children [10-13]. In child, the postural response to load is not fully developed and mobility of spinal bones, resulting in limited movement [10,11]. It is evident that carrying a

body pain [1-4]. In recent years the studies has increased its focus on body pain in these children [5-9].

The type of school bag, method of transport to arrive to school, weight of school bag, and the time for which it is carried can affect the heavy backpack has health effects. This has been clearly demonstrated by many studies conducted in Africa[14], Europe[15-17] and Asia [18]. In Libya, there is a lack of studies related to our subject that have examined the

weight of school bags and body pain in children. The aim of this study was to examine the correlation between school bag weight and the occurrence of pain among first to fourth grade students in Libyan's schools.

### Methodology

The study conducted on healthy male and female students started from 2014 up to 2022. 2371 students attending first (6Y) to fourth (9Y) grade at a government school in western part of Libya took part in the study. Students were selected randomly from each class. After that, the students were interviewed by the researcher during the school days.

During the interviewing period, the child's age, gender, weight, height, school bag weight, was recorded. Percentage of school bag weight relative to body weight was calculated. Health effects (back pain, shoulder pain, neck pain and no pain) were recorded. Questionnaire was used included school bag type, perception of students toward school bag weight (lighter weight, heavier weight). At the beginning of the school day, the researcher collected data on a randomly chosen day to measure the weight of all the books and food items.

Descriptive statistics were used to determine the mean, standard deviation, frequency variables and Chi-Square test, ANOVA, T-test and logistic regression were also used. The  $\alpha$  level considered in the analyses was set at 0.05; 95% confidence intervals were presented. The analyses were carried out using Statistical Package for Social Sciences (SPSS) 25.0 software.

### Results

A total of 2371 students was participating in this study, out of which 1242 (52.38%) were

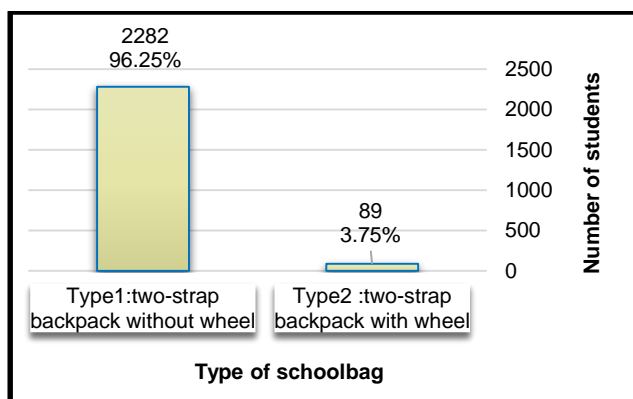
male and 1129 (47.62%) female. The age of the schoolchildren ranged from 6-9 years. The number of students according to educational stage was 730 (30.8%), 586 (24.70 %), 655 (27.60 %) and 400 (16.90%) in first, second, third and fourth grade respectively. The averages of weight ( $27.50 \pm 10.32$ ), height ( $137.20 \pm 6.82$ ), bag weight ( $4.27 \pm 1.13$ ) and bag weight to student weight ratio ( $15.53 \pm 8.88$ ) have seen in Table-1.

**Table (1).** Averages of student grade, weight, height, bag weight (full), and bag weight to student weight ratio.

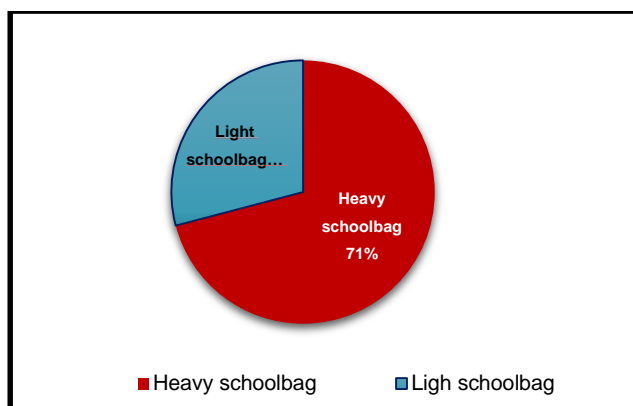
	# of Students (%)	Student weight (Mean $\pm$ SD) (Kg)	Height of student (Mean $\pm$ SD) (CM)	Bag weight full (Mean $\pm$ SD) (Kg)	School bag weigh/ Student weight (Ratio)*
<b>1st</b>	730 (30.80 %)	24.06 $\pm$ 13.89	119.71 $\pm$ 6.04	3.57 $\pm$ 0.91	14.83 $\pm$ 4.59
<b>2nd</b>	586 (24.70 %)	25.29 $\pm$ 4.90	126.37 $\pm$ 8.30	3.65 $\pm$ 0.80	14.43 $\pm$ 9.46
<b>3rd</b>	655 (27.60 %)	28.65 $\pm$ 5.67	131.83 $\pm$ 7.90	4.50 $\pm$ 1.67	15.70 $\pm$ 6.48
<b>4th</b>	400 (16.90 %)	31.19 $\pm$ 6.51	135.58 $\pm$ 11.49	4.62 $\pm$ 1.09	14.81 $\pm$ 3.83
<b>Total</b>	2371 (100.0%)	27.29 $\pm$ 7.59	128.37 $\pm$ 8.43	4.08 $\pm$ 1.11	4.95 $\pm$ 6.09

\*School bag weight / Student weight = Result  $\times$  %

2282 (96.25%) of students in the study were used a two-strap backpack without wheel while 89 (03.75%) carried their schoolbags on their backs using two strap backpacks with wheel (Fig. 1). The weight of schoolbag ranged from ( $3.57 \pm 0.91$  kg) to ( $4.62.09$  kg), and the weekly mean of schoolbag weight was ( $4.08 \pm 1.11$  kg) (Table-1). In addition to that, 71.0% of participants felt their school bag was heavy during carrying it, while 29.0% of the sampled students felt that their school bag was light (Fig. 2).



**Figure 1.** Distribution of students according to the type of schoolbag.



**Figure 2.** Perception of students toward schoolbag weight.

As shown in results, the majority 91.40% of school children carry school bags that weigh 10% or more of their body weight, while 8.60% of students usually carry school bags that weigh less than 10%. The loads carried with regard to (%) body weight guideline are shown in table 2.

**Table (2).** Distribution of students according to the ratio of school bag weight to body weight.

Ratio of school bag to student weight	Number of Students	Percentage (%)
< 10%	209	8.60%
≥ 10% and < 15%	987	41.60%
≥ 15%	1175	49.80%
Total	2371	100.00%

Table 3 shows a high percentage of school children who complained of pain (neck, shoulder and lower back). Of 2371 children, neck 1137 (47.90%), Shoulder 1481 (62.60%), back 1179 (49.70%) were classified as having pain while, neck 1234 (52.10%), Shoulder 890 (37.40%), back 1192 (50.30%) were classified as having no pain respectively. The bag weight was significantly associated with the occurrence of pain in primary school children.

**Table (3):** Distribution of students based on frequency of occurrence of musculoskeletal pain in general due to carrying school bag.

Body Region	Occurrence of pain		Total	P. value
	Always (pain)	None (no pain)		
Neck	1137 (47.90 %)	1234 (52.10 %)	2371 (100.0%)	0.098
Shoulder	1481 (62.60 %)	890 (37.40 %)	2371 (100.0%)	0.003
Lower back	1179 (49.70 %)	1192 (50.30 %)	2371 (100.0%)	0.047

### Discussion

In this study, we have examined the relationship between the weight of school bags during carrying them and the occurrence of neck, shoulder and back pain among primary school children in the western part of Libya.

According to the study, 2282 (96.25%) of students used a two-strap backpack without a wheel, whereas 89 (03.75%) used a two-strap backpack with a wheel. Similar findings have been reported in many other studies [15-19]. Both shoulders were used to carry the bags placed on the trunk, but the bags did not remain at waist level.

In many studies [10, 11, 19], it was reported that the mean weight of school bags is 9.06

kg, 8.3 kg, and 6.6 kg, respectively, which were heavier than the average school bag weight 4.08 kg carried by students. The students carried school bags with weights ranging from (3.57±0.91 kg) to (4.62±1.09 kg) over the course 5 days, and the weight variation of school bags could explain why certain children bring more books and food items to school daily than others. In addition to that, 71.0% of participants reported feeling heavy when carrying their school bag, while 29.0% of the students in the sample reported that their school bag was light.

91.40% of students carried more than 10% of their body weight and the average mean weight of school bags as a percentage of body weight ranges from 14.43% to 15.70%. This indicates that the students exceed the suggested weight by 4.43–5.70%.

The results of the study showed a significant relationship between the weight of the school bag and the occurrence of pain in the study sample's student population (Table 3). Similar to our results, a high level of complaints of shoulder pain (47.8% and 38.1%) were reported by Al-Qato (2012) and Shamsoddini et al. (2010), respectively. Most of the students complained of shoulder pain because most of them used bags with two straps, which put pressure on the shoulders. Carrying heavy

schoolbags will have many effects, including distorting the back's natural curves.

### Conclusion

The study concluded that there is a strong relationship between heavy school bags and occurrence of pain in primary school children. The students were suffering from pain in their neck, shoulders and back. This daily pain affect their academic performance.

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### Conference Presentation

Part of this paper was presented at the 7th Libyan Conference for Medical Sciences, 2022 October 11-13, National Medical Research Centre, Zawia, Libya.

### Clinical Trials

The study did not involve any clinical trials.

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