Physical Discomfort Faced by the School Children while Carrying School Backpack

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ABSTRACT

The greatest concerns to school students are physical, cognitive, emotional and social development. The prominent school children’s health issue in the India is the use of school backpacks. Backpacks used by school children can lead to poor posture and they might develop lower and upper back pain and strain their shoulders and neck. Heavy backpacks carrying by school students can cause irreversible physical harms because school student’s spine is in the stage of development. So, present study was undertaken with the objective of to assess the body discomfort due to school backpack in school children while carrying school backpack. The musculoskeletal symptoms (i.e. shoulder pain, back pain, neck pain, lower arm pain and upper arm pain) in school children due to carrying heavy backpacks have been seen. Lower back, legs and shoulder were the most affected part of the body of respondents and lifting, carrying and landing activities required the corrective measures immediately. Carrying backpacks increases the risk of back pain. Preventive and educational activities should be implemented to reduce the backpack load.

Keywords
School children, Musculoskeletal symptoms, School backpacks, Discomfort

Introduction

School students at the age of 11-14 years with their consistent rate of growth and development have greatest concerns to physical, cognitive, emotional and social development. The use of school backpack filled with educational and other related accessories (i.e. books, stationary, tiffin, water bottle etc.) is one of the forms of manual load carriage used by school children. Weight of the backpack strongly related to the incidence of shoulder, neck, back, and extremities complaints in school students. School backpacks used by school students can lead to poor body posture and they might develop pain and strain in lower back, upper back, shoulders and neck. Overweight school backpacks are responsible for a considerable quantity of back pain in school children which may be due to the changes in lumbar disc height or curvature. School students may be at risk for musculoskeletal injuries especially lower back and upper back related injuries because they carry loads that are heavier in proportion to their body weight which may lead to compress backbone abnormally and musculoskeletal deformity in later life. School backpacks can be threatening to the wellbeing of school students when they are too heavy. Heavy backpacks carrying by school students can cause irreversible physical problems.
because school student’s spine is in the critical stage of development. Carrying overweight backpacks may contribute adverse health effect on school children. So due to school backpack, high and rising occurrence of health problems in children is matter of concern.

So, present study was therefore taken up with the objective to assess the body discomfort due to school backpack in children while carrying school backpack.

Materials and Methods

For conducting the study two schools of Hisar city were randomly selected. Out of each selected school, ten school children were randomly selected. Thus the total constituted sample was 20 respondents. An interview schedule was developed and used for field survey.

Human body discomfort map and OWAS (OVAKO work posture analysis system) were used to assess the body discomfort due to school backpack in children while carrying school backpack. The data were tabulated and analysed by using the following statistical tools i.e. weighted mean score, frequency, percentages and rank.

Results and Discussion

Physical parameters of respondents

Table 1. Showed that half of the respondents were 14 years of age and minimum number of respondents (10 percent) were 12 years of age. It is revealed 45 percent of respondents belonged to height category of 145-155 cms and maximum numbers of respondents (65 percent) fall into weight category of 30-40 Kg. George et al., (2015) also found out musculoskeletal discomfort due to back pack weight in school students aged between 10 – 12 years attending 5th- 7th standard.

BMI of respondents

Table 2. revealed that 35 percent of respondents had BMI (Body Mass Index) in the range of 18.5-24.9 and 65 percent of respondents had BMI less than 18.5. Mean BMI of the respondents was 16.38 (± 2.22).

Mode of journey and distance travelled by the respondents

Data in Table 3 revealed that average distance travelled by the respondents was 1 km and 87 meters (+0.84) on each day; and 35 percent of respondents covered this distance on foot followed by bicycle (30 percent of respondents), by auto (25 percent of respondents) and by bike (10 percent of respondents). Average travel time taken by the respondents with carrying school backpack was 29 minutes (±9.03) on each day. It indicates that generally school children had to travel longer distances with school backpack.

Measurements of school bag

It is revealed in Table 4 that 55 percent of respondents carry backpack on both shoulders and 45 percent of respondents carry backpack on one shoulder. It was also revealed in Table 4 that. Mean weight of school backpack was 7.30 (±1.43). Mean width, mean length and mean height of school backpack was 13.3(± 1.49), 30.8(± 3.66) and 31.4(± 3.54) respectively. Zakeri Y et al., (2016). Found out that non-standard backpack weight increases the prevalence of dropped shoulders, kyphosis and lordosis in school students that can put in danger the physical health of the school students. Similarly Daneshmandi et al., (2008) revealed in their study that school backpacks weight exceeding 10% of the body weight increases energy consumption, increases the neck and trunk forward lean, results in decreasing lung volumes and increased cardio-respiratory parameters.
### Table 1 Physical parameters of respondents

| Parameters     | Frequency | Percentage |
|----------------|-----------|------------|
| Age (in years) |           |            |
| 12             | 2         | 10         |
| 13             | 8         | 40         |
| 14             | 10        | 50         |
| Height (in cm) |           |            |
| <145           | 4         | 20         |
| 145-155        | 9         | 45         |
| >155           | 7         | 35         |
| Weight (in Kg) |           |            |
| <30            | 2         | 10         |
| 30-40          | 13        | 65         |
| >40            | 5         | 25         |

### Table 2 Physical parameters of respondents

| BMI Score (kg/m²) | Frequency | Percentage | Description        | Mean (±S.D.) |
|-------------------|-----------|------------|--------------------|--------------|
| <18.5             | 13        | 65         | Underweight        | 16.38 (± 2.22) |
| 18.5-24.9         | 7         | 35         | Normal weight      |              |

*BMI was calculated by Quetlet's Index = Weight (kg) / Height² (m)

### Table 3 Mode of journey and distance travelled by the respondents

| Parameters       | Frequency | Percentage | Mean (±S.D.) |
|------------------|-----------|------------|--------------|
| Distance travelled* (in Km) |           |            |              |
| <1               | 4         | 20         |              |
| 1-2              | 9         | 45         | 1.87 (± 0.84) |
| >2               | 7         | 35         |              |
| Mode of journey  |           |            |              |
| On foot          | 7         | 35         |              |
| By auto          | 5         | 25         |              |
| Bycycle          | 6         | 30         |              |
| Bike down        | 2         | 10         |              |
| Travel time* (in minutes) |       |            |              |
| <20              | 3         | 15         | 29 (± 9.03)   |
| 20-30            | 9         | 45         |              |
| >30              | 8         | 40         |              |

* With school bag
### Table 4 Measurements of school bag

| Parameters                        | Frequency | Percentage | Mean (±S.D.) |
|-----------------------------------|-----------|------------|--------------|
| **Type**                          |           |            |              |
| Backpack (carry on both shoulders)| 9         | 45         |              |
| Shoulder bag (carry on one shoulder)| 11       | 55         |              |
| Weight (with accessories) (in Kg) |           |            |              |
| <6                                | 3         | 15         |              |
| 6-7                               | 7         | 35         | 7.30 (±1.43) |
| >7                                | 10        | 50         |              |
| **Size**                          |           |            |              |
| Width (in cm)                     |           |            |              |
| <12                               | 4         | 20         |              |
| 12-15                             | 16        | 80         | 13.3 (± 1.49) |
| Length (in cm)                    |           |            |              |
| <30                               | 5         | 25         |              |
| 30-35                             | 15        | 75         | 30.8 (± 3.66) |
| Height (in cm)                    |           |            |              |
| <30                               | 6         | 30         |              |
| 30-35                             | 14        | 70         | 31.4 (± 3.54) |

### Table 5 Analysis of Human Body Map Discomfort

| Sr. no. | Body part | WMS | Rank |
|---------|-----------|-----|------|
| 1.      | Neck      | 2.5 | III  |
| 2.      | Shoulder  | 4.1 | I    |
| 3.      | Upper arm | 2.1 | V    |
| 4.      | Lower arm | 2.2 | IV   |
| 6.      | Back      | 3.7 | II   |

Corlett and Bishop’s scale (1976)

### Table 6 OWAS analysis for different stages of school backpack carrying

| Stages                              | Back (Angle) | Arms (Angle) | Legs (Angle) | Load (Kg) | Action category | Action required                  |
|-------------------------------------|--------------|--------------|--------------|-----------|----------------|-------------------------------|
| Walking                             | 2 (Bent forward) | 1 (both arms below shoulder level) | 7 (walking or moving) | 1 (no effort or effort less than 10 kg.) | 2 | Corrective measures in the near future |
| Standing                            | 2 (Bent)     | 3 (both arms below shoulder level) | 3 (standing with the weight) | 1 (no effort or effort less than 10 kg.) | 3 | Corrective measures as soon as possible |
| Stepping up and down from stairs    | 4 (Bent forward) | 1 (both arms below shoulder level) | 7 (walking or moving) | 1 (less than 10 kg) | 2 | Corrective measures in the near future |
Analysis of Human Body Map Discomfort

Table 5. revealed that most of the respondents posed shoulder pain (WMS 4.1, rank I) followed by back pain (MS 3.7, rank II), neck pain (MS 2.5, rank III), lower arm pain (MS 2.2, rank IV) and upper arm pain (MS 2.1, rank V). Pant et al., (2016) also found out that school children while carrying school backpacks faced high discomfort in neck, shoulder and back.

OWAS analysis for different stages of school backpack carrying

Composite score for different stages of school backpack carrying was determined by using OWAS (OVAKO work posture analysis system). The standing stage of the respondents with carrying school backpack was required corrective measures as soon as possible while walking with carrying school backpack and stepping up and down from stairs required corrective measures in the near future. Oviedo et al., (2012) also analysed in their study that the prevalence of school children carrying heavy backpacks is extremely high so preventive and educational activities should be implemented in 12–17 age group.

The heavy backpack load on the back has led to serious of physical problems like backache, neck pain, shoulder pain etc. School children faced problems in different body parts and high discomfort was found in shoulder and back. According to the OWAS sheet walking, standing and stepping up and down from stairs required the corrective measures as soon as possible. The musculoskeletal symptoms (i.e. shoulder pain, back pain, neck pain, lower arm pain and upper arm pain) in school children due to carrying heavy backpacks have been seen. Carrying overweight backpacks increases the risk of musculoskeletal discomfort in school children.

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