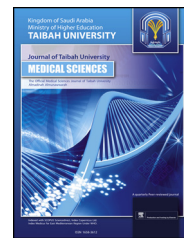




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Brief Communication

The association between backpack use and low back pain among pre-university students: A pilot study

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Abstract

Background: Individuals aged 30–60 years have a high possibility of experiencing low back pain. However, children and adolescents are not exempted from this problem. This study aimed to determine the relationship between backpack usage and the frequency of low back pain in pre-university students.

Methods: A total of 101 currently enrolled pre-university students were recruited for this cross-sectional study. They answered a questionnaire about their demographic details and their frequency of backpack usage. Their backpacks were weighed for four consecutive school days. The Roland–Morris Disability Questionnaire and Body Discomfort Chart were used to rate discomfort levels.

Results: The use and weight of a backpack were not significantly associated with low back pain, as indicated by the Roland–Morris Disability Questionnaire and Body Discomfort Chart ($p > 0.05$).

Conclusion: This study did not find an association between the use of a backpack and low back pain in Malaysian pre-university students.

Keywords: Bone; Mechanical loading; Pain; Teenager; Vertebrae

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Introduction

Low back pain is a communal problem defined as pain located between the lower ribs and the buttock folds.^{1,2} It is an important contributor to disability globally, and children are no exception. A study has shown that the prevalence of low back pain among children and teenagers varies between 11% and 52.1%.³ Low back pain is a significant health problem because it predisposes youths to musculoskeletal problems in the later stages of their lives.

The use of a backpack is the most important factor causing low back pain among students. The weight of backpacks has increased significantly due to the necessity of carrying academic materials.⁴ The occurrence of low back pain is associated with a backpack weight greater than 15% of total body mass and a prolonged period of carrying the bag.^{3,5,6} The type of backpack also influences low back pain among students. The two-strap backpack is the most ergonomic design.⁷ One-shouldered and hand-held bags may cause stress and strain on the back muscles due to an imbalanced load distribution between the shoulders.⁸ Roller-bags also contribute to low back pain due to improper posture changes during their use.⁹ Carrying a backpack on one shoulder instead of both shoulders also

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increases the risk of low back pain due to postural deviation.^{10–12} Similarly, asymmetrical carriage contributes to low back pain as well.¹³

Apart from backpacks, other factors such as body mass index (BMI), sex and physical activity status also contribute to low back pain. Non-ideal BMI, either underweight or overweight, is a predictor of low back pain.^{14–16} Most studies indicate that female students have a greater tendency to experience low back pain than their male counterparts.^{3,7,11,13–17} This may be due to a higher tendency for females to carry heavier backpacks, as well as physical and physiological sex differences.^{15,17–19} Individuals with inappropriate sitting positions and a sedentary lifestyle have low back muscle endurance.¹⁹ Inversely, exercise and vigorous activity can strengthen the back muscles, thus lowering the risk for low back pain.¹⁸

There are limited studies on backpack load and low back pain amongst Malaysian youths because most studies involved school children.¹⁷ We attempted to bridge this research gap by examining the effects of backpack use and related risk factors on low back pain in a group of pre-university students in Malaysia. The main reasons for selecting these individuals were the paucity of data on low back pain among Malaysians youths, the homogeneity of this group in terms of age, and the convenience of sampling.

Materials and Methods

Subjects

A cross-sectional study was performed on 101 (49 male, 52 female) students attending a bridging programme designed to prepare high-school graduates to enter university (pre-university) in a Malaysian higher learning institution. The age range of the students was 16–18 years, with a median age of 18 years. Recruitment was performed from 5th December 2016 to 9th December 2016. Universal sampling of all the pre-university students of the institution was conducted. The students were briefed on the details of this study, and informed written consent was obtained. The included subjects were physically healthy and had no major deformities. They could walk and carry loads on their own. Those with severe orthopaedic problems or who were ill during the study were excluded.

Ethical considerations

The protocol was reviewed and approved by the Universiti Kebangsaan Malaysia Research Ethics Committee (Code Number: UKM PPI/111/8/JEP-2016-599). All subjects were informed of the details of this study, and their queries were answered. Individual consent was obtained before the participation. Consent from parents/guardians was obtained for subjects younger than 18 years.

Measurement

The Virgo Analog Weighing Scale (Model 9811b, Virgo, Maharashtra, India) was used in this study to measure the weight of the students without their backpack load, students with their backpack load, and students with their backpack

load and an additional load such as hand bags, water bottles or lunch boxes. These weight measurements were repeated for four days, and the average was used in the final analysis. The height of students was measured using a stadiometer. Body mass index was calculated as per convention.

A self-administered questionnaire was used to obtain general information on demographic details (age and gender), physical activity and backpack usage, including the type of schoolbag used, the method of carriage, and any discomfort experienced due to schoolbag carriage. The Roland–Morris Disability Questionnaire, which is freely accessible online (permission not required for use) (<http://www.rmdq.org/>), was used to assess low back pain among the subjects. This questionnaire has been used in previous studies to investigate the relationship between backpack weight and low back pain.²⁰ The daily report of body discomfort was recorded by the subjects at the end of each school day using a numerical Daily Pain Intensity Scale for four days.

Statistical analysis

Statistical analysis was performed using SPSS 23.0 (IBM, Armonk, USA). The normality of the data was assessed using a Kolmogorov–Smirnov test. Most data were not normally distributed, so a non-parametric analysis approach was used. Comparisons of backpack weight and the scores from the Roland–Morris Disability Questionnaire and the Daily Pain Intensity Scale between sexes, types of backpack, method of carriage and history of low back pain were conducted using Mann–Whitney U tests. The associations between variables of interest were analysed using the Spearman correlation test. Statistical significance was defined as $p < 0.05$. Data are presented as the median [interquartile range (IQR)].

Results

A total of 101 (42 male and 59 female) subjects participated in this study. The age range of the subjects was 16–18 years (median = 18; IQR = 1 year). Most of the students were 18 years old (86.1%), followed by 17 years old (12.9%). Only one subject was 16 years old. Most students had a normal BMI (72.9%). More than half of the subjects were physically active (59.4%) (Table 1).

The median backpack weight carried by students was 3.50 kg (IQR = 1.86 kg; range = 0–11.00 kg), while the median backpack weight/body weight percentage was 5.87% (IQR = 3.48%) Male students carried heavier bags (median = 3.63 kg, IQR = 2.41 kg) than female students (median = 3.25 kg, IQR = 1.38 kg). The median percentage backpack weight per body mass over four days was 5.87% (IQR = 3.48%; range = 0.00–13.46%). Female students carried higher median percentage mass (6.19%, IQR = 2.97) than male students (5.42%, IQR = 3.58%). Eighty-seven per cent of the subjects carried a two-shouldered bag using both shoulders. More female students (10.9%) favoured one shouldered bags than males (2.0%).

A total of 61.4% of the subjects indicated that they had a history of low back pain. This pain occurred more frequently in females (36.6%) than males (24.8%). Most subjects (62.4%) indicated that none of their family members suffered from low back pain.

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