ASSOCIATION BETWEEN SCHOOLBAG WEIGHT AND BACK PAIN AMONG PRIMARY SCHOOLCHILDREN IN KAJANG, SELANGOR

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ABSTRACT

These days, there is a growing concern that schoolchildren are carrying too heavy school back on their backs. The use of a back pack is the most important factor causing low back pain among students. Thus, a cross sectional study was conducted on 81 schoolchildren from two different types of primary school in Kajang, Selangor. The objective of this paper is to determine the association between schoolbag weight and back pain among primary schoolchildren in Kajang, Selangor. For the method, respondents' body weight and their schoolbag weight were measured using the electronic body composition OMRON and KERN weighing scale respectively, while the height was measured using Body Meter Seca 208cm. Back pain in the past one week was assessed using questionnaire, adapted from previous studies. This studied involving 81 primary schoolchildren from two types of school which were government and private school. 74.1% of schoolchildren had the schoolbag weight more than 10% of their body weight. 32.1% of schoolchildren reported having back pain and 21.0% of them were female respondents. Back pain was detected in 24.7% government schoolchildren and 7.4% private schoolchildren. There was significant association between back pain and; relative weight (x2=9.720, p=0.002) and types of school (x2=4.949, p=0.026). As conclusion, schoolchildren that carry schoolbag heavier than that generally recommended which is not more than 10% of body weight will experienced the back pain

Keywords: Primary schoolchildren, schoolbag weight, back pain, Kajang

INTRODUCTION

There is a growing concern these days that schoolchildren are carrying too heavy schoolbag on their backs. Primary school children are at a maturity age and it is important that they do not carry superfluous loads. They usually carry their school bag to, from and around the school. The school bag contains of their textbooks, packed meals, water bottles, sport attires and stationaries[1]. School bag is a bag that is used for carrying books and other things for school, usually with a long strap and carried over the shoulder or carried on the back like a backpack[2]. Heavy school bags can change the body posture and the musculoskeletal system must react appropriately in order to satisfy for this stress[3].

Global studies have noted association of school bag weight and back pain among primary school children[3-4]. A study conducted in Al-Ahsa, Saudi Arabia reported that the students were suffering the back pain related to the use of heavy school bag3. In Southern Brazil, a study conducted by[5], stated that the usage of overweight backpacks and carrying these in a different manner, sitting for long periods of time with poor pose, use of anatomically incorrect furniture, watching television for long periods of time, sleeping less than seven hours a day, smoking, obesity and psychological factors such as depression and anxiety are some of the risk factors for onset of back pain in students. In addition, children also experienced pain in the upper body involving the neck, shoulders and upper back. Pain in these areas is associated with carrying heavy loads[6]. In Malaysia, study by[7], found that the children have low back pain associated with carrying heavy school bags. They also found that the risk factors for the development of back pain among the primary school children were the school bag weight and method of carrying school bag. Therefore, the objective of this paper is to determine the association between schoolbag weight and back pain among primary schoolchildren in Kajang,

METHODS

This was a cross-sectional study conducted in two types of primary school which were Government (GS) and Private (PS) school located at Kajang, Selangor. A total of 81 respondents with informed consent participated in this study, comprising 36 (8 years) and 45 (11 years) schoolchildren, who have an average age of 8 and 11 years respectively, and 42 males and 39 females. The schools were randomly selected from a list of national and international primary school in Kajang. Then, the permission was obtained from Selangor Education Department (JPNS) and Ministry of Education (MOE). The Lemeshow formula was used to determine the number of sample size needed. From the calculation, there were 40 respondents needed for each group. However, 48 respondents were needed in order to increase 20% of non-response rate. So that, the total of 96 respondents were estimated needed

for this study since there were two groups of respondents involved. However, for this study, in GS 48 respondents were recruited but 33 respondents for PS since the total of schoolchildren for Year 2 and Year 5 in that school were 33. For the selection of respondents in GS, the stratified random sampling techniques was used[8]. All classes of years 8 and 11 were involved. The name list of students was obtained from school administrative officer or class teacher for the selection of students in each class. Those who fulfilled the inclusion criteria were selected randomly. Concurrently, purposive sampling was used for PS and all the schoolchildren aged 8 and 11 years involved.

Respondents' weight and their schoolbag weights were measured using electronic body composition scale (OMRON) and KERN weighing scale respectively. The height of respondents was measured using Bodymeter Seca 208cm and Body Mass Index (BMI) of them will be calculated. The measurement of schoolbag weight was taken for five days from Monday to Friday to get the average. A set of questionnaires was used to obtain the respondents' sociodemographic, information related to their schoolbag, physical activities and health problem related to schoolbag weight. The questionnaire included a diagram of body parts divided into neck, shoulder, upper back, lower back, elbow, arm, hand, thigh, knee and leg to assist the students in identifying the right body parts when answering the questions. Besides, there was also the Visual Analogue Scale (VAS) in this questionnaire to help students provide a more accurate responses to the intended questions and the usage of VAS with a questionnaire is very common in research conducted among school children as it would be much easier for kids to understand since it is more graphical rather than words[8]. The existing of back pain was questionnaire based whether respondents answered "yes" or "no" when asked, if they were having back pain at the moment.
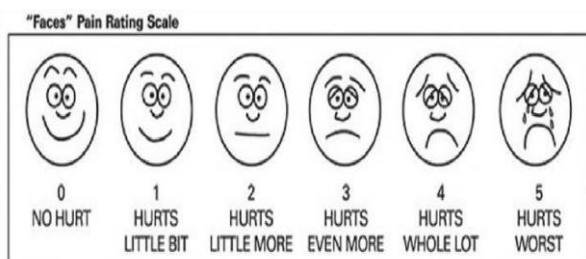

Figure 1: The Visual Analogue Scale (VAS) used in questionnaire

The questionnaire was modified from the previous study, Association of School Bag Weight with Lung Function, Back Pain and Perceived Load Among Primary School Children in Kajang, Selangor that have been conducted by[9].

Statistical analysis was conducted using Statistical Package for Social Science (SPSS, version 20.0). Demographic data were analyzed using descriptive statistics. Association between schoolbag weight and back pain was analyzed using Chi square test. The level of significant was set at 95% Confidence Interval with p value $\leq$ 0.05.

RESULTS

The ethnicity of the respondents was shown in Figure 2. Majority of respondents were Malay (91.4%). A total of 81 year 2 and 5 respondents (42 males and 39 females) were recruited. Of this, 48 (21 males, 27 females) were from GS and 33 (21 males, 12 females) were from PS as shown in Figure 3. This was a quasi-experimental study (pre-test and post-test) conducted in two randomly selected primary schools (rural and urban) in Hulu Langat, Selangor, Malaysia. For this research purposes, one of primary school from Cheras represented urban while primary school from Hulu Langat represented as rural area. This pre- and post-test Quasi-Experimental study was carried out to determine the effectiveness of fire and burns at home education.
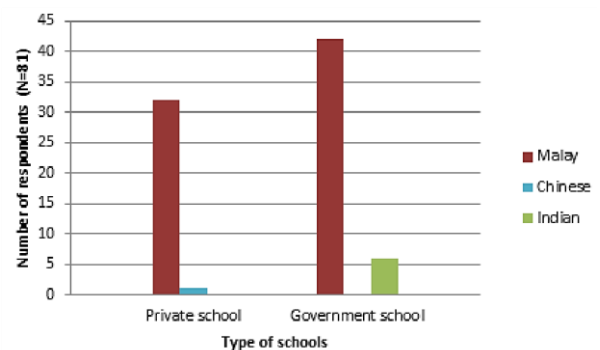

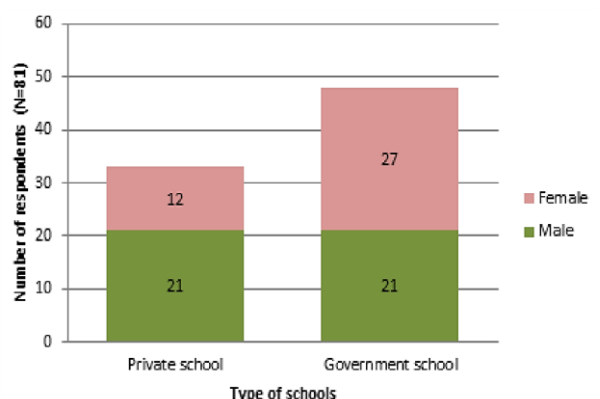**Figure 2:** The number of respondents according to races

Figure 3: The number of respondents according to gender

Weight of schoolbag

58.0% of government schoolchildren and 39.5% private schoolchildren were using double strap schoolbag. The respondents that carried their schoolbags with both of shoulders were 58.0% in GS and 33.3% in PS. The relative weight of

schoolbags carried by the respondents was 18.62(±4.87) in GS and 9.45(±3.89) in PS. Respondents that carried schoolbag more than 10% of their weight were 59.3% in GS and 14.8% in PS. Table 1 shown that schoolchildren in GS were carrying heavier schoolbag compared to PS schoolchildren, (x2=41.23, p=0.00)

Table 1: Schoolbag weight according to types of school

Variable (N=81)	School Type		Total		
	Government (N=48)	Private (N=33)		X^2	p
Carried schoolbag $\geq$ 10% of body weight	48(59.3%)	1(14.8%)		41.23	0.00*
Bag type					
Single strap	0(0.0%)	1(1.2%)	1(1.2%)		
Double strap	47(58.0%)	32(39.5%)	79(97.5%)		
Bag with wheel	1(1.2%)	0(0.0%)	1(1.2%)		
Method of carriage					
One shoulder	0(0.0%)	6(7.4%)	6(7.4%)		
Both shoulders	47(58.0%)	27(33.3%)	74(91.3%)		
Pull with wheel	1(1.2%)	0(0.0%)	1(1.2%)		

*significant at p<0.05

Back pain

Back pain was reported by 26(32.1%) respondents which were 20(24.7%) from GS and 6(7.4%) from PS. Chi square test, used to analyze the association between back pain and types of school, type of schoolbag, carriage method and BMI. There was found that types of school have significantly associated with back pain, x2=4.949, p=0.026 (Table 2).

Table 2: Chi square test of type of school, type of school bag, carriage method and BMI with back pain

Variable (N= 81)	Back pain		x^2	p
	No	Yes		
School type				
Government	28 (34.6%)	20 (24.7%)	4.949	0.026*
Private	27 (33.3%)	6 (7.4%)		
Bag type				
Single strap	1 (1.2%)	0 (0.0%)	2.596	0.273
Double strap	54 (66.7%)	25 (30.9%)		
Bag with wheel	1 (1.2%)	0 (0.0%)		
Method of carriage				
One shoulder	6 (7.4%)	0 (0.0%)	5.048	0.080
Both shoulders	49 (60.5%)	25 (30.9%)		
Pull with wheel	0 (0.0%)	1 (1.2%)		
Body Mass Index (BMI)				
Underweight	41 (50.6%)	22 (27.2%)	1.546	0.462
Normal	12 (14.8%)	4 (4.9%)		
Overweight	2 (2.5%)	0 (0.0%)		

Significant at p<0.05*

Back pain among respondents according to gender

Table 3 showed that 21.0% female and 11.1% male school children experienced back pain. This showed that female respondents experienced back pain more than male respondents.

Table 3: Back pain among male and female respondents

	Male (N=42)	Female (N=39)	Overall (N=81)	x^2	p
Back pain					
Yes	9 (11.1%)	17 (21.0%)	26 (32.1%)	4.557	0.033
No	33 (40.7%)	22 (27.2%)	55 (67.9%)		

Significant at p<0.05

Back pain level reported by the respondents

Figure 4 showed that most respondents that experienced back pain reported having back pain hurts little more with 13.6%.
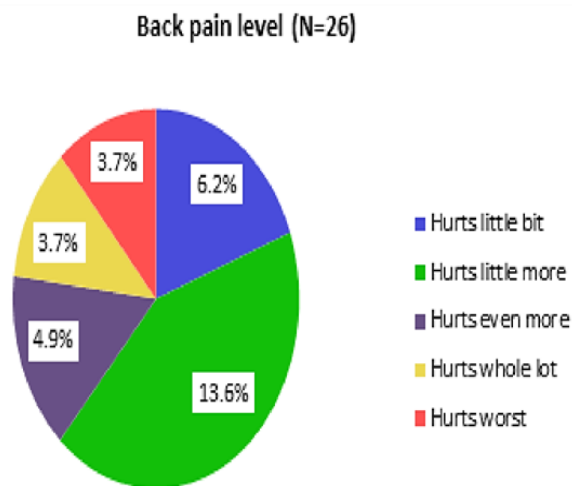
Figure 4: The back-pain level of respondents

DISCUSSION

This cross-sectional study was conducted among primary schoolchildren in Kajang, Selangor. This study involved two type of schools which were government and private primary school. There was less study performed locally studying the effects of school bag weight and its link with back pain in different school system or types. For example, there was a previous study have been done in Malaysia by[4], involved only the government schools but different medium primary schools which were National School, Chinese Medium School and Tamil Medium School. Other studies in Malaysia[7] and[8] were also conducted in government primary schools. So that, this study tried to determine the association of school bag weight and back pain in two different type of primary schools.

The respondents who carrying schoolbag weight more than 10% of their body weight were 60(74.1%) and 30.6% of them were having back pain. Meanwhile, 1.2% that experienced back pain was carrying schoolbag not more than 10%. There was an association between schoolbag weight and back pain, (x2=9.720, p=0.002). This was similar with previous study by[8], who showed schoolbag weight was significantly associated with lower back pain (p=0.048). Besides, the one of the important findings in the study conducted by[7], was that as high as 58.3% of the schoolchildren reported having low back pain associated with carrying heavy schoolbags.

The schoolbag was heavier among the GS schoolchildren (18.62kg) which were more than 10% of their body weight. This somewhat reflects higher use of learning materials in the GS compared to PS. The weight of textbooks supplied by the Ministry of Education ranges between 1.19kg and 2.36kg and if schoolchildren abide to the daily time table and avoid carrying materials that are not necessary, the weight carried by them can be substantially reduced. The

educational systems were difference between GS and PS. As the PS was a Tahfiz School Academic, the system used was totally difference. PS schoolchildren will spend their time more for "hafazan" and only having one subject for educational class daily. PS schoolchildren need to bring only one textbook for every day. That was one of the reasons schoolchildren from PS carried lighter schoolbag. Moreover, there were the lockers prepared for the PS schoolchildren so that they can keep their things in there. The existing of back pain was 26(32.1%) out of which 20(24.7%) were from GS and 6(7.4%) from PS. The occurrence of back pain was higher in GS as the schoolchildren from there were carried heavier schoolbag. The types of school were found significantly associated with back pain, x2= 4.949 and p=0.026. In previous study conducted by[4], revealed that there was the strong association between types of school and the occurrence of back pain. The schools that involved in that study were National school, Tamil medium school and Chinese medium school.

There were no significant association between back pain and types of schoolbag, method of carriage and BMI. This was supported by[9]. However, these results were different from study done by[10], which showed that carrying a one-shouldered bag caused more low back pain than wearing a two shouldered bag. The study also demonstrated that subjects with a higher BMI had a higher degree of low back pain. This was probably due to the extra loading exerted on the musculoskeletal system in individuals with a large body size. The study done by[5] reported that overweight and/or obese students had a higher prevalence of back pain than students with normal BMI.

Females experienced back pain more than male in this study. This could be due to gender differences as the physiological and physical characteristics between gender were different[8]. The findings by[7], showed that females children were less efficient in carrying loads on their backs, females were supposed to utilise bigger erector spinae muscles compared to males, which can lead to faster rate of muscle fatigue and increase the risk of low back pain. Thus,[5] revealed that back pain was significantly higher in girls than in boys.

11(13.6%) respondents said that back pain was hurts little more. 3.7% of them experienced back pain that hurts the worst. There were also other parts of body that may affect due to heavy schoolbag. 14(17.3%) of respondents reported having pain at the shoulders. In the study conducted by[11], 27% of children reported having neck pain and it was significantly associated with school furniture features, emotional and conducts problem, family history of low back pain and previous treatment for musculoskeletal disorders.

The schoolbag weights were measured every day from Monday to Friday to get the average that carried by the schoolchildren during the school days. The variability of schoolbag weights due to differences in the time table across a week should be considered to better estimate the actual weight of the schoolbag[4].

However, in this study, the existing of back pain was detected by asking the respondents "yes" or "no" to previous experience of pain in the back region. There was no privacy during the completion of questionnaires. Thus, there was a possibility that answers given by the respondents in this study resulted from influences by the others. A clinical assessment to confirm the occurrence of back pain would minimize this bias[4].

Preventive measures are required in order to reduce the health problem related to schoolbag weight. Parents should monitor their children and packing their schoolbag according to the class time table. This action is to ensure no unnecessary materials are carried by them to school[4]. Besides, to decrease injury and improve comfort, experts have recommended that children should use backpacks that match the size of the child[6]. Another possible way to minimize the problem is by preparing the lockers to the schoolchildren within the school compound. Schoolchildren may keep their learning materials and other things in that locker rather than carry them daily.

CONCLUSION

In conclusion, this study shows that most of the school-children are carrying heavy schoolbag and they are exceeding 10% of their body weight. The existing of back pain is high among the respondents who are carrying heavy schoolbag. Schoolchildren from government school carry heavier schoolbag and almost half of them experienced back pain. The existing of back pain is significantly associated with schoolbag weight and types of school. It is hoped that the results from this study will help in suggesting and supporting improvements to be taken regarding this schoolbag weight issues.

ETHICAL CONSIDERATIONS
Ethics approval was obtained from the Universiti Putra Malaysia Ethics Committee for Research involving Human Subjects (ref:UPM/TNCPI/RMC/1.4.18.2 (JKEUPM)) dated 10 January 2018. Permission to conduct the study was also obtained from the Ministry of Education, Selangor Education Department and Principal of the participating schools. Written informed consent was obtained from parents and respondents before data collection.

COMPETING INTERESTS
There is no conflict of interest.

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