

Impact of School Bag Use Instructional Guidelines on Primary School Children's Awareness and pain Intensity

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Abstract: *Regular use of heavy school bags and inappropriate carrying methods can put children at the risk of spinal pain, changes the body posture, and muscle imbalance that could turn into chronic back and neck problems later in life. There is an ongoing concern regarding the weight of children's schoolbags and the negative consequences of such heavy loads on spine development in primary school children. Preventive measures are strongly recommended to protect children. Thus, this study aims to assess the impact of school bag use instructional guidelines on primary school children's awareness and pain intensity. Using quasi experimental design, a total of 100 boys and girls children aged between 8 to 12 years were randomly selected and was divided into 50 for study and 50 for control group. Data were collected using anthropometric measurement, a structured questionnaire, numeric pain rating scale, and Wong-Baker faces pain rating scale. Each child's body weight and school bag weight as well as the ratio of load to body weight were measured. Results revealed that 54 % and 68% of study and control group respectively carried a school bag weight more than 10 percent of their body weight. Meanwhile, 88% and 84% of children in study and control group respectively reported school bag associated spinal pain. The occurrence of shoulder, lower back, and neck pain among schoolchildren was 96%, 72% and 62%, respectively. A significant relationship was found between percentage of school bag- weight and presence of pain among children ($P < 0.05$). Improvement of awareness was observed after introducing the guidelines. Furthermore, regarding pain intensity based on WBFS, a statistically significant difference was found between study and control group in posttests. Thus, the study recommends implementing these guidelines on a nationwide awareness campaigns and equipping schools with facilities such as locker and desk with drawer to keep school bag.*

Key words: *School Bag, Guidelines, Children's Awareness, Pain.*

I. Introduction

Schools are considered to be an ideal place for students to conduct activities that favor proper physical and motor development and by providing a healthy environment to flourish the children's body and spirit ability. Carrying heavy school bags have raised concerns regarding the side effects of prolonged or habitual carriage of heavily loaded backpacks among school age children (Youlian, 2008). School health providers and researchers have expressed concern about the long term impacts of carrying excessive loads by primary school children on a daily basis. Furthermore, spinal curvature occurs when the backpack is loaded 10 to 15% of body weight (Brackley, 2009). As such, musculoskeletal pain among primary school children appears to be more common than was previously thought (Skoffer, 2007). Combination of risks leads to high increase of spinal pain among school children including regular inappropriate carrying methods of heavy school bags more than 10% of their body weight, duration carrying the school bag, manipulating and handling position of the load on the body of students are determinant factors for musculoskeletal complaints associated with school bag carriage (Puckree, 2004, Yanto, 2008 and Aizat, 2009). A number of these students were actually carrying in excess of 20% of their bodyweight (Shamsoddini, 2010 and Al-Hazaa, 2006).

Additionally, Rachele, 2012 reported that, knowledge and behavior of students about risk factors of school bag associated pain can be improved by an educational programme. However, the sustainability of education effects are not guaranteed unless the educational package is considered in the curriculum, parents are informed about the risk factors of musculoskeletal disorders and they are encouraged to monitor their children's behavior. Furthermore, school infrastructure and furniture must be designed according to the needs of the students. Fabiana, 2012 also added that theoretical knowledge acquisition is the first step towards adopting healthy postural habits to prevent pain and that the back care program contributed to an increase in the level of knowledge of spinal anatomy and physiology, adequate postures and furniture, and handling of school materials and other loads.

II. Significance

In recent years, heavy backpack weight has become an issue of increasing significance, since it is known to have serious effects on children's health. Pain and other problems induced by heavy backpacks can affect children's quality of life in many ways; for instance, it may result in disruptions in daily activities and lost school time. Carrying heavy backpacks can lead to pain and injury that prevent students from participating in everyday activities (Hung, 2009). Carrying schoolbag increases risk of neck, shoulder and back pain and possibly the risk of back pathology. The prevalence of school children carrying heavy schoolbag is extremely high. The daily physical stresses associated with carrying schoolbag 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 (Mayank, 2006).

For example, a heavy bag that's slung over one shoulder can, over the 12 years of schooling, cause chronic back problems that linger into adulthood. Risks include muscle strain, distortion of the natural 'S' curve of the spine and rounding of the shoulders. The low back pain as a result of carrying of school bag by students has necessitated the attention given to the determination of limits of weight of school bag carried by students in the school (Ajay, 2012). This pain affects students' lives in various ways including physical injury and a loss of time during activities (Moor, 2007 and Rice, 2008).

Carrying a schoolbag is a daily activity for most children and many researches have been conducted in an effort to identify a safe load limit for children to carry in their schoolbags. Despite this, there is still no consensus about guideline weight and other factors associated with carrying a schoolbag (Dockrel, 2013). American Occupational Therapy Association (AOTA) and the America Academy of Pediatrics advise that students should carry no more than 15% of their bodyweight. Currently, many professional organizations are communicating virtually the same message: choose the right size backpack; pack well and empty out unnecessary items; wear straps on both shoulders; and carry less than 10% of body weight (Janakiraman, 2014).

An Egyptian study recommended that further researches are needed to evaluate the effect of safety programs on reducing school bag weight as well as teach primary school age children how to keep their back healthy and how to avoid musculoskeletal problems (Ibrahim, 2012). After extensive literature review by researcher, it was found that, many Egyptian researches have been done to investigate pain associated with carrying school bag, yet no researches were carried out to develop instructional guidelines and evaluate its effect of on awareness of school bag associated pain. Matias, 2013 also found a high prevalence of back pain in schoolchildren, suggesting an urgent need to develop educational and preventative programs in schools. Hung, 2009 also recommended raising awareness of students about backpack safety, healthy backpack weight, and the proper method of wearing and loading. Dianat, avadivala and Allahverdipour, 2011 also recommended preventive measures and appropriate guidelines with regard to safe load carriage in schoolchildren are therefore needed to protect children. Thus, this research hopefully will test the impact of these preventive measures which will consequently add to nursing body of knowledge and promote school health nursing practice. Since today's children's are tomorrow's youth, this research will also clarify this neglected problem and raise awareness among school children as well as parents and teachers in Egypt.

Operational definition: for the sake of this study school bag associated spinal pain is neck, shoulder and back pain caused by factors associated with carrying school bag.

Aim of the Study: To determine the impact of school bag use instructional guidelines on primary school children's awareness and pain intensity.

Research hypotheses: H1: Children who are exposed to the school bag use instructional guidelines will exhibit higher knowledge and behavior post-test scores than pre-test scores.

H2: Children who are exposed to the school bag use instructional guidelines will exhibit higher knowledge and behavior post-test scores than those in control group.

H3: Children who are exposed to the school bag use instructional guidelines will exhibit lower intensity of pain after introducing the guidelines than before.

III. Subjects and Methods

Research Design: A quasi experimental design was utilized in the study.

Setting: Two primary schools, namely Taha Husein and El-Monira primary school.

Sample: After the selection of schools, 2 classes from every school were randomly selected from a list (i.e. 4th and 6th grade). Using a simple random sample technique, the sample size was calculated using the free online sample size calculator website to be 100 students aged from 8 to 14 years old who were then recruited into 50 for control and 50 for study group.

Tools for data collection: 1- Anthropometric measurements including height and weight using weighing scale and Stature meter. Children's BMI tool for schools online calculator was used. Weighing scale was calibrated prior to the study.

2- A self-administered questionnaire based on Mehta (2002) questionnaire was developed and field tested by the researcher including 4 parts; the 1st part consists of children's personal characteristics such as age, gender, grade level. 2nd part includes school bag use associated pain history in the previous 3 months. 3rd part include the knowledge section consists of 10 question such as identifying spine deviations in an illustrations, the best way to carry a backpack, the correct way to organize school materials in school bag, the maximum load of carrying school bag, the best way of carrying an object, body posture when moving objects to a wheelbarrow, natural curvature of spine, the best way of relaxing the back when recess perceptions of the load of school bag.

4th part include children's self-reported behavioral/postural section consisting of 10 questions of school bag use

habits such as type of schoolbag used, school bag content, daily checking of bag weight, school bag carrying method, duration of carriage, time taken to get to school, and method of transport to school as well as, the correct way to lift an object from the floor, and which is the correct way to take a heavy object and put it in another place...etc. Questions were weighted equally and 1 score was given to the correct answer. Then, the maximum score for knowledge and behavior was transformed to 100.

3- Numeric Rating Scale (NRS) was adopted from Wong and Hockenberry and used to assess pain intensity numerically in school age children 8 years and older. The child is asked to rate pain on a scale of 11 points from 0 to 10. Children verbally rate the intensity of pain on a scale from (0) no pain to (10) worst pain possible; most hurt possible. Interpretation of pain intensity range from mild (from 1 to 3 point), moderate (from 4 to 7 point) and severe (from 8 to 10 point).

4- An Arabic translated version of 0-10 visual faces scale (Wong-Baker FACES Pain Rating Scale) used with permission to assess the perceived intensity of pain among children. It included 6 faces; each face is for a person who has no pain (hurt) or some, or a lot of pain. Face 0 doesn't hurt at all. Face 2 hurts just a little bit. Face 4 hurts a little bit more. Face 6 hurts even more. Face 8 hurts a whole lot. Face 10 hurts worst. Children were asked to choose the face that best depicts the intensity of pain they are experiencing.

Inclusion criteria: Primary school children aged from 8 to 14 years old, parental consent, pupil assent, ability to ambulate independently, and ability to wear a school bag while standing on a weighing scale.

Exclusion criteria: Primary school children with congenital and structural abnormalities, musculoskeletal problems, neurological problems, and acute or post-acute illness were excluded.

Protection of ethical and human rights: This study was approved by community health nursing department council of the Faculty of nursing; Cairo University. An official permission was obtained from Ministry of Education, the Central Agency for Public Mobilization and Statistics, Cairo educational directorate at Cairo Governorate to conduct the study. An official permission was further obtained from the director of each school. A meeting was scheduled with the director of each school to present the research project. Once all necessary consents were granted, a date was chosen to conduct the study according to the schedule of students. A detailed description about the study, procedure and questionnaire was given to recruited students. Both parental and child written consent was obtained before participation in the study.

Procedure: The study was carried out on 3 phases: assessment phase, implementation and evaluation phases (1 week and 3 months later). During assessment phase, weight was obtained first in early morning then questionnaires were explained and personally distributed to students. The researcher remained in the class during the completion of the questionnaires, which took an average of 15 minutes. Care was taken to simplify the questions as much as possible and explanations were given whenever questions arose. The weight of students was measured when carrying the school bag and then without the school bag and the difference between the two weights were recorded as the weight of the school bag. School bag weight as a percentage of body weight was computed by dividing the weight of the bag by the child's (B.W to S.W ratio).

In the implementation phase, first, an interview was carried out with the school teachers and parents to clarify their role in the instructional guidelines and to assure their cooperation then the validated instructional guidelines developed by researcher was introduced to study group only including content such as anatomy and structure of spine; scope of the problem, impact of poor posture, ergonomic principles about correct school bag use, handling and arrangement; principles of good posture and body mechanics, sitting posture, lying, lifting, pushing, and pulling, as well as simple back exercises. Rearrangement of school bag contents as well as reducing the weight of school bags, appropriate wearing and carrying method and back exercises were demonstrated to the students practically. The content of guidelines was presented by the researcher as a 20-minute session once per week for 1 month in the classroom. During evaluation phase, the validated questionnaire was redistributed again for each child a week and three months afterwards. Questionnaires were collected over three months' period between Septembers till December 2014. At the end of the study each student and head of school was provided with an Arabic copy of the instructional guidelines.

Validity and reliability of study tools: Convergent Validity of NRS was $t = 3.41$, $P < .01$. The test-retest reliability analysis found an interclass correlation coefficient of 0.83 ($P < 0.001$). Concurrent validity of the translated Wong-Baker FACES Pain Rating Scale proved was excellent ($r = 0.90$). Reliability of Wong-Baker FACES Pain Rating Scale has been proved by the use of "test and retest" ($r > 0.5$).

Pilot Study: A pilot study was conducted on 10 (10%) of students to check clarity of items and determine the feasibility of the study. Pilot sample was included in research.

Statistical data analysis: Data was analyzed using SPSS statistical package version 16. Numerical data were expressed as Mean \pm standard deviation. Qualitative data were expressed as frequency percentage. Chi-square test was used to examine the relation between qualitative variables; ANOVA test was used for comparison between means of groups. P -value = 0.05 was considered significant.

IV. Results and Data Analysis

Part 1: Description of children's personal characteristics:

As shown in table 1 the mean age of children was 11.09±0.831 and 10.69±1.224 years for study and control group respectively. Furthermore, 44% and 62% of study and control group respectively aged from 10 years old to less than 12 years old while 38% and 34 % of children ranged from 12-14 years old. It is also clear that, 85% of the children (study plus control group) are males while 65% (study plus control group) are females.

Table 1. Frequency Distribution of children' personal characteristics (n= 100).

Group	Study group n= 50		Control group n= 50		F. test	X ²	P. value
	No	%	No	%			
Age of children:							
8-	9	18	2	4			
10-	22	44	31	62			
12-14	19	38	17	34			
X ±SD	11.09±0.831		10.69±1.224		3.654		0.059
Gender							
Male	25	25	30	60			
Female	25	25	20	40		1.125	0.317
Educational grade level							
4 th level	17	24	29	58		7.840	0.005*
6 th level	33	76	21	42			

* p<0.05

It is clear from table 2 that, the overall mean body weight of primary school children is 39.420 (kg) ±9.833 for the study group and 36.260 (kg) ±7.660 for the control group. Moreover, children carried an average full school bag weight of 4.2400 (kg) ±1.440 for study and 4.780 (kg) ±1.262 for control group. The percentage of school bag weight to children's' bodyweight in study and control group was 11.11% and 13.80% respectively. The mean BMI for study and control group was 21.422± 6.665 and 22.930±9.290 respectively.

Table 2. Frequency Distribution of mean and range of students weight, height in centimeters, school bag weight (full and empty), and mean bag weight as % of body weight in kilograms and BMI (n= 100).

Item	Study n= 50			Control n= 50			F. test	p. value
	Range		X ±SD	Range		X ±SD		
	Min	Max		Min	Max			
Student height (cm)	100	163	137.28±16.732	79	154	129.56±18.547	4.776	0.031*
	Range =63 cm			Range =75 cm				
Student weight (kg)	24 kg	60 kg	39.420±9.833	20 kg	55 kg	36.260±7.660	3.213	0.076
	Range = 36kg			Range = 35kg				
School bag full (kg)	2 kg	8 kg	4.2400 ±1.440	2 kg	8 kg	4.780±1.262	3.976	0.049*
	Range= 6kg			Range= 6kg				
School bag empty (kg)	.25	5.50	.9750±.759	.50	2.00	.950±.394	.043	.837
	Range=5.25 kg			Range=1.50 kg				
% of school bag to student weight	4 kg	23 kg	11.110±4.829	5 kg	35 kg	13.804±5.598	6.639	0.011*
	Range = 19 kg			Range = 29 kg				

* p<0.05

Part 2 School bag associated pain assessment data among primary school children:

Table 3 illustrates that, approximately 88% and 84% of children in study and control group respectively reported school bag associated spinal pain due to carrying heavy school bags. The occurrence of shoulder, lower

back, and neck pain among schoolchildren (study plus control group) was 96%, 72% and 62%, respectively. As regards to intensity of pain based NRS, mean scores of pain intensity was 4.520±2.484 and 4.180±2.89 in study and control group respectively.

Table 3. Frequency distribution of school bag associated spinal pain description among school children (n=100):

Group	Study group n= 50		Control group n= 50		F. test	X ²	P. value
	No	%	No	%			
General spinal pain	44	88	42	84		1.200	.566
Mean Scores of Pain (NRS)	4.520±2.484		4.180±2.89		.266		.607
Neck	16	32	15	30		1.225	.830
Shoulder	24	48	24	48		1.250	1.00
Lower back	18	36	18	36		125	1.00

* p<0.05

Table 4 revealed a significant relationships between school bag associated pain and bag weight as well as percentage of school bag to student weight at 0.041* and 0.011* respectively. Furthermore, no significant relationships were found between pain and carrying method, time taken to school, student weight or rest time taken while carrying the school bag.

Table 4. Relationship between school bag associated spinal pain and other factors among study and control group n=100:

Item	Pain	Carrying method	Carrying duration	Bag weight	Student weight	% of school bag to student weight	Rest
Mann-Whitney test	1.172	1.200	1142.0	943.5	1.056	862.5	1.170
p. value	.539	.783	.542	.041*	.235	.011*	.608

In relation to intensity of pain based on WBFS, table 5 denote that prior to introducing the guidelines, 32% and 24 % of study and control group respectively reported that carrying school bag caused pain that hurts even more. Meanwhile, it is obvious from table 2 that there was a statistically significant difference between study and control group regarding intensity of pain based on WBFS in post test1 and posttest 2 at 0.000* and 0.005* respectively.

Table 5. Comparison of intensity of school bag associated pain on WBFS between study and control group in pretest, posttest 1 and posttest 2 (n= 100):

Item	Pretest				Posttest 1				Posttest2			
	Study group n= 50		Control group n= 50		Study group n= 50		Control group n= 50		Study group n= 50		Control group n= 50	
Intensity of pain	No	%	No	%	No	%	No	%	No	%	No	%
No hurt	3	6	5	10	14	28	5	10	21	42	4	8
Hurts just a little bit	14	28	16	32	32	64	13	26	18	36	14	26
Hurts a little more	9	18	9	18	4	8	11	22	5	10	11	22
Hurts even more	16	32	12	24	zero	zero	11	22	5	10	11	22
Hurts a whole lot	7	14	4	8	zero	zero	6	12	1	2	6	12
Hurts as worst	1	2	4	8	zero	zero	4	8	zero	zero	4	8
Total	50	100	50	100	50	100	50	100	50	100	50	100
Test	.180				43.312				44.158			
P.value	.672				.000**				005*			

* p<0.05

Part 3: Description of children's knowledge and behavioral/postural habits of school bag use among primary school children:

Regarding knowledge about school bag, all children (100% of both groups) were not aware of the recommended weight limit for carrying school backpacks. Moreover, 85% and 87% of children in the study and

control group respectively couldn't identify the spine deviations in the illustrations. Furthermore, 99% and 98% of children in both study and control group didn't know the correct way of carrying a backpack, or the correct way to organize school materials in school bag (88% and 89% of study and control group respectively).

As shown in table 6, an overall 38% and 36% of study and control group respectively carried school bags that were more than 10% of their body weight. Moreover, 82% and 88% of study and control group carried school bag in an incorrect way while 78% and 74% of them carried their school bags even during break time. Whereas, 94% and 80% of them believed that their school bag is heavy. Meanwhile, 92% and 84% of study and control group respectively reported that carrying school bag make them get tired. Backpack-style bags with two straps were found to be the most popular style of schoolbag carried by 82% & 88% of study and control group respectively.

Table 6. Children's behavioral/postural habits of school bag use of study and control group n= 100.

Group	Study group n= 50		Control group n= 50		F. test	X ²	P. value
	No	%	No	%			
% of school bag to student weight ≤10					6.639		.011
10-	23	46	16	32			
15-	19	38	18	36			
20-	3	6	8	16			
25-	5	10	7	14			
	Zero	Zero	1	2			
Carrying method						1.222	.755
Right	8	18	6	12			
Wrong	41	82	44	88			
Schoolbag type					1.200		.783
2 strips (backpack)	41	82	44	88			
One strip	8	16	6	12			
Roller Trolley	1	2	Zero	Zero			
Gait imbalance while carrying bag						1.185	.634
Yes							
No	31	62	34	68			
	19	38	16	32			
Rest						1.176	.501
Yes	11	22	14	28			
No	39	78	36	72			
Carrying school during break time						1.228	.863
Yes							
No	39	78	37	74			
	11	22	13	26			
Perception of school bag weight: My school bag is heavy?	47	94	40	80		869.	.001*
Carrying my school bag make me get tired?	46	92	42	84		2.274	.039

* p<0.05

Part 4. Hypotheses testing of study variables among study and control group:

Table 7 proved the hypotheses of the current study. The table indicates that there was a statistically significant relationship between mean scores of pretest, posttest1 and posttest 2 between study and control group in relation to school bag use knowledge and behavior.

Table 7. Mean scores of school bag use knowledge and behavior among study and control group at pretest and post-test1 and post-test2 n= 100:

Variable	Score (mean ± SD)					
	Pretest		Posttest 1		Posttest 2	
	Study	Control	Study	Control	Study	Control
School bag use knowledge	3.520±1.606	3.620±1.5103	8.800±1.010	4.020±1.347	7.720±1.030	4.160±1.283
F test	.180		248.897		231.759	
P. value	.672		.000*		.000*	
School bag use behavior	4.36±.942	4.510±1.084	7.76±1.408	5.20±1.069	6.90±1.249	3.98±.892
F test	.071		102.64		111.455	
P. value	.943		.000*		.005*	

* p<0.05

V. Discussion

Clearly, school bag associated pain is a great health problem that needs more attention from health care personnel, parents and schools. Discussion of study results will be presented in relation to description of personal data of primary school children, children's reported school bag pain and its associated factors, children's awareness about school bag associated pain and hypotheses testing of study variables among study and control group. Study results revealed that the mean age of children was eleven and ten years for study and control group respectively. Furthermore, the overall mean body weight for primary school children was thirty eight for study group and thirty six kilograms for control group. Moreover, the mean weight of school bag carried by children was four kilograms for both groups. School bag weight carried by children in the current study was lower than that founded in a study by Ibrahim, 2012 (mean was nine Kg). Whereas, this mean was higher than that at Dinat, 2011 study (mean was two and half Kg).

As regards to weight of school bag when expressed as mean percentage of children's body weight, the current study revealed that both study and control group carried more than ten percent of their body weight. These findings are in harmony with Ibrahim, 2012, Connolly, 2008, Bauer, 2009 and Singh 2009 who reported the same results and emphasized that the backpack load should be limited to less than ten percent of body weight because an increase to more than ten percent may lead to posture change, heart rate change, and lower limb dynamics change for children while walking. In the same line Al-Hazzaa, 2006 who have also investigated the percentage of body weight represented by school backpack and recommended that the school bag limit not to be more than 5-10% of student body weight.

In relation to school bag associated pain description among school children, results revealed that majority of children in study and control group respectively reported school bag associated pain. The occurrence of shoulder, lower back, and neck pain among schoolchildren was reported by almost all, majority and more than half of children respectively. A significant relationship was also found between the percentage of school bag to student weight and the presence of pain. Furthermore, a significant relationship was also found between school bag associated pain and bag weight. This goes with a study by Ibrahim, 2012 and Sheir-Neiss in 2003 who emphasized the association of backpack use and back pain in children. They found the use of backpacks during the school day and backpack weights were independently associated with back pain. Moore, 2007 also found a high relative backpack weight (exceeding 15%) was associated with back pain due to the change in posture while wearing a heavy backpack.

In Moore study, 2007 greater relative backpack weight was related to spinal misalignment or curvature, muscle strain, rounding of the shoulders, and spasms of the back and shoulders. From the current study researcher point of view, carrying loads that are heavier in proportion to body weight increase children's risk for backpack-related injuries. In relation to intensity of pain based on WBFS between study and control group around one third of study and control group reported that carrying school bag caused spinal pain that hurts even more. Furthermore, there was a statistically significant difference between study and control group regarding intensity of pain based on WBFS in posttests (1&2).

The fact that pain could be decreased after back care interventions is supported by Geldhof, 2006 who found low intensity of pain at posttest among study group. Geldof also commented that, in the scope of intervention studies, spinal pain prevalence could better be approached as a long term effect while the evaluation of an educational program should focus on the direct effects like better back posture knowledge. Regarding knowledge about school bag, all children were not aware of the recommended weight limit for carrying school

backpacks. Moreover, majority of children couldn't identify the spine deviations in the illustrations.

Furthermore, almost all children in study and control group didn't know the correct way of carrying a backpack, or the correct way to organize school materials in backpack. As regards to children's behavioral/postural habits of school bag use, the current study revealed that, majority of study and control group carried school bag in an incorrect way even during break time. Moreover, more than two third of both groups complains from gait imbalance during carrying school bag to school without rest periods. Whereas, almost all and majority of study and control group believed that their school bag is heavy and that carrying school bag make them get tired.

This goes with Negrini, 2002 who investigated schoolchildren's subjective perceptions of children daily backpack loads and found that majority of them felt that their bags were too heavy, more than half of participants reported fatigue, and around half complained of back pain. Results of Moore, 2007 study also showed that around half of students felt that the school bag is always heavy, and around one third of them took a rest while carrying the school bag due to its weight and more than one third of sampled students complained of always getting tired while carrying school bag. Results of the Moore's, 2007 study showed that gender, grade, time to arrive to school, ratio of bag weight to body weight, carry method and right-left swaying or bending forward and repositioning bag were significantly associated ($P < 0.05$) with occurrence of fatigue.

From the current researcher point of view, primary school children carry books bags on their shoulder 6 days in a week for the entire school year, so this is a critical issue that needs to be addressed. This necessitates a nationwide awareness programs campaigns for primary school children, parents, and school teachers to tackle this problem in Egypt. Findings of current study indicate that there was a statistically significant relationship between the mean scores of school bag use knowledge and behavior in pretest and posttests one and two. As expected, the instructional guidelines were more effective on the improvement of knowledge than behavior. Behavior change needs further attention to be paid by school teachers and parents.

This is line with previous researches done by Hashemi, Ansari, Mirzaei, Mohammadi, Rakhshani, and Khammar, 2012 who found an improvement in knowledge and behavior of primary school children that was observed a week and three months after the intervention. Fernandes, 2008, Fabiana, 2012 and Rachele, 2012 also supported these findings and found that, educational sessions promoted changes in backpack use and it was observed a satisfactory adherence to the intervention program proposed. Furthermore, the effect of the educational programme reduced with time, indicating that primary school children's knowledge and behavior promotion will not be sustained if the interventional programme is not repeated over time. So, from researcher point of view, it is recommended to incorporate program content into student curriculum.

VI. Summary and conclusion

The study arrived at the conclusion that 96%, 72% and 62%, of school children respectively suffered from shoulder, lower back, and neck pain. Moreover, a significant relationships was found between school bag associated pain and bag weight as well as percentage of school bag to student weight at 0.41* and 0.11* respectively. The percentage of school bag weight to students' bodyweight in study and control group was 11.11% and 13.80% respectively. School bag use knowledge and behavior has been improved among study group after introducing the instructional guidelines. As such, there was a statistically significant difference between study and control group regarding intensity of pain based on WBFS in post test1 and posttest2.

Recommendations:

General recommendation:

- 1- Using these instructional guidelines to raise awareness about school bag associated pain among primary school children on a nationwide campaign.

Recommendations for children:

- 1- Choosing the right type (lightest material) and size of school bags.
- 2- Carry school bag weight that is less than 10% of student body weight.
- 3- Pack well and empty unnecessary items from school bag.

Recommendations for parents:

- 1- Buy the best kind of bags to primary school children.
- 2- Supervise students packing school bags every day to avoid unnecessary books and things to school so their backpack doesn't get heavy

Recommendations for schools and teachers:

1. Endorse instructional guidelines in the students curriculum
2. Provide storage facilities such as lockers and desk with drawer to keep school bags
3. Clarify subject timetable/schedule for students to prevent student from bringing unnecessary books

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