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Awareness of parents about school backpack and its related musculoskeletal disorders in Assiut City

*Neama Mohamed El Magrabi, **Safaa Rashad Mahmoud, and ***Yousrria El-Sayed Yousef

**Assistant Professor of Community nursing. Faculty of Nursing, Assiut University.*
***Lecturer of community nursing, Faculty of Nursing, Assiut University.*
***Lecturer of Pediatrics nursing, Faculty of Nursing, Sohag University.*

Abstract: *Many students carry school backpacks that exceed 10 to 15 percent of their body weight, which puts them at risk for back pain and related disorders. Improper backpack use can also lead to poor posture.* ***Aim*** *of the study was to assess parental knowledge about standard school backpacks, correct carrying of backpack, and assess their awareness of musculoskeletal disorders related to use of school backpack.*
Methods: *A randomized cross-sectional study was used. The study was carried out using a multistage random sampling at Assiut city. The subjects of the study were 318 parents and their children.* ***The tool of data*** *collection was: A self structured questionnaire developed by the researchers and filled by parents contained two parts:* ***Part I****. Personal data.* ***Part II****: Knowledge of parents about school backpack and its effect on the child's health.*
Results: *Most parents were unaware of standard school backpack, correct body mechanics of carrying school backpack. Also, Most of them (92.5%) reported that their children complain of heavy school bag. Meanwhile, only 7.5% carry school backpack with ideal weight. More than half of the studied parents (58.5%) reported that their children spent ≥ 30 minutes carrying the school backpack, & two-thirds of them (66%) walk to school. Also, more than two-thirds of them put additional contents in their school backpack & complain of low back pain, shoulder or arm pain (68.9% & 66.7%) respectively. In addition, more than two-thirds of the studied parents didn't check their children' school backpack.*
Conclusion: *Most parents were unaware of the standard school backpack, correct method for carrying the school backpack or musculoskeletal disorders related to the use of heavy school backpack.*
Recommendation: *Design and implement educational program about characteristics of healthy school backpack for parents, teachers, and school children, Provision of school lockers to save the excess books.*
Key words: *Children, parent awareness, backpack, standard weight, musculoskeletal pain.*

Corresponding author*: Safaa Rashad Mahmoud, Community Health Nursing Department, Faculty of Nursing, Assiut University, Assiut, Egypt*. Pin code:71111,

I. Introduction

Backpacks are a convenient way for children to carry essential educational materials to school, but they insert other materials which increases the weight of backpack. Additionally, when purchasing a backpack, many parents probably give little or no attention to backpack design, padding and overall weight. Moreover, many parents are not insight about their child's backpack weight or contents or even how their child lifts, carries or wears his/her backpack **(Forjuoha et al, 2004) & (AOTA, 2009).**

Carrying heavy backpacks have raised concerns regarding the side effects of prolonged or habitual carriage of heavily loaded backpacks among school age children **(Youlian, et al, 2008)**. Backpacks carried by school children, are known as daily task in their life, and may be associated with some potential health threatening consequences, including altered gait, bad posture and discomfort **(Javadivala, et al, 2012)**.

A large number of grade school children and adolescents are reported to have upper limb including back, neck, and shoulder pain (**Young, et al, 2006)** & **Sheir-Neiss, et al, 2003)**. Heavy backpacks which carried improperly on the backs or shoulders of school children can put pressure on their joints and ligaments and may be associated with several potential health consequences including bad posture, back strain, and eventual low back pain (**Limon, et al., 2004, Kistner, et al., 2012 & Barkhordari, et al., 2013).** Back and neck pain have a substantial economic impact either direct medical care costs or indirect costs of disability (**Negrini, et al., 2004 & Talbott, et al., 2009).**

School health providers and researchers have expressed concern about the long term impacts of carrying excessive loads by children on a daily basis. Spinal curvature occurs when the backpack is loaded to 15% of body weight **(Brackley, et al., 2009)**. Variety of risk factors including total weight carried, duration and

frequency of carriage and the manner in which the weight is carried affect the musculoskeletal system and may affect the incidence of musculoskeletal pain or discomfort **(Mackenzie & Sampath, 2003).**

Numerous studies have estimated that the maximum mean weights of school backpacks in children should be 10% of the body weight. Evidences from epidemiologic, physiologic, and biomechanical studies suggest that school backpack weight would be healthy and standard when it is 10% to 15% of body weight **(Brackley, et al., 2009 & Javadivala, et al., 2012, and Heuscher, et al, 2012).**

Backpacks carried by school children from kindergarten through college may be associated with some potential health consequences, including muscular aches, back strain, altered gait, bad posture and eventual low back pain. In particular, heavy backpacks can put pressure on the growing joints and ligaments of young school children, thus initiating the back strain process **(Rai & Agarawal 2013) & Forjuoh et al., 2004)**

Parental awareness and their supervision can help students of elementary school age who are not informed enough about choosing their backpack carefully and carrying it correctly. More importantly, it seems that they are not aware about the side effects of inappropriate school backpack carriage **(Brackley, et al., 2009).**

Numerous studies have reported carrying heavily loaded school backpacks in term of the percentage of the children's body weight including 17.7% in the United States **(Pascoe et al, 1997)**, 20% in Italy **(Negrini, et al., 2002)** and 20% in Hong Kong **(HKSCHD, 1988)**,. Findings of a study amongst 558 children aged 7-12 years in Hamadan showed that the average load carried by schoolchildren was 12.0% of body weight **(Emdadi & Emdadi, 2004)**. In addition, the mean school backpack weight for all the children in another study conducted in Tabriz was 10.1% (SD = 3.55) of their body weight **(Dianat et al, 2011)**.

II. Significant of the study:

Parents are the best advocates for safety promotion. They should represent the group most likely to help to significantly reduce backpack related injuries among school children by selecting safe school backpacks, supervising, carrying and checking backpack weights. So **the aim** of the present study was to:

1- Assess parental awareness of standard school backpack
2- Assess parents' knowledge about standard of correct carrying the backpack
3- Assess parental awareness of musculoskeletal disorders related to use school backpack

Study question:

1- Are the parents aware of standard school backpack?
2- Are the parents having knowledge about standard of correct carrying the backpack?
3- Are the parents aware of different musculoskeletal disorders related to use school backpack**?**

III. Methodology

Setting: The total number of elementary school in Assiut is 264 Schools at the level of four sectors, and 5% of these schools were taken for this study. A multistage random selection of the study setting was used to obtain a representative sample of preparatory schools in Assiut city. Twelve schools were randomly selected from each sector, then three schools from each sector (north, south, east, and west). Two government schools and one private were randomly selected.

Subjects: A simple random sample of 318 elementary school children and their parents in Assiut City were included. Participants included girls and boys, aged between 6 and 12 years, registered from grades one to six whose parents were available in the day of "parent's council meeting". They were interviewed after the parent's council meeting to contribute as participants.

IV. Data collection:

Tools of the study:

A self structured interview questionnaire developed by the researchers and filled by parents contained two parts: **Part I: a.** personal data e.g. Child' age, gender, and grade, level of parent's literacy. **b.** information of parent regarding: type of school backpacks used by the child, duration and frequency of carrying and the manner in which the weight is carried, mode of transportation to the school ….etc.

c. Anthropometric measurement of the child weight and the weight of his/her backpack in Kg.

Part II: Knowledge of parents about school backpack that included 22 statements and was classified into three domains: **a.** standard school backpack (7 statements), **b**. correct carrying of school backpack (8 statements) and **c.** musculoskeletal disorders related to the use of school backpack (7 statements). Responses for all items were ''yes/no'' or 'don't know''.

Method:

All the needed approvals were obtained from Faculty of Nursing, Assiut University, and Undersecretary of the Ministry of Education, and School directors to obtain permission to conduct the study

after the purpose was explained. Also, a review of current and related literature was done. The researchers got the date of the parents counsel meeting for data collection. Parents were not informed prior to data collection in order to prepare school backpack based on their own previous habits and behaviors. In other words, participants did not change school backpack weight intentionally.

Validity: Content validity of the tool was measured by two experts in the field of nursing and one orthopedic doctor. Their suggestions and recommendations were followed.

Reliability: Test- retest reliability was used with 10 parents prior to the start of the study to assess the reliability of the tool (r=.94). They were excluded from the study subjects to avoid maturation and contamination of the data.

Pilot study: Ten parents were asked to fill the questionnaire to estimate the clarity, applicability and the time needed to fill the questionnaire. The necessary modifications were done as revealed from the pilot

Ethical considerations

All the relevant principles of ethics in research were followed. The study protocol was approved by the pertinent authority. Participants' consent was obtained after informing them about their rights to participate, refuse, or withdraw at any time. Total confidentiality of any obtained information was ensured. The study maneuver could not entail any harmful effects on participants.

Field work:

Parents were individually interviewed and asked to fill part one and two of the questionnaire. The researcher filled the questionnaire for illiterate parent.

Weight of the child and weight of his school bag were measured using a standardized scale. The child was placed on a flat horizontal surface after removal of any item that affect the child's weight. The reading was done by the researcher who was standing in front of the child. The scale was adjusted to zero after each measurement. In addition, the weight of the school backpack of each of these children was measured. The weight was recorded to the nearest 0.1 kg. Data were collected during the academic year 2014-2015, through the two semesters (months of October, November, March, and April). Three parent's council meetings in three different schools through the previous mentioned months were attended by the researchers to interview the available parents who accepted to participate in the study. From 25- 27 parents filled the questionnaire at each interview which takes from 25- 30 minutes. At the end of each interview, Parents were given a copy of a small pictured booklet to help them whenever they needed it to refresh their knowledge.

Statistical design:

Date entry and data analysis were done using SPSS version 19 (Statistical Package for Social Science). Data were presented as number, percentage, mean, & standard deviation.

V. Results

Table 1: Personal characteristics of the studied parents

Items	No. (318)	%
Filed by father	205	64.5
Filed by mother	113	35.5
Child grade		
1	48	15.1
2	45	14.2
3	42	13.2
4	63	19.8
5	57	17.9
6	63	19.8
Mother education		
Educated	285	89.6
Uneducated	33	10.4
Mother occupation		
Housewives	162	50.9
Working	156	49.1
Father education		
Educated	294	92.5
Uneducated	24	7.5
Father occupation		
Governmental	204	64.2
Non-governmental	114	35.8

Table (1) illustrated that fathers represent around two-thirds of the studied parents (64.5%), & most of them (92.5%) were educated. Mothers represented almost one third of the studied parents (35.5%), the majority of them (89.6%) were educated, & nearly half of them are working.

Table (2) distribution of the studied parents according to their background knowledge of school bag

Type of school bag carried by the child	**No.**	**%**
Backpack	248	77.9
Shoulder bag	48	15.1
Bag with wheels	22	7.0
Child complain of heavy backpack	**Yes**	**%**
Yes	294	92.5
No	24	7.5
Ideal weight of school bag in relation to child weight		
< 15%	267	83.9
> 15%	51	16.1
Time spent carrying the school bag		
< 15 minutes	21	6.6
15 m. - < 30 minutes	111	34.9
≥ 30 minutes	186	58.5
Mode of transportation to the school		
Walking	210	66.0
Bicycle	12	3.8
Taxi/ Bus	69	21.7
Private car	27	8.5
Preparing school schedule:		
- Put books & notebooks according to the schedule	99	31.1
- According to the schedule in addition to other contents*	219	68.9
School schedule patterns		
Stable	87	27.4
Unstable	231	72.6
Checking the school bag & remove unnecessary contents.		
Yes	106	33.3
No	212	66.7
Child' complain of low back pain, shoulder or neck pain.		
Never	9	2.8
Sometimes	87	27.4
Always	222	69.8
Searching for updates on school bag safety.		
Yes	66	20.8
No	252	79.2

*Folders, sport clothes, personal hygiene, electronic devices, textbooks, lunch bag.

Table (2) showed that more than three-quarters of children (77.9%) carried backpack type; most of the studied parents (92.5%) reported that their children complain of heavy school bag, the majority (83.9%) of them reported the ideal school backpack weight in relation to child weight is < 15%. More than half of the studied parents (58.5%) reported that their children spent ≥ 30 minutes carrying the school backpack, & two-thirds of them (66%) go to school walking. Also, more than two-thirds of them put additional contents in their school backpack & complain of low back pain, shoulder or arm pain (68.9% & 66.7%) respectively. More than two-thirds of the studied parents (66.7%) didn't check their children' school backpack.

Table (3) Parent awareness of standard school backpack

Statements	Correct answer	%
Type of school backpack	255	80.2
Lightweight backpack	192	60.4
Backpack with padded shoulder straps	27	8.5
backpack with wide shoulder straps	9	2.8
backpack with waist strap	0	0
Backpacks with different parts for distribution of weight	78	24.5
Size of the backpack should be fit for child	33	10.4

Table (3) represented that the studied parents were aware of standard school backpack regarding the type, the weight, & backpacks with different parts (80.2%, 60.4%, & 24.5%) respectively. They were unaware of other standard school backpack

Table (4) Parent awareness of correct method for carrying of school backpack

Statements	Correct answer	%
To lift the backpack it is better to bend their knees, then take it	6	1.9
Wear a backpack after putting it on a table, at waist level	0	0
The shoulder strap should be firm and sufficiently fastened.	0	0
Use both shoulder straps on the backpack to prevent damage to the spine	24	7.5
Backpack is better be placed in the middle of the back	6	1.9
Backpack should not be above the top of the shoulders	0	0
Bottom of a backpack should not be lower than the waist	0	0
Not to carry backpack on one shoulder	27	8.5

Table (4) illustrated that studied parents were unaware of correct carrying school backpack. Few percent of them mention some steps such as bend the knees then take the backpack, use both shoulder straps on the backpack, place the backpack in the middle of the back, & don't carry backpack on one shoulder (1.9%, 7.5%, 1.9%, & 8.5%) respectively.

Table (5) Parents' awareness of side effects of miscarrying school backpack

Statements	Correct answer	%
Shoulder pain	168	52.8
Lean forward	66	20.8
Fatigue	78	24.5
Musculoskeletal pain	30	9.4
Low back pain	243	76.4
Neck pain	75	23.6
Hand pain	39	12.3

Table (5) represented that studied parents were aware of side effect of miscarrying school backpack regarding shoulder pain & low back pain (52.8% & 76.4%) respectively. While nearly one-quarters of them mention Fatigue & Neck pain (24.5% & 23.6%) respectively.

Table(6): Percent child body weight represented by backpack weight

Percentage	No.	%
< 15 % of child body weight	24	7.5
15% - < 20% of child body weight	129	40.6
20% - < 25% of child body weight	105	33.0
25% - ≥ 30% of child body weight	60	18.9
Mean± SD	20.3 ± 5.4	

Table (6) illustrated that from 318 children, only 24 of them (7.5%) carry school backpack with ideal weight (< 15 % of the child' weight), with the mean of (20.3 ± 5.4). The mean± SD of backpack weight was 20.3 ± 5.4.

VI. Discussion

Parental awareness and their supervision can help students of elementary school age who are not informed enough about choosing their backpack carefully and carrying it correctly.

The present study showed that around two-thirds of data were filled by father (table 1). This result can be because most school parent council meetings are often attended by fathers.

In the present study, more than two-thirds of parents reported that children carry additional contents in their school backpack, such as electronic devices, personal hygiene equipment, or sport clothes, and/ or lunch bag (table 2). These results were consistent with a study conducted by **Cavallo et al (2002)** which revealed that the weight of materials carried to and from school has significantly increased as curricula changes and extracurricular activities grow. This finding is mostly because children most of the times carry extra curriculum school materials, sports equipment or instruments in addition to their lunch bag**.**

The present study revealed also that only 2.8% of the parents reported that their children never complain of musculoskeletal pain while more than two-thirds of parents clarified that their children always complain of low back pain, shoulder or neck pain (table 2). These results are logic because most of children were carrying heavy backpack. These results were in agreement of a study was conducted by **Hong & Cheung , (2003)** who assessed the prevalence of back pain among school children due to carrying heavy backpacks. The study revealed that rates of lower back pain in children are increasing, and these results suggest that a reduction in backpack weight is advisable. Moreover, **Chansirinukor, et al., (2001)** conducted a study to determine whether the backpack, its position on the spine or time carried affected on adolescents cervical and shoulder posture. Thirteen students were recorded under several loads carrying condition. Cervical and shoulder position angles were calculated and compared. Carrying a backpack weighing 15% of body weight appeared to be too

heavy to maintain standing posture of adolescent. These results revealed that both backpack weight and time carried influenced cervical and shoulder posture.

According to the results of the present, more than two-thirds of studied parents reported that they never checked their children' bags for unnecessary content (table 2). These results may be due to the absence of cultural awareness among parents and lack of attention to the preparation of school schedule, also the work of father and mother is another burden. These results were in the same line with **Forjuoh, et al,(2003)** who found that most parents reported that they never checked their child's backpack weight and more than one third never checked the backpack contents.

As regards parent awareness about standard school backpack and consequence of heavy weight, the present study illustrated that the majority of parents did not know about the standard backpack weight and contents as well as its consequences. The findings also revealed that parents did not have sufficient knowledge about signs and symptoms of musculoskeletal disorders resulting from incorrect use of school backpack and about the necessity of using both shoulder straps (table 3&4). Where a very few percentage of the studied parents were aware of correct method of carrying school backpack. Few percent of them mention some steps such as bend the knees then take the backpack, use both shoulder straps on the backpack, place the backpack in the middle of the back, & don't carry backpack on one shoulder (table 5). That could be attributed to the reported back, shoulder and musculoskeletal symptoms among children. These findings also highlight the lack of knowledge and awareness of parents which is alarming since they are the responsible persons of buying the backpack. These results were consistent with the findings of **Javadivala et al,. (2012)** who indicated that more than half of the parents in his study were not aware about the standard weight, and size of school backpacks.

Although musculoskeletal symptoms are believed to be multifactorial in origin, the carriage of heavy schoolbags is suspected contributory factor and may represent an overlooked daily physical stress (**Whittfield et al, 2010).** In the current study only a very few percentage of children carry school backpack with ideal weight (< 15 % of the child' weight) (table 6). These results could be because most of the studied parents didn't check their children' backpack to exclude the unnecessary contents. A study conducted by **Lockhart et al, (2004)** revealed that weight of the backpack is one of numerous contributing factors related to musculoskeletal discomfort among school age students in addition to the weight of the backpack**.**

Likewise, **Mackie et al. (2005)** found that duration and frequency of carriage and the manner in which the weight is carried, all affect the musculoskeletal system and in turn may affect the incidence of musculoskeletal pain or discomfort. These findings were in congruent with the findings of the present study were parents reported that their children always reported lower back, shoulder and neck pain and almost two thirds of them walk to school. In addition, a study Conducted in New Zealand by **Whittfield et al,. (2010)** to "assess the weight of schoolbags and the prevalence of musculoskeletal symptoms among 140 students" supported the findings of the present study.

VII. Conclusion:

Most parents were unaware of the standard school backpack, correct method for carrying the school backpack or musculoskeletal disorders related to the use of heavy school backpack.

VIII. Recommendations:

From the finding of the study, the researchers recommend:

For parents and their children:

1- Design and implement educational program about characteristics of healthy school backpack for parents, teachers, and school children.
2- When buying the school bag, must take into account its quality and weight.

For schools administrators:

1. Distribute booklets to all parents at the end of the school year as a guide of the bag characteristics and how the child carries it.
2. Provision of school lockers to save the excess books rather than carrying all the books home every day.
3. Commitment to fixed school schedule.
4. Activating the idea of Tablet use instead of paper books for each pupil

For ministry of Education:

1- Shortcut curriculum without prejudice to the scientific article

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