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Parent's awareness and knowledge about school backpack and related musculoskeletal disorders Saudi Arabia: A cross-sectional study

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ABSTRACT

Background: School children often use backpacks, which are known to cause a variety of health-related issues, including altered gait, poor posture and pain. **Methods:** A cross-sectional study was conducted in Saudi Arabia during the period of 1/10/2022 to 1/11/2022 among parent who has at least one school-aged child. The data were collected via an online questionnaire that inquired about the student's biography, school back practices and perceptions and carrying ways and musculoskeletal (MSK) outcomes. **Results:** A total of 2424 parents fulfilling the criteria. About 69% of the parents know the type of school backpack and 22.2% reported that their child' complains of musculoskeletal consequences. **Conclusion:** The parents' knowledge of school backpacks was above average in terms of all parameters, including appropriate weight, character traits and carrying techniques. Additionally, they were well knowledgeable about related MSK illnesses.

Keywords: Backpack, musculoskeletal effect, parents, awareness, knowledge, practice, children, Saudi Arabia, ALAhsa.

1. INTRODUCTION

Children use backpacks all the time to bring important school supplies to school. Sometimes, children may have other items within their backpacks which add more weight (Al Shahry et al., 2018). Moreover, many parents may not pay attention to their child backpack design, cushioning, or total weight when purchasing a backpack. Also, many parents neglect their child's backpack overall weight, contents, or even method the child wears it (Forjuoh et al., 2004; Magrabi et al., 2015). Additionally, most parents reported that they have never checked their children's backpacks for unnecessary contents (Magrabi et al., 2015; Alsiddiky et al., 2019).

In developed countries, the prevalence of using backpack particularly among school-aged children exceeds 90% (Goodgold et al., 2002; Whittfield et al., 2001). Reference to WHO interdisciplinary specialists assessing school environments, they paid more concern for musculoskeletal discomfort among school-aged children (WHO IRIS, 2017). Recently, many studies revealed that heavy backpacks and their unfitting carrying for long time periods can affect a child's musculoskeletal system badly, as it can be associated with fatigue and back pain, besides affecting the spine's normal growth (Brackley et al., 2004; Skaggs et al., 2006; Brackley et al., 2009). Also, heavy or inappropriately carried backpack may cause deformities in spinal curves and maybe scoliosis or kyphosis (Korovessis et al., 2005; Drzał et al., 2015; Brzęk et al., 2017). Recent studies have estimated the most common sites of pain include the shoulder (70%), followed by the back (18%) and the least reported was in the neck (12%) (Al Shahry et al., 2018).

It is recommended that the overall weight of the schoolbag not exceed 10%-15% of the child body weight (Brackley et al., 2004). Though, most of studies demonstrated that the weights carried by students exceed the recommended limits (Grimmer and Williams, 2000; Al-Saleem et al., 2016; Hong et al., 2008; Forjuoh et al., 2003) found that backpack loads exceed the child's weight by 30%-40% (Grimmer et al., 1999). A survey in Riyadh, Saudi Arabia, found that 83% of the kids had excessive weight in their schoolbags. (Al Shahry et al., 2018). Also, there was an alarming condition in Al-Ahsa, KSA, where 41.1% of female and 31.2% of male students were carrying school bags with a weight of more than 15% (Al-Saleem et al., 2016).

Recently, there are few studies looking into parental awareness and knowledge of schoolbag-related musculoskeletal problems throughout the world and even fewer in our region. The purpose of the present study was to evaluate parents' awareness and understanding of school backpacks and associated musculoskeletal diseases in Saudi Arabia.

2. MATERIAL AND METHODOLOGY

Study design and population

A descriptive cross-sectional study which is targeting parents of school-age children in Saudi Arabia. During the period from 1/10/2022 to 1/11/2022 with a sample size of 385 using the Richard Geiger equation, with a margin error determined as 5%, a confidence level of 95% and a sample proportion of 50%. Parents who live in Saudi Arabia, who have kids in primary school and those with kids aged between 7 to 12 years were included. The parents with children who do not carry the school bags by themselves, children who have medical illnesses that prevent them from carrying the school bags were excluded. After having the ethical considerations and approval of college of medicine at King Faisal University. The data were collected by an online questionnaire which was initiated by the study researchers after comprehensive literature review and expert's consultation. A panel of 3 experts reviewed the initiated questionnaire for validity and reliability with all suggested modifications were applied. Pilot study including 35 parents was conducted and assessed awareness section reliability of 0.71. In addition, Simple revisions to the questionnaire were made in terms of clarity based on the pilot-testing feedback.

The questionnaire consists of five sections. The section of the questionnaire brought together the demographics of parents and their children. The second section contained questions about parents' background knowledge of school bags. Section three of the questionnaire assessed parents' awareness of standard school backpacks. The questions in the fourth section examined Parent's knowledge of the proper method of carrying a school backpack. The last section asked questions about parents' awareness of the side effects of carrying improper school backpacks. The study questionnaire was uploaded online through social media platforms by the researchers and their relatives till no more new responses were added.

Data analysis

The data were collected, reviewed and then fed to Statistical Package for Social Sciences version 21 (SPSS: An IBM Company). All statistical methods used were two tailed with alpha level of 0.05 considering significance if P value less than or equal to 0.05. Regarding parent's awareness, each correct answer was given 1-point score. Overall knowledge level regarding school bag was assessed through summing up discrete scores for different correct knowledge items. If the total score was 60% or more of the total

possible score, the level of awareness was considered to be good and scores less than 50% were considered poor. Descriptive analysis was done by prescribing frequency distribution and percentage for study variables including parents and children personal data, background regarding school backpack and source of information. Also, Participants awareness and practice about school backpack were tabulated while overall awareness level was graphed. Cross tabulation for showing distribution of parents' overall awareness level by their personal data and other factors using Pearson chi-square test for significance and exact probability test if there were small frequency distributions.

3. RESULTS

A total of 2424 parents fulfilling the inclusion criteria completed the study questionnaire. A total of 618 were from eastern region, 528 from northern region, 440 from central region, 431 from western region and 407 from southern region. Exact of 74.9% of respondents were children’s mothers and 94.1% were married. A total of 57.9% of the fathers had university level of education and 62.8% work at governmental sector. As for mothers, 61.9% were university graduated and 51% were housewives (Table 1).

Table 1 Study parent's personal data, Saudi Arabia

Parents data	No	%
Region		
Central	440	18.2%
Northern	528	21.8%
Eastern	618	25.5%
Western	431	17.8%
Southern	407	16.8%
Respondent		
Father	608	25.1%
Mother	1816	74.9%
Marital status		
Married	2281	94.1%
Divorced	143	5.9%
Father education		
Illiterate	90	3.7%
Secondary / below	931	38.4%
University / above	1403	57.9%
Father work		
Not working	203	8.4%
Governmental sector	1523	62.8%
Private sector	698	28.8%
Mother education		
Illiterate	141	5.8%
Secondary / below	783	32.3%
University / above	1500	61.9%
Mother work		
Not working	1237	51.0%
Governmental sector	912	37.6%
Private sector	275	11.3%

Table 2 shows Children information for study parents, Saudi Arabia. A total of 313 (12.9%) families had one child, while 1631 (67.3%) had three children / more. As for child age, it ranged from 7-14 years with mean age of 8.9 ± 1.6 old. A total of 77.7% of the children were at governmental schools.

Table 2 Children information for study parents, Saudi Arabia

Children data	No	%
Number of children		
1	313	12.9%
2	480	19.8%
3	1631	67.3%
Male children		
0	214	10.1%
1	687	32.5%
2	615	29.1%
3	389	18.4%
4	125	5.9%
5	81	3.8%
Female children		
0	230	10.9%
1	671	31.8%
2	638	30.2%
3	365	17.3%
4	128	6.1%
5	79	3.7%
School type		
Governmental	1883	77.7%
Private	541	22.3%
Child age in years		
Mean ± SD	8.9 ± 1.6	

Table 3 shows the background knowledge of school bag among study parent, Saudi Arabia. A total of 57.6% of the study parents reported that they got an education about school bag which was at school among 70.8% of them and by awareness campaigns among 18.6%. As for type of school bag carried by the child, it was backpack among 81% of the children which was chosen by parents among 51.7%. A total of 77.8% of the children carry their bags for less than 15 minutes and 79.6% of them go to school by private car. Exact of 61.9% of the parents know that the weight of the schoolbag should not be more than 10% of the child’s weight. A total of 75% of the parents reported that they prepare their children bag, 85.1% Check the school bag and remove unnecessary contents, 67.5% regularly ask and check child for muscular pains, fatigue, bending and posture and 69.5% Search for updates on school bag safety.

Table 3 Background knowledge of school bag among study parent, Saudi Arabia

Background knowledge of school bag	No	%
Did you get an education about school bag		
Yes	1396	57.6%
No	1028	42.4%
If yes, where?		
At payback selling shop	131	9.4%
Awareness campaigns	259	18.6%
School	988	70.8%
Social media	18	1.3%
Type of school bag carried by the child		
Backpack	1963	81.0%

Shoulder bag	77	3.2%
Bag with wheels	384	15.8%
Who chose the schoolbag		
Parents	1252	51.7%
The child	1172	48.3%
Time spent carrying the school bag		
< 15 minutes	1886	77.8%
> 15 minutes	538	22.2%
Mode of transportation to the school		
Walking	170	7.0%
Bus	325	13.4%
Private car	1929	79.6%
Do you know that the weight of the schoolbag should not be more than 10% of the child's weight?		
No	924	38.1%
Yes	1500	61.9%
Do you Prepare your child school bag?		
No	605	25.0%
Yes	1819	75.0%
Do you Check the school bag and remove unnecessary contents?		
No	362	14.9%
Yes	2062	85.1%
Do you regularly ask and check your child for muscular pains, fatigue, bending, and posture?		
No	787	32.5%
Yes	1637	67.5%
Do you Search for updates on school bag safety		
No	739	30.5%
Yes	1685	69.5%

Table 4 shows the Parents awareness regarding school backpack and related MSK effects, Saudi Arabia. In general, 69% of the parents know the type of school backpack. As for Features of school backpack, the most known among study parents included Size of the backpack should be fit for child (95.4%), Backpack with two shoulder straps rather than one (95.1%), Lightweight backpack (92.2%), and Backpack with wide shoulder straps (87.7%). With regard to carrying methods of school backpack, 93.3% of the parents know that the schoolbag should be carried on two shoulders and not on one, 73.4% know that placing the backpack in the middle is better, 69.7% know that shoulder strap should be tight to keep the load closer to the back and as for MSK side effects of school backpack miscarriage, the most known among study parents were shoulder pain (91.9%), neck pain (88.6%), fatigue (88.6%), low back pain (87.4%) and affect the posture and cause spinal deformity (87%). Exact of 22.2% of the parents reported that their child' complains of low back pain, shoulder, or neck pain related to school bag which was at shoulders among 55.2% of them, at lower back (25.7%) and at neck (19.1%).

Table 4 Parents awareness regarding school backpack and related MSK effects, Saudi Arabia

Awareness domains and items	No	%
Do you know the type of school backpack	1673	69.0%
Features of school backpack		

Size of the backpack should be fit for child	2313	95.4%
Backpack with two shoulder straps rather than one.	2305	95.1%
Backpack with padded shoulder straps.	2122	87.5%
Backpack with wide shoulder straps.	2127	87.7%
Backpack with padded back.	1908	78.7%
Backpack with waist strap.	972	40.1%
Backpack with multiple compartments for distribution of weight.	1958	80.8%
Lightweight backpack.	2236	92.2%
Carrying methods of school backpack		
Do you know that the schoolbag should be carried on two shoulders and not on one	2262	93.3%
To lift the backpack, it is better to bend their knees, then take it	1604	66.2%
Wear a backpack after putting it on a table, at waist level	1402	57.8%
The shoulder strap should be tight to keep the load closer to the back	1689	69.7%
Backpack is better be placed in the middle of the back	1779	73.4%
Backpack should not be above the top of the shoulders	1597	65.9%
Bottom of a backpack should not be lower than the waist	1537	63.4%
MSK side effects of school backpack miscarriage		
Can affect the muscles and spine and produce musculoskeletal health issues	2143	88.4%
Can produce neck pain	2099	86.6%
Can produce shoulder pain	2228	91.9%
Can produce fatigue	2147	88.6%
Can produce low back pain	2118	87.4%
Can affect the posture and cause spinal deformity	2109	87.0%

Figure 1 shows the Overall parent's awareness level regarding school backpack and related musculoskeletal disorders Saudi Arabia. Exact of 1894 (78.1%) parents had good awareness level about school backpack while 530 (21.9%) had poor awareness level.

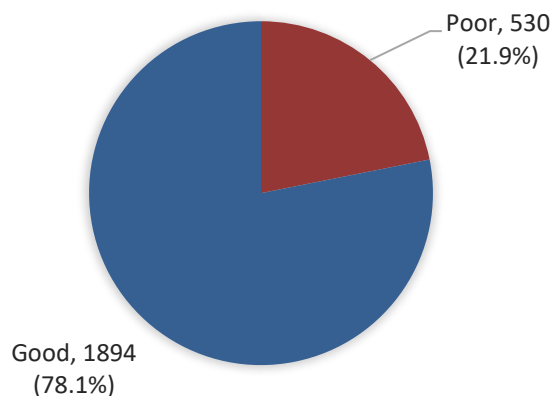


Figure 1 Overall parent's awareness level regarding school backpack and related musculoskeletal disorders Saudi Arabia

Factors associated with parent's overall awareness about school backpack and related consequences (Table 5). Exact of 81.9% of mothers had good awareness level versus 66.8% of parents with recorded statistical significance (P=.001) Also, 80.6% of fathers with secondary level of education had good awareness compared to 71.1% of illiterate group (P=.032). Good awareness was detected among 78.3% of university graduated mothers compared to 65.2% of illiterate mothers (P=.001). Additionally, 81.2% of children where parent choose the school bag had good awareness level versus 74.8% of those who let child to choose (P=.001). Also, 79.5% of parents for children with no complains of low back pain, shoulder, or neck pain related to school bag had good awareness versus 73.2% of others who had a child with complain (P=.002). Good awareness was detected among 89.3% of parents who got an education about school bag versus 62.9% of others (P=.001).

Table 5 Factors associated with parent's overall awareness about school backpack and related consequences

Factors		Overall awareness level				P-value
		Poor		Good		
		No	%	No	%	
Region	Central	125	28.4%	315	71.6%	.096 ^s
	Northern	76	14.4%	452	85.6%	
	Eastern	154	24.9%	464	75.1%	
	Western	115	26.7%	316	73.3%	
	Southern	60	14.7%	347	85.3%	
Respondent	Father	202	33.2%	406	66.8%	.001*
	Mother	328	18.1%	1488	81.9%	
Marital status	Married	495	21.7%	1786	78.3%	.436
	Divorced	35	24.5%	108	75.5%	
Father education	Illiterate	26	28.9%	64	71.1%	.032*
	Secondary / below	181	19.4%	750	80.6%	
	University / above	323	23.0%	1080	77.0%	
Father work	Not working	42	20.7%	161	79.3%	.168
	Governmental sector	318	20.9%	1205	79.1%	
	Private sector	170	24.4%	528	75.6%	
Mother education	Illiterate	49	34.8%	92	65.2%	.001*
	Secondary / below	155	19.8%	628	80.2%	
	University / above	326	21.7%	1174	78.3%	
Mother work	Not working	284	23.0%	953	77.0%	.096
	Governmental sector	176	19.3%	736	80.7%	

	Private sector	70	25.5%	205	74.5%	
Number of children	1	72	23.0%	241	77.0%	.053
	2	123	25.6%	357	74.4%	
	3	335	20.5%	1296	79.5%	
School type	Governmental	416	22.1%	1467	77.9%	.613
	Private	114	21.1%	427	78.9%	
Who chose the schoolbag	Parents	235	18.8%	1017	81.2%	.001*
	The child	295	25.2%	877	74.8%	
Child' complains of low back pain, shoulder, or neck pain related to school bag	Yes	144	26.8%	394	73.2%	.002*
	No	386	20.5%	1500	79.5%	
Did you get an education about school bag	Yes	149	10.7%	1247	89.3%	.001*
	No	381	37.1%	647	62.9%	
If yes, where?	At payback selling shop	12	9.2%	119	90.8%	.313 [§]
	Awareness campaigns	21	8.1%	238	91.9%	
	School	115	11.6%	873	88.4%	
	Social media	1	5.6%	17	94.4%	

P: Pearson X² test

§: Exact probability test

* P < 0.05 (significant)

4. DISCUSSION

Concerns have been expressed concerning the prolonged or usual carrying of heavy backpacks by school-aged children due to the associated side effects of carrying heavy bags. (Hong et al., 2008) Several research studies on the usage of backpacks and musculoskeletal discomfort in adolescents, adults and service members who hike for fun or for work have been published (Forjuoh et al., 2003; Grimmer et al., 1999), Even though there aren't many reports about young children who are growing up (Negrini et al., 1999).

The current study aimed to assess parent's awareness and knowledge about school backpack and related musculoskeletal disorders in Saudi Arabia. The study showed that more than three-fourths of the parents were aware of school backpack and related side effects. In more details, more than two-thirds of the parents know the type of school backpack. As for Features of school backpack, the most known among study parents included the size of the backpack should be appropriate for the child, followed by a backpack with two shoulder straps as opposed to one, a lightweight backpack and a Backpack with broad shoulder straps, all of which were well-known to the great majority of study parents. Similar results were documented by Chalise et al., (2020) who found that vast majority of the parents know about the recommended weight of school backpack (<15% of body weight).

Authors also found that nearly 96% parents know that backpack must be light and it should have well-padded shoulder straps while more than three-fourths of them reported that it should be suitable to child's age and weight. Around 70% to 90% parents were aware of appropriate handling of school backpacks. A lower level of awareness was detected by Javdivala et al., (2012) the size of the backpack must be in proportion to the upper back, but many parents were unaware of this as 89%. Also, Patil et al., (2016) found similar findings as parents' awareness about characteristics and carrying practices of backpack was moderate, however it poorly reflected in behavioral practices of their children in most of the parameters. Another study by Alsiddiky et al., (2019) approximately one-third of parents were aware of the optimal weight of the schoolbag, however 49.6% of dads and 42.2% of mothers did not inspect their children's schoolbags for unneeded items. Another study showed that only in 10% of cases, school bags fully meet the basic criteria. In the remaining 90% of cases, there was an absence of at least one or more desired characteristics (Laštro et al., 2021).

With regard to carrying methods of school backpack, the present study demonstrated that most of the parents know that the schoolbag should be carried on two shoulders and not on one, Three-quarters are aware that the backpack should be put in the centre of the back, while two-thirds know that shoulder strap should be tight to keep the load closer to the back and that to lift the backpack, it is preferable for them to kneel before taking it. Alami et al., (2018) revealed that 85.8% of student incorrectly carried their backpacks. Only 55% of pupils had a backpack between their two scapulae, despite the fact that 83.1% of students used both backpack straps. Additionally, the respondents' bags were near to their backs in around 31.3% of cases. Other studies by Abdelati et

al., (2017) and Skaggs et al., (2006), found that only 0.3% and 2.7% of the students used the lumbar strap for carrying their backpacks, respectively.

As for MSK side effects of school backpack miscarriage, the most known among study parents were shoulder pain, neck pain, fatigue, low back pain and affect the posture and cause spinal deformity. Exact of one-fifth of the parents reported that their child complains of low back pain, shoulder, or neck pain related to school bag which was at shoulders among half of them, at lower back (25.7%) and at neck (19.1%). These were consistent with many other study findings concerned with parent's knowledge of heavy school bag associated MSK complications (Pawaskar and Patil, 2020; Rai and Agarawal, 2013).

5. CONCLUSION

The study revealed that parents had more than satisfactory level of awareness regarding school backpack for all features including ideal weight, characteristics and proper methods of carrying. Also, they had very good awareness regarding associated MSK disorders. Mothers were more knowledgeable than fathers especially highly educated mothers. Also, being educated about school backpack was associated with high awareness level. More attention should be paid for transferring parent's knowledge into proper practice Children should learn about the qualities of a secure backpack from their parents and instructors. Adequate measures might lessen the burden of children's musculoskeletal health issues.

Author contribution

Ali TawfiqAlamer -Writing the proposal, review of the manuscript

Abbas Hadi Alsuwayj, Ahmed Yousef Algafle, Mohammed Hassan Alrasasi, Hassan Abdulmonem Alhassan, Abdullah Mohammed Alaithan, Nibras Adel Alfandi, Jalal Khaled Aldandan, Hussain Adil Alghadeer, Mohammed Fahad Al Khalifah, Hassan Mohammed Alahmad, Mohammed Hussain alradhi, Rawan Mubarak Aldrees, Ruqayyah Anwar Alghazal, and Sokinah Nasser Almusalami, - data collection, data entry and analysis with review of the manuscript

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Author contribution

All authors of this study were equally involved in the design of the study, data collection, analysis, drafting and correction of the final draft and the author was responsible for the proper implementation of the study at all stages. There is no author whose name is not listed in the authors list.

Informed consent

Written & Oral informed consent was obtained from all individual participants included in the study. Additional informed consent was obtained from all individual participants for whom identifying information is included in this manuscript.

Ethical approval

The study was approved by the King Faisal University, AlAhsa, Saudi Arabia (Ethical approval codeKFU-REC-2022-NOV-ETHICS324).

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Conflict of interest

The authors declare that there is no conflict of interests.

Data and materials availability

All data sets collected during this study are available upon reasonable request from the corresponding author.

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