

Correlation between obesity and emotional, social, and behavioral problems associated with physical limitation among children and adolescents in Western Saudi Arabia

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ABSTRACT

الأهداف: تهدف هذه الدراسة إلى تقييم تأثير مؤشر كتلة الجسم على الحركة، السلوك، والنشاط الدراسي والاجتماعي للأطفال البدناء في مدينة جدة بالمملكة العربية السعودية.

الطريقة: شملت هذه الدراسة المقطعية 281 طفل بدين (ذكر: 151، الأنثى: 130) بين أغسطس 2014 إلى فبراير 2015. تم اختيار العينة بصورة عشوائية لتمثيل مختلف الطبقات الاجتماعية، مستوى التعليم، وتخطيط الأسرة.

النتائج: متوسط العمر للعينة كان (ذكر: 10.6، الأنثى: 10.5) سنوات. أثبت ارتفاع مؤشر كتلة الجسم لمن يعانون من مشاكل في النشاط البدني المتمثل في المشي 50.6%، الركض 55.8%، والرياضة بنسبة 44.3%، في خلال ان المشاكل المدرسية المتعلقة بالتركيز 37.4% والمتابعة قد سُجلت بنسبة 31.3%، بينما المشاكل الاجتماعية كعدم القدرة على فعل ما يفعله الأطفال الآخريين 42.8%، واللعب معهم 46%، والإستمرارية في اللعب 33.4%، من ناحية أخرى، لم تظهر المشاكل العاطفية والحضور المدرسي إرتباط ظاهر مع مؤشر كتلة الجسم.

الخلاصة: إن إرتفاع في مؤشر كتلة الجسم يؤدي إلى إرتفاع في حدود الحركة، التركيز الدراسي، والمشاكل الاجتماعية لدى الأطفال البدناء. بينما المشاكل العاطفية والحضور المدرسي لم يظهر ارتباط كبير مع مؤشر كتلة الجسم.

Objectives: To evaluate the impact of body mass index (BMI) on limitation of physical activity and the associated effect on behavioral, school, and social problems among obese children in Western Saudi Arabia.

Methods: A cross-sectional obesity survey was conducted in Jeddah, Saudi Arabia. Data were collected between August 2014 and February 2015 from 281 obese children aged between 2-18 (girls: 130, boys: 151). Participants were selected randomly to represent different economic status, level of education, and family structure.

Results: The mean age of participants was 10.5 years for girls and 10.6 years for boys. Higher BMI was associated with physical activity problems in walking (50.6%), running (55.8%), and exercise (44.3%), with school problems in attention (37.4%) and follow-up duties fade (31.3%), and with social problems in doing things other children could do (42.8%), playing with others (46%), and continuing play (33.4%). There was no significant relationship between BMI and emotional problems and school attendance.

Conclusion: Higher BMI significantly increased physical limitation, problems maintaining attention in school, and social problems among obese children. However, emotional problems and school attendance did not show a significant correlation with BMI.

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Childhood obesity has become a worldwide health hazard. It is accompanied by serious and severe co-morbidities, including anxiety, depression, stress, and degenerative joint diseases affecting weight bearing joints. Furthermore, it is associated with social and behavioral problems.^{1,2} The prevalence of childhood obesity has increased over the years and the number of children suffering from obesity continues to increase worldwide. Obesity is attributed to many diseases and health conditions. Many authors have identified a strong link between obesity and internalizing difficulties, poorer quality of life, more profound social issues, and

increased behavioral problems. Obese children and adolescents are at greater risk for joint problems, as well as social and psychological problems, such as anxiety, stress, depression, and poor self-esteem.¹⁻⁵ Many studies have confirmed that obesity is the strongest predictor of stress in childhood; obesity has a significant effect on childhood depressive symptoms, low self-esteem, and social isolation due to negative relationships with school peers.^{3,4} Physical inactivity has been identified as one of the core risk factors associated with pediatric obesity.⁶ Several studies have shown that obesity influences school performance. However, little is known regarding the effect of obesity on school attendance.^{7,8} In this study, we aimed to examine the relationship between emotional, behavioral, and social problems associated with physical limitation in obese children in Jeddah, Kingdom of Saudi Arabia (KSA).

Methods. *Study design and population.* A cross-sectional survey was conducted in Jeddah, KSA. Data on obese children and adolescents aged 2-18 years were collected between August 2014 and February 2015. Girls and boys were selected randomly and represented by different economic status, level of education, and family structure. A total of 281 children (130 girls and 151 boys) provided complete data for the analysis. The Research and Ethics Committee at the King Abdulaziz University Hospital in Jeddah, KSA approved the study. Written and verbal consent was obtained from patients and their parents prior to completion of the questionnaire, physical examination, and blood sample collection.

Data Collection. A cross-sectional questionnaire-based study design was applied. Sets of standardized data collection sheets entailing a series of questions with multiple-choice answers were utilized. The questionnaire included; physical activity problems, such as: if the child suffers from difficulties in walking, running, sports, and exercise. School learning difficulties, such as follow-up duties fade, attention in school, absenteeism from school if the child not feeling comfort, going to hospital or visiting the doctor. Social problems, such as: if the child was feeling severe stress, which prevents him from playing, continuing playing with other children, and cannot do things that other children can do. Emotional problems, such as: if the child was feeling sad, depressed, and worry. The

participants were directed to the ambulatory clinic in King Abdulaziz Hospital, Jeddah, KSA, where trained health professional volunteers filled in the questionnaires based on the responses of parents or guardians. Exclusion criterias were dietary intervention, exposure to hormone treatment, development of secondary obesity due to endocrinopathies, chronic diseases, any medication, and data insufficiency due to incomplete questionnaires. For research purposes, we surveyed the following general items: personal data, demographic data, parental education level and occupation, family income, family structure, physical activity, nutritional status, and medical history. Trained health personnel at the ambulatory clinic collected the anthropometric data. Height was measured using a wall-mounted stadiometer, with the children not wearing shoes with their shoulders in a relaxed position, and arms hanging freely. Weight was measured with a beam-balance scale, which was re-calibrated for every new subject. Subjects were weighed barefoot and wearing minimal clothing.

Body mass index (BMI) measurements. Weight was measured with the subject in light clothing and without shoes. The BMI was calculated as weight (kg)/height (m²). The BMI percentile was determined for each subject according to the Centers for Disease Control and Prevention BMI charts.⁹

Statistical analysis. Data was entered, coded, and analyzed using the Statistical Package for Social Science, version 16 (SPSS Inc., Chicago, IL, USA). The analysis was performed by finding the correlation coefficients and testing the significance of the relationship between physical activity, school, social, emotional problems, and BMI using Spearman correlation of ordinal data, after we assumed that the data followed a normal distribution. The answers to the problems were categorized as follows: none (meaning no), occasional (meaning 1 to 3), and frequent (meaning more than 3). Point biserial correlation, a special case of Pearson correlation, was used to calculate the relationship between activity problems and BMI (kg/m² and standard deviation [SD]) and the ratio of center circumference to hip scores. The results were considered significant with $p < 0.05$.

Results. The study included 281 children (girls 130/281 [46.3%] and boys 151/281 [53.7%]). Descriptive characteristics of the children according to BMI and age among boys and girls are provided in Table 1. At baseline, children with higher BMI experienced greater physical limitation, as assessed by responses to questions related to the activities of walking, running, sport, and exercise (Table 2). Walking

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problems were identified in 50.6% ($p=0.018$, $r=0.164$) of obese children; those children who experienced problems had a higher BMI than those who did not. Further, 55.8% ($p=0.006$, $r=0.189$) of obese children experienced problems with running, and 44.3%

Table 1 - Characteristics of body mass index and age among boys and girls in a Saudi Arabian obesity survey between 2014 and 2015.

Variable	Gender	n (%)	Mean ± SD	95% CI
BMI kg/m ²	Male	141 (93.4)	27.6 ± 5.5	(26.7-28.5)
	Female	124 (95.4)	26.7 ± 5.1	(26-27.8)
Age	Male	151	10.6 ± 3.9	(9.9-11.2)
	Female	130	10.5 ± 3.8	(9.8-11.1)

BMI - body mass index, SD - standard deviation, CI - confidence interval

Table 2 - Characteristics of cross physical activities problems among obese children.

Variable	n (%)	Mean ± SD	95% CI
BMI kg/m ²			
Problem			
<i>Walking</i>			
None	124 (94.7)	26.7 ± 5.4	(25.7-27.7)
Occasional	82 (96.5)	28.1 ± 5.0	(27-29.2)
Frequent	44 (91.7)	28.1 ± 5.4	(26.4-29.7)
<i>Running</i>			
None	111 (94.1)	26 ± 5.2	(25-26.9)
Occasional	70 (95.9)	27.4 ± 4.6	(26.3-28.5)
Frequent	71 (94.7)	29.5 ± 5.5	(28.2-30.8)
<i>Sports and exercise</i>			
None	138 (95.8)	26.8 ± 5.2	(25.9-27.7)
Occasional	70 (95.9)	26.9 ± 4.7	(25.8-28.1)
Frequent	38 (90.5)	29.8 ± 5.1	(27.9-31.8)

BMI - body mass index, SD - standard deviation, CI - confidence interval

Table 3 - Characteristics of cross social activities problems in a Saudi Arabian obesity survey between 2014 and 2015.

Variable	n (%)	Mean ± SD	95% CI
BMI kg/m ²			
Problem			
<i>Playing with other children</i>			
None	133 (93.0)	26.6 ± 5.4	(25.7-27.5)
Occasional	75 (96.2)	28.1 ± 5.6	(26.7-29.3)
Frequent	42 (97.7)	28.4 ± 4.4	(27-29.7)
<i>Children doing things you cannot do</i>			
None	143 (95.3)	26.5 ± 5.3	(25.5-27.3)
Occasional	83 (93.3)	28.4 ± 4.7	(27.3-29.4)
Frequent	23 (95.8)	28.7 ± 6.2	(26-31.3)
<i>Continuing to play with other children</i>			
None	163 (95.3)	27 ± 5.2	(26.2-27.7)
Occasional	57 (93.4)	27.8 ± 5.4	(26.3-29.2)
Frequent	22 (91.7)	28.2 ± 5.7	(25.6-30.7)

BMI - body mass index, SD - standard deviation, CI - confidence interval

($p=0.060$, $r=0.132$) of obese children had problems with the practice of sports and exercise, which affected their social activity and lowered their self-esteem. We also observed that 42.8% of obese children reported not being able to do things that other children could do ($p=0.002$, $r=0.213$); 46% of obese children reported feeling severe stress, which prevented them from playing with other children ($p=0.071$, $r=0.127$), and 33.4% of obese children reported having problems in continuing to play with other children ($p=0.001$, $r=0.224$).

Obese children had particularly high rates of other problems, for example, 37.4% had problems with maintaining attention in school ($p=0.043$, $r=0.142$), which affected their performance, and 31.3% had problem in follow-up duties fade ($p=0.068$, $r=0.118$). The latter was significantly related to BMI, with children who suffered from the problem of having higher BMI than those who did not (Table 3). On the other hand, there was no significant correlation between BMI and attendance/absenteeism in school. Furthermore, there was no significant correlation between BMI and emotional problems.

Discussion. Obesity and depression among school-aged children have a negative impact on school performance and relationships with peers, which are important precursors to psychopathy. Previous studies⁹ have reported higher incidences of depression, stress, and anxiety in obese children. In contrast, other studies^{1,10,11} have found no significant correlation between obesity and depression, anxiety, and psychological stress. An Italian study¹ composed of 148 obese children (79 girls and 69 boys; mean age 8.9 ± 1.23 years) showed a significantly higher level of depressive symptoms in obese children in comparison with normal-weight children. A Brazilian study¹⁰ enrolling 50 children reported opposing results with no correlation between BMI and anxiety and depressive symptoms. In a Korean study,¹¹ with 2305 elementary school-aged participants, the authors confirmed a positive correlation between obesity and stress and depression symptoms. Other published studies^{1,10,11} have shown obese children to be more depressed, to feel hopeless, and to have lower self-esteem, and lower life satisfaction compared with non-obese healthy children. In the present study, there was no significant correlation between BMI and emotional problems; we found that sadness, depression, and worry were not correlated with BMI. The exact mechanisms, which might explain the relationship between obesity and physical activity, remain unclear. One possibility is that symptoms of joint pain promote

excess weight gain during adolescence via reduced physical activity, exercise, or sport participation. In our study, we confirmed a significant correlation between BMI and frequency of physical activity difficulties, such as walking, running, and exercise. We found that 50.6% of obese children had problems with walking, 55.8% with running, and 44.3% with exercise. Previous studies have examined the correlation between being obese and pain in the knee joint, which can lead to limitation in physical activity.^{6,12} According to a recent systemic review,⁶ 6 studies examining the relationship between motor proficiency and body composition found that children with poor motor proficiency had significantly higher BMI. In a Canadian study,⁶ which involved 103 children in the fourth-grade (aged 8-10 years) who were enrolled in public school system in Canada, a significant negative relationship was found between BMI and total physical activity performance. Furthermore, a 2-way interaction between time and physical activity was significant for BMI only, suggesting a reverse correlation between BMI and duration of physical activity.⁶ In an Italian study,¹² obese children were reported to have poorer motor performance when performing standing long jump and basketball throw than their non-obese peers. The New Hampshire School Health Care Coalition assessed the correlation between obesity and fitness among 6511 student participants aged 6-14 years, and concluded that there was no significant association between obesity and fitness.¹³ Childhood obesity has dramatically increased over the last 2 decades, and is associated with poor health status and general health. In a study¹⁴ of 43,297 American children aged from 10 to 17 years, reported in 2007, 15% were considered obese. The study reported¹⁴ that obese children were more likely to have poor health, activity restrictions, school problems, missed school days, and learning disability. Many obese adolescent girls and boys are socially marginalized among their peers. After controlling for other factors, obese respondents were found to receive fewer friendship nominations than their normal-weight peers. Overall, the relationship between obesity and social isolation was moderate in strength. In the present study, we found that 42.8% of obese children could not do things that other children could do, which lead to reduced self-esteem; that 46% of obese children felt severe stress, which prevented them from playing with other children; and that 33.4% of obese children had problems in continuing to play with other children. All of these problems affected their relationships with their peers. In the National Longitudinal Study,³ the

total population consisted of 90,118 children aged 13-18 years were assessed for height and weight. Obese adolescents were more likely to be socially isolated, participate less in sports, and have fewer friendships; the isolation may aggravate the social and emotional problems in obese children.³ In a further American study,⁷ which enrolled 93,151 children aged from 10 to 17 years, it was reported that the odds of missing more than 11 days of school was greater among obese children than non-obese children, as spending more time in preparation themselves for school. In light of these findings, they hypothesized that social marginalization of obese individuals contributes to reduced self-esteem and increased depressive symptoms among obese adolescents.^{3,7} In Philadelphia,¹⁵ the American School Health Association analyzed 291,040 students including 165,056 obese students (grades 1 to 12), and concluded that obesity was not strongly associated with school absence, except among extremely obese children.¹⁵ In an American study¹⁶ of 920 children, the authors reported a negative relationship between BMI and attendance in school.¹⁶ Likewise, in this study, we excluded the correlation between obesity and attendance/absenteeism in school for any reason. However, we confirmed the relationship between some school problems and BMI ratio; 37.4% of obese children had problems in maintaining attention in school, which affected their performance, and 31.3% of obese children had problem in follow-up of duties fade.

Study limitations. The main limitation of this study was its cross-sectional design, which did not allow confident causal inferences. Prospective studies are needed to confirm our findings. Other limitations include the limited area covered, the sample size, the fact that some results were not used due to incomplete data, and the lack of information on the content of media use.

In conclusion, this study analyzes the relationship between obesity and problems with physical limitation and social, school, and emotional problems among children. These analyses support the relationship between physical activity limitation, social problems, and BMI. On the other hand, our study confirms a negative relationship between emotional problems, school attendance, and BMI ratio. The problem of obesity in children must be taken seriously and treated aggressively. We strongly recommend that children and adolescents be informed by physicians, dieticians, and teachers of the specific co-morbidities associated with childhood obesity.

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Ethical Consent

All manuscripts reporting the results of experimental investigations involving human subjects should include a statement confirming that informed consent was obtained from each subject or subject's guardian, after receiving approval of the experimental protocol by a local human ethics committee, or institutional review board. When reporting experiments on animals, authors should indicate whether the institutional and national guide for the care and use of laboratory animals was followed.