Prevalence of obesity and overweight among primary school children in Misurata - Libya

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Received: 26.08.2024 Published: 12.10.2024

Abstract:

Background: Childhood obesity is a major public health issue that affects millions of children worldwide. Various factors contribute to the increase in obesity rates, including dietary habits and lifestyle changes. Obese children are at higher risk for developing physical and psychological diseases. The study aims to determine the prevalence of obesity and overweight among primary school children in the city of Misurata.

Methods: A cross-sectional study was conducted in six primary schools around the municipality of Misurata, 415 apparently healthy children (aged 6-13 years) were included in the study. The study was conducted in the period from 6 December to 31 December 2023. Anthropometric measurements were taken by well-trained intern doctors. We used the Body Mass Index (BMI) percentile calculator for children of the United States Center for Disease Control (CDC) to calculate the Body Mass Index.

Results: The number of children involved in the study was 415, out of them 191 were boys (46%), and 224 were girls (54%). The mean age was 9.17 years and ranged from 6 years to 13 years. The interpretation of BMI showed that 274 children (66%) were average weight, 41 (9.9%) were underweight, 44 (10.6%) were overweight, 39 (9.4%) were obese and 17 (4.1%) were severely obese.

Conclusion: The prevalence of childhood obesity in Misurata is alarming. Collaborative Efforts to develop comprehensive approaches to fight such obesity rates should be adopted.

Keywords: Childhood Obesity, overweight, Body Mass Index, Misurata, Libya.

مدى انتشار السمنة والوزن الزائد بين أطفال المدارس الابتدائية في مصراتة - ليبيا

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تاريخ الاستلام 2024.08.26 تاريخ النشر 2024.10.12

الملخص:

الخلفية: تعتبر السمنة لدى الأطفال مشكلة صحية عامة رئيسية تؤثر على ملايين الأطفال في جميع أنحاء العالم. تساهم عوامل مختلفة في زيادة معدلات السمنة، بما في ذلك العادات الغذائية وتغييرات نمط الحياة. الأطفال الذين يعانون من السمنة هم أكثر عرضة للإصابة بالأمراض الجسدية والنفسية. تهدف الدراسة إلى تحديد مدى انتشار السمنة والوزن الزائد بين أطفال المدارس الابتدائية في مدينة مصراتة.

طرق البحث: أجريت دراسة مقطعية في ست مدارس ابتدائية في بلدية مصراتة، وتم تضمين 415 طفلاً يتمتعون بصحة جيدة (تتراوح أعمارهم بين 6–13 عامًا) في الدراسة. أجريت الدراسة في الفترة من 6 ديسمبر إلى 31 ديسمبر 2023. وتم أخذ القياسات البشرية من قبل أطباء مدربين تدريبًا جيدًا. استخدمنا الآلة الحاسبة المئوية لمؤشر كتلة الجسم (BMI) للأطفال بحسب مركز مكافحة الأمراض الأمريكي (CDC) لحساب مؤشر كتلة الجسم. **النتائج:** بلغ عدد الأطفال المشاركين في الدراسة 415 طفلاً، منهم 191 ذكرًا (46%)، و224 أنثى (54%). وكان متوسط العمر 9.17 سنة وتراوح من 6 سنوات إلى 13 سنة. أظهر تفسير مؤشر كتلة الجسم أن 274 طفلاً (66%) كانوا متوسطي الوزن، و41 (9.9%) يعانون من نقص الوزن، و44 (10.6%) يعانون من زيادة الوزن، و39 (9.4%) يعانون من السمنة المفرطة، و17 (4.1%) يعانون من السمنة المفرطة. **الاستنتاج:** إن انتشار السمنة لدى الأطفال في مصراتة أمر مثير للقلق. وينبغي اعتماد الجهود التعاونية لتطوير أساليب شاملة لمكافحة معدلات السمنة هذه.

الكلمات المفتاحية: السمنة لدى الأطفال، الوزن الزائد، مؤشر كتلة الجسم، مصراتة، ليبيا.

1. Introduction:

Childhood obesity is one of the most serious public health challenges of the 21st century (WHO, 2020). According to the World Health Organization(2023),

overweight is characterized by excessive fat deposits, while obesity is a chronic, complex disease defined as "abnormal or excessive fat accumulation that presents a health risk." The global prevalence of childhood overweight and obesity has risen at an alarming rate and is estimated to be 8.5%. Although the prevalence is higher in high-income countries, low- and middle-income countries, particularly in urban settings, are increasingly affected (Zhang et al., 2024). In 2022, more than 390 million children and adolescents were overweight, including 160 million living with obesity (World Health Organization, 2023).

Childhood obesity results from multidimensional biological, behavioral, and environmental causes, with unhealthy diets, especially high-calorie food, physical inactivity, and sedentary behaviors being the key contributors (Janssen et al., 2005; Safaei et al., 2021; Noubiap et al., 2022). Additionally, genetics, hormonal, socioeconomic, and psychological factors, as well as certain medications, play significant roles in childhood overweight and obesity (Sahoo et al., 2015; CDC, 2022).

Overweight and obese children are likely to remain obese into adulthood, which places them at risk for adverse health events (Simmonds et al., 2016). A substantial and reasonably uniform body of evidence now indicates that excessive weight and obesity in childhood and adolescence can lead to negative consequences in adulthood, including premature mortality and physical health problems (Balasundaram & Krishna, 2024), such as high blood pressure, high cholesterol, metabolic syndrome, type 2 diabetes, and cardiovascular diseases (Reilly & Kelly, 2011; CDC, 2024). Other health conditions, like asthma (Lang, 2012), dental issues (Reilly & Kelly, 2011), orthopedic problems (Wills, 2004), sleep apnea (Narang & Mathew, 2012), and fatty liver disease (Reilly & Kelly, 2011) are also common adverse health events among children with overweight and obesity. Besides the physical health effects, childhood obesity can lead to psychosocial problems such as body image issues, low self-esteem, social isolation, discrimination, depression, and reduced quality of life (Rankin et al., 2016).

Furthermore, the economic burden associated with treating obesity-related illnesses places a heavy strain on healthcare systems worldwide (World Health Organization, 2023). Since overweight and obesity, and their related diseases, are largely preventable, early intervention in childhood becomes a high priority.

This study aims to measure the prevalence of obesity and overweight among primary school children in the city of Misurata to provide a comprehensive understanding of the magnitude of this growing problem.

2. Subject and Methods:

A Cross-sectional study was conducted on primary schools in Misurata city which is a city in northwestern Libya, situated 187 km to the east of Tripoli. With a population of about 881,000, it is the third-largest city in Libya, after Tripoli and Benghazi (Wikipedia, 2023).

Using Multistage cluster sampling design, four districts of the city were identified (western, eastern, southern, and center regions), and six primary schools were randomly selected from the districts. Subsequently, classrooms were chosen randomly from each selected school, and all students in the selected classrooms were included in the study.

The sample size was calculated based on Steven K. Thompson formula (Thompson, 2012) with 95% confidence Interval (CI) and the result was 382. An additional 10% of the sample size was included to account for any potential loss or reduction in the sample, bringing the total sample size to 420.

$$n = \frac{Np(1-p)}{(N-1)(d^2/z^2) + p(1-p)}$$

415 apparently healthy children, aged 6-13 years were included in the study during the period from 6th to 31st December 2023,

Well-trained intern doctors took anthropometric measurements. Participants were asked to remove their shoes before stepping on a stadiometer placed on a flat floor along the wall. The students were advised to hold their breath and maintain an erect anatomical posture. The measurement of height was then carefully read to the nearest 0.1 cm. Weight was measured using a digital weighing. Measurements were taken with each student in light clothes and without shoes. Weight carefully read when the point readings stabilized and was recorded to the nearest 0.1 kg.

To calculate the Body Mass Index, the BMI Percentile Calculator for Children of the US Centers for Disease Control (2023) was utilized which classifies underweight as less than the 5th percentile, healthy weight from 5th percentile to less than the 85th percentile, overweight from 85th percentile to less than the 95th percentile, obesity as 95th percentile or greater and severe obesity as 120% of the 95th percentile or greater or a BMI of 35 kg/m^2 or greater.

Data were entered and analyzed by SPSS software version 26 and presented in tables and graphs. Independent samples T-Test was used in assessment of difference in BMI according to gender. P-value was considered significant if <0.05.

Ethical Approval of the study was taken from the educational directorate of Misurata municipality and from principal of each school.

Figure (1): Site of Misurata city in Libya

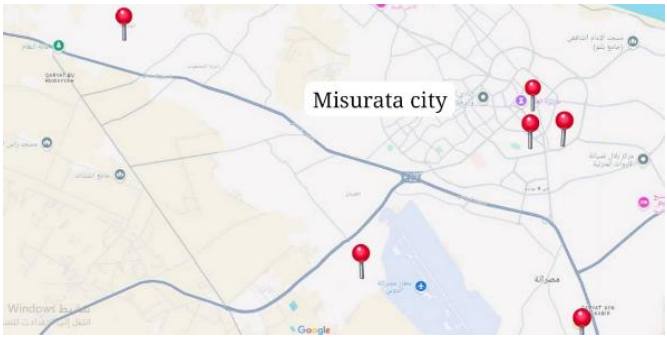

Figure (2): Distribution of schools included in the study around Misurata city

3. Results:

The number of children involved in the study was 415, out of them 191 (46%) were boys and 224 (54%) were girls. The mean age of the participants was 9.17 years and ranged from 6 to 13 years.

The study involved six primary schools situated in the east, west, south, and center of Misurata city. Children distribution according to schools is presented in table (1).

Table (1): Children distribution according to schools with detailed and overall age and sex distribution

School	Gender				Age group				Total N (%)
	Male		Female		6-9 years		10-13 years		
	N	%	N	%	N	%	N	%	
Alhedaya	30	48.39	32	51.61	3	4.84	59	95.16	62 (14.9)
Alkarama	0	0.00	119	100.00	84	70.59	35	29.41	119 (28.7)
Misurata Assumood	106	92.17	9	7.83	91	79.13	24	20.87	115 (27.7)
Annajah	23	50.00	23	50.00	0	0.00	46	100.00	46 (11.1)
17 April	10	41.67	14	58.33	4	16.67	20	83.33	24 (5.8)
Ras almajel	22	44.90	27	55.10	49	100.00	0	0.00	49 (11.8)
Total	191		224		231		184		415 (100)

Mean body mass index of participants was 17.68 with a standard deviation of 4.25, the minimum BMI was 9.60, and the maximum was 37.78.

The interpretation of BMI according to age as represented in table (2), showed that 274 children (66%) were average weight, 41 (9.9%) were underweight, 44 (10.6%) were overweight, 39 (9.4%) were obese and 17 (4.1%) were severely obese. Figure (3).

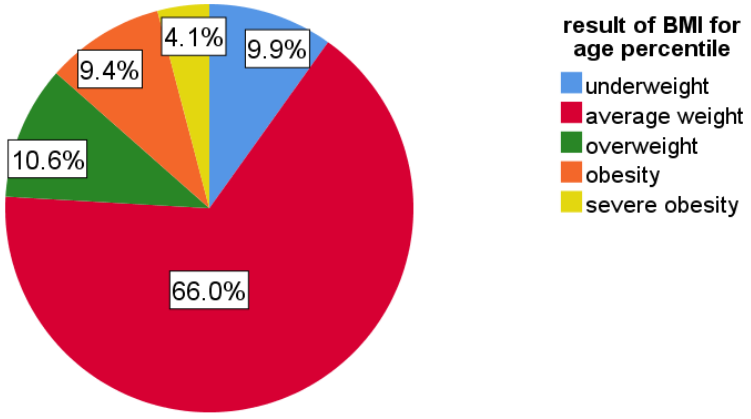

Figure (3): Distribution of BMI interpretation for age percentile among children in the study population

Table (2): children distribution according to BMI interpretation

BMI Interpretation	Gender		Age Group		Total
	Male	Female	6-9 years	10-13 years	
Underweight	8 (4.2%)	33 (14.7%)	34 (14.7%)	7 (3.8%)	41 (9.9%)
Average Weight	138 (72.3%)	136 (60.7%)	161 (69.7%)	113 (61.4%)	274 (66.0%)
Overweight	18 (9.4%)	26 (11.6%)	20 (8.7%)	24 (13.0%)	44 (10.6%)
Obesity	19 (9.9%)	20 (8.9%)	12 (5.2%)	27 (14.7%)	39 (9.4%)
Severe Obesity	8 (4.2%)	9 (4.0%)	4 (1.7%)	13 (7.1%)	17 (4.1%)
Total	191 (100%)	224 (100%)	231 (100%)	184 (100%)	415 (100%)

The percentage of average-weight children was higher in males rather than females which was 72.3% and 60.7% respectively. Girl students showed a higher percentage (14.7%) of underweight as compared to the boys (4.2%). The percentage of overweight boys was 12%, whereas the percentage of overweight girls was 10%. There was no significant difference in obesity rates between males and females (9.9% vs 8.9%) or in severe obesity rates (4.2% vs 4.0%), Figure (4).

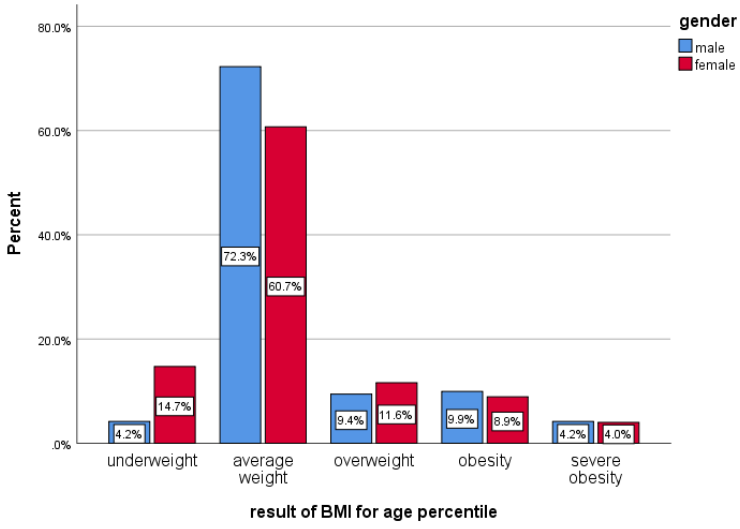

Figure (4): comparison between males and females for BMI interpretation

Based on the independent samples T-Test analysis, it was found that there is no significant association between gender and obesity as the P-value was 0.230 at 95% CI.

4. Discussion:

Childhood obesity is a serious public health problem with a rapidly increasing prevalence worldwide. It is associated with several risk factors for the development of heart disease and other chronic diseases (WHO, 2020). The prevalence of obesity and overweight varies greatly with age groups, gender, and socioeconomic status. This study was conducted to determine the prevalence of obesity and overweight among primary school children in Misurata.

In the current study, the overall obesity rate among primary school children was found to be 13.5%, with 9.4% classified as obese and 4.1% as extremely obese. About 10.6% of the children were overweight, 9.9% were underweight, and 66% had a normal weight.

The percentage of overweight boys was slightly higher compared to girls (12% vs. 10%). Obesity rates were almost similar between boys (13.6%) and girls (12.9%), and there was no significant association between gender and overweight or obesity, as the p-value was 0.230 at a 95% confidence interval (CI).

Comparing our results to a previous study conducted in Misurata in 2006 and published in 2018 (Hussien, 2018), the figures for obesity (13.5%) were very similar (12.4%). However, the prevalence of overweight among children dropped from 15.8% in 2006 to 10.6% in our study.

In a study conducted in Benghazi in 2017 (Elsaid et al., 2023), the prevalence of overweight children was 7.2%, which is lower than that of our participants, whereas the prevalence of obesity was significantly higher at 20.6%. Similarly, a study conducted in 2012 in Tripoli (Hassan EM et al., 2016), focused on private school students, found that the combined prevalence of overweight and obesity was approximately 50%, which is much higher than our findings.

When comparing our results to nearby Arab countries, the prevalence of overweight children in Port Said, Egypt (Badawi et al., 2013), was 17.7%, higher than our rate. However, the obesity prevalence in Port Said was 13.5%, exactly the same as our study. Higher rates of obesity (19.5%) were observed among children who participated in a study conducted in Cairo, Egypt (Hassan NE et al., 2016).

In Sfax, Tunisia (Regaieg et al., 2014), using the International Obesity Task Force (IOTF) definitions, the frequency of overweight was 6.3%, and obesity was 2.4%, both figures significantly lower than those reported in our study.

In Iraq, a study conducted by Shakoor and Al-deen (2015) in Kirkuk City reported that 18% of public primary school students were overweight, while 6.2% were obese. This reflects a higher prevalence of overweight and a lower obesity rate compared to our findings. Another recent study in Iraq revealed a combined overweight and obesity prevalence of 35.2%, which is significantly higher than the rates observed in our participants (Firas et al., 2023).

In comparison to figures obtained from Kuwait (Alrashidi et al., 2015), where overweight and obesity were detected in 25.5% and 36.5%, respectively, our rates are significantly lower.

According to our study, the prevalence of overweight and obesity was nearly equal between male and female students, with no statistically significant association detected (p-value = 0.230 at 95% CI). This is consistent with several other local (Hussien, 2018; Elsaid et al., 2023) and Arabic studies that also found no significant gender-based differences in obesity prevalence (Hassan et al., 2016; Shakoor & Al-deen, 2015; Alrashidi et al., 2015; Oulamara et al., 2020).

It is important to consider the method used to classify obesity in children, as different growth charts can yield varying results. Variability in the classification system should be taken into account when assessing and addressing obesity in children.

The rising trend in childhood obesity rates is critical for policymakers to design effective interventions and programs aimed at reducing these rates. Several factors contribute to the increase in obesity, including changes in dietary habits and lifestyle (WHO, 2020). The growing prevalence of fast food and unhealthy eating patterns is a major factor in the rise of obesity rates. Furthermore, the sedentary lifestyle associated with technological development, particularly the widespread use of smartphones and social media, has also contributed to the increase in obesity, as children spend more time on devices and less time engaging in physical activities (Sahoo et al., 2015).

When comparing the results from Misurata to other cities in the region, it is evident that the prevalence of obesity in Misurata is close to the average of the surrounding cities. Although it is not the highest rate, the prevalence of obesity in Misurata is still higher than the global average of childhood obesity, which is estimated according to a 2023 systematic review to be 8.5% (Zhang et al., 2024). This makes the higher rates observed in Misurata alarming and in need of attention.

5. Study Limitations:

This study is limited to the prevalence of obesity and overweight by physical measurements were taken on the children directly without the presence of their parents, which made the study limited only to physical measurements without taking the children's medical history or asking them about lifestyle, eating habits, and the economic and social level of the family, and therefore the study did not link obesity to the risk factors that may lead to it.

Studying obesity rates among children at the national level periodically and knowing the risk factors that lead to obesity is very important to see the change in the nutritional habits of society and to develop appropriate strategies to reduce this problem.

6. Conclusion:

The Prevalence of childhood obesity among primary school children in Misurata city is alarming and calls for attention. However, there is no significant increase in obesity prevalence since 2006. Collaborative Efforts to develop comprehensive approaches to fight such obesity rates should be adopted.

7. Recommendation:

After this study, analytical studies recommended to assess the habitual factors that contributes this rate of prevalence which allowed further steps to address those factors.

8. Acknowledgment:

We sincerely thank the Administration of Education in Misurata Municipality for their crucial support and collaboration, as well as the schools involved for their cooperation. The commitment of the administrators, teachers, and students was vital to the success of this research.

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