

Socio-behavioral factors associated with overweight and obesity among school children in Menoufia Governorate, Egypt

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Abstract:

Background: Childhood obesity is a widespread and significant public health challenge globally, recognized as a complex, multifactorial condition. Behavioral, socio-environmental, and psychological factors contribute to the onset and progression of obesity in children. Children who are overweight or obese are at increased risk of becoming obese adults and face a heightened likelihood of developing chronic diseases due to the persistent inflammatory state associated with obesity. **Objectives:** to assess the prevalence of obesity and identify the socio-behavioral factors related to being overweight and obese among school children. **Methods:** A cross-sectional study was conducted from April 1, 2022, to July 31, 2023, involving 134 schoolchildren aged 6 to 14 years. The study measured the children's weight and height to calculate their body mass index (BMI). A questionnaire was administered to assess both social and behavioral factors. Social factors were evaluated using a validated questionnaire designed to scale socioeconomic status. Behavioral factors were assessed using the Child Eating Behavior Questionnaire (CEBQ), a validated tool. The questionnaire was completed by the mothers, who were trained before data collection. **Results:** Among the studied children, 24.6% were classified as overweight, and 28.4% as obese. A statistically significant association was observed between the weight status of the participants and certain eating behaviors, including Food Responsiveness, Emotional Overeating, Enjoyment of Food, and Emotional Undereating. However, no significant relationship was found between the children's weight status and either their socioeconomic level or their mothers' employment status. **Conclusion and Recommendations:** Childhood obesity and overweight are strongly affected by eating behaviors. So, the management of obesity should include correction of the children's eating behaviors.


Keywords: Behaviors, Childhood, Prevalence, weight

Introduction

Obesity is a global and top public health problem. It is considered a pandemic issue

all over the world. It has become one of the major pressing challenges. ⁽¹⁾ The World Health Organization (WHO) defines obesity

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as an excess in fat mass great enough to adversely affect health and may also lead to death. ⁽²⁾ Childhood overweight or obesity is highly predictive of adult obesity. ⁽³⁾

Childhood obesity presents both immediate and long-term health complications. Children with obesity are at increased risk for psychological comorbidities such as depression, anxiety, low self-esteem, as well as various emotional and behavioral disorders.

They are also more prone to physical health issues, including liver complications, joint and bone disorders, and systemic inflammation. Cardiovascular risk factors, bronchial asthma, hypertension, and dyslipidemia are more common among these children.

In adulthood, they face heightened risks for chronic conditions, including diabetes, cardiovascular diseases, stroke, osteoarthritis, chronic kidney disease, gallbladder disease, certain cancers, and premature mortality. Thus, childhood obesity imposes a considerable burden on public health and society. ⁽⁴⁾

Regarding etiology, childhood obesity is a complex disease with a multifactorial character. Environmental, genetic, psychosocial, socioeconomic, and dietary factors interact together in a complex way. A

sedentary lifestyle, inactivity, and more screen time increase the incidence of obesity too. ^(5,6)

Previous studies have shown that behavioral, socio-environmental, and psychological aspects are considered causative factors for childhood obesity. ⁽⁷⁾

The prevalence of childhood obesity in Egypt was estimated by the WHO in 2016 and showed that around forty-one million children under the age of 5 years were overweight or obese. In 2016, the worldwide prevalence of overweight and obesity among children aged (5-19) years increased from 4% in 1975 to more than 18% with more prevalence among boys compared to girls in around 124 million children. ⁽⁸⁾

Therefore, identifying the magnitude of the problem and its socio-behavioral factors is important and the basis for developing interventions to prevent and control this problem.

Subjects and methods

A cross-sectional study was conducted at the Integrated District Governmental Language School, Shebin El-kom District, Menoufia Governorate, Egypt. The study was conducted through the period from the first of April 2022, till the end of July 2023.

The inclusion criteria of participants were school children aged 6-14 years attending



the selected school regularly. The calculated sample size was 134 students, it was determined using the online Raosoft sample size calculator for a definite population.

It was calculated based on a review of past literature (El-Shafie *et al.*, 2013), who found that the percentage of obesity among primary school children was 9.6%, with a power of 80%, a confidence interval of 95% and 0.05 as the absolute sampling error that can be tolerated.

The equation used is:

$$\text{Sample size} = \frac{(Z_{1-\alpha/2})^2 p (1-p)}{d^2}$$

$Z_{1-\alpha/2}$ = is standard normal variate (at 5% type 1 error ($P < 0.05$) it is 1.96).

p = Expected proportion of childhood obesity (9.6%).

d = Absolute error or precision (0.05)

Mothers of children who were recruited in the study were given an appointment to interview with the researcher for explaining of questionnaire and data collection after their consent.

A pilot study was made to make sure of the fulfillment of the questionnaire. The interview was held in the school after the end of the working day.

Ethical Considerations

The study received approval from the Ethical Committee of the Faculty of Medicine, Menoufia University. An official

request was also sent to the Menoufia Educational Affairs administration to obtain permission for school access.

Before the interviews, oral consent was obtained from the participants after explaining the objectives and benefits of the study. All collected data was kept confidential and used exclusively for research purposes.

Procedures of the study

1- Physical Examination

A general examination was done of all students as:

Anthropometric measurements:

Weight, Height, and Body Mass Index (BMI):^(9,10)

- ✓ Height in centimeters was measured using a stadiometer. Hats and anything on heads were removed. Children's position was fulfilled by standing straight against the stadiometer with heels together and head straight and they were barefooted.
- ✓ Weight in kilograms was recorded using a digital weighing scale with the patient bare feet standing straight with heels together while wearing light clothes.
- ✓ Body mass index (BMI): BMI was calculated by dividing a person's weight in kilograms by the square of height in meters.



CDC growth charts BMI for age and sex to identify each student's weight status category.

- Healthy weight: from 5th percentile: less than 85th percentile
- Overweight :85th: less than 95th percentile
- Obese: Equal or greater than 95th percentile

2- Questionnaire

The selected students and their parents were interviewed Using a questionnaire which was translated into Arabic as follows:

The questionnaire had the following sections

➤ Section (1): Socio-demographic data (A validated questionnaire)

The Questionnaire contains the following questions such as questions to assess the personal data of the students: age of the child, gender, birth order, and residenceetc. By (Fahmy *et al.*) socioeconomic scoring system.

This scale includes eight domains (father and mother occupation, father and mother education, computer use, per-capita income, family size, crowding index, sewage disposal, and refuse disposal) with a total score of 48.⁽¹¹⁾

➤ Section (2): Child eating behavior (A validated questionnaire)

This section included the Children's Eating Behavior Questionnaire (CEBQ),

which is a multi-dimensional, parent-reported questionnaire measuring children's eating behavior related to overweight and obesity risk.

It was developed and validated in China and Europe. It applies to school children. It consists of 35 items in the form of eight subscales, with each sub-scale loaded by 3 - 6 items. The items are rated on a five-point Likert scale, from 1 - 5 (1 = never, 2 = seldom, 3 = sometimes, 4 = often, 5 = always).

The items cover eight dimensions of eating style: enjoyment of food (EF), food responsiveness (FR), emotional overeating (EOE), desire to drink (DD), satiety responsiveness (SR), slowness in eating (SE), emotional undereating (EUE) and food fussiness (FF).⁽¹²⁾

'Enjoyment of Food' scale: It represents a general interest in food and Food.

The responsiveness scale is intended to measure eating in response to external food cues. **'Desire to Drink' scale:** It was developed to detect an increased desire to have drinks, particularly sugar-sweetened drinks, and has been related to a liking for consuming sweetened drinks.

'Satiety Responsiveness': It reflects the ability to regulate the amount of food that is eaten according to internal satiety cues.



'Slowness in Eating' scale: It measures the speed of eating during a meal and reflects a gradually reduced interest in a meal. **'Food Fussiness':** it reflects a lack of interest in food and unwillingness to try new foods (food neophobia), leading to an inadequate variety of foods. **'Emotional overeating'** and **'emotional undereating'** scales are characterized by either increased or decreased eating in response to negative emotions, such as anger and anxiety.⁽¹³⁾

Statistical analysis: Data were collected, tabulated, and statistically analyzed on a personal computer using IBM Statistical Package for Social Science (SPSS) version 23. Qualitative data were presented as a percent, number, and chi-squared test.

Quantitative data were presented in the form of means, and standard deviations (SD). The Pearson coefficient was used to analyze the correlation. Regarding the P value, the P value was not significant if >0.05 and P value was significant if < 0.05 .

Results

Figure 1 illustrates the distribution of overweight and obese children among the 134 participants. Among them, 28.4% were overweight and 24.6% were obese. Specifically for boys, the rates were 29.87% and 23.38%, and for girls, 17.54% and 35.09%, respectively.

In Table 1, out of the 134 children, 57.5% were males and 42.5% were females. Moreover, 79.1% of the mothers had a prominent level of education, and 49.3% were employed. Most of the participants belonged to the middle socioeconomic stratum.

Table 2 indicates that there was no significant association between the weight status of the children and the education level of their mothers ($p\text{-value} > 0.05$) or fathers ($p\text{-value} > 0.05$). Similarly, socioeconomic status and maternal employment did not show any significant relationship with the children's weight status ($p\text{-value} > 0.05$).

Regarding the eating behaviors of the children, Table 3 reveals that Food Responsiveness, Emotional Overeating, Enjoyment of food, and Emotional Undereating had a significant positive correlation with the BMI of the participants ($P\text{ value} < 0.05$).

However, Desire to Drink, Satiety Responsiveness, Slowness in Eating, and Food Fussiness did not exhibit any significant statistical relationship between normal weight, overweight, and obese children ($p\text{-value} > 0.05$).

Discussion

Childhood obesity is a serious global health issue.⁽¹⁴⁾ If untreated, childhood

obesity may last a lifetime and increase the risk of adult obesity as well as several metabolic and cardiovascular problems.

Childhood obesity is therefore one of the top health concerns, and management of childhood obesity and its complications is a good strategy to lower morbidity and mortality rates and hospital expenses in later life..⁽¹⁵⁾

Many studies showed that, since 1980, the prevalence of obesity has doubled in more than seventy countries. In the United States, its prevalence doubled from 6% to 12%, and in Spain, morbid obesity increased by over 200% over 13 years. This growing fashion also applies to childhood obesity.^(16,18)

In the present study, there was a high prevalence of overweight and obesity among school children 25% & 28 % respectively (Figure 1). These findings are consistent with the results of a systematic review and meta-analysis, which reported an increase in the prevalence of overweight and obesity among Spanish children aged 2 to 6 years.

The study showed that the percentage of overweight and obese children rose from 23.3% during the period 1999–2010 to 39.9% between 2011 and 2021.⁽¹⁹⁾

However, the current study has higher values than those described by many other

studies, a study conducted in Saudi Arabia shows (18.6%) were overweight and (7.1%) were obese.⁽²⁰⁾, also a recent Egyptian study showed that overweight and obese represent 8.3% and 16.7% respectively, while underweighted children represent 33.3% of school children in urban areas.⁽²¹⁾

This can be explained by the recent study conducted in the era of the COVID-19 pandemic in which, the problem of childhood overweight and obesity has expanded.⁽²²⁾

Also, the study that was conducted in Saudi Arabia used BMI adult interpretation in the result, which can make the result doubtful. Children have different interpretations and BMI growth charts for age and sex should be used as that was done in the present study.

Regarding the socioeconomic questionnaire, the current study shows that there is no relationship between BMI and the educational level of the mother or whether the mother works or not. However, in other studies, there were sometimes negative or positive relationships.

A study showed that the relationship depended on a mother's education status and work hours as more working hours would affect the guidance role of mother to put healthy diet plan for her children.⁽²³⁾

Another study was concluded in rural areas in Egypt showed that BMI Negatively affected by the work of mothers, overweight and obese children are more among non-working mothers.⁽²⁴⁾

That can be explained by the difference in cultures and the bad dietary habits that affect the whole family whether the mother works or not. However, that does not mean the guidance role of the mother is not important regarding the whole health of a child not only his BMI.

Regarding Child Feeding Behavior

Questionnaire: Eight eating behavior dimensions and their association with BMI were reviewed here. There was a statistically significant relationship and a positive correlation between weight status and (Food Responsiveness, Emotional Overeating, Enjoyment of Food, and Emotional Undereating).

The other Four domains (Desire to Drink, Satiety Responsiveness, Slowness in Eating, and Food Fussiness) had no statistically significant relationship with the BMI of the studied children.

This is consistent with a study, which postulated a positive relationship between children's BMI and food responsiveness and enjoyment of food. These scales measure children's overall appetite for food; the Food

Responsiveness scale is intended to identify more dysfunctional levels of appetite, such as the tendency to eat more if given the chance, while the Enjoyment of Food scale measures normal variation in overall appetite.⁽²⁵⁾

In the recent study, there was no significant relationship between Satiety Responsiveness and weight status. A study conducted on the Auburn University campus showed that, due to higher scores for food responsiveness, food enjoyment, and emotional overeating, obese children showed a greater interest in food.

It was also shown that, as compared to children of normal weight, obese children scored comparatively lower on satiety responses, a measure of their lack of interest in food.⁽²⁶⁾

This can be explained as a recent study sample was collected during the school months, children had one or two meals in school away from the eyes of their mothers, during this period overweight and obese children may have taken high-caloric food with empty nutrients values like in sweets or chips. As a result, their satiety might have been the same as that of normal-weight children, but they had more calories.

Limitation of the study: A limitation of the study was the length of time required to



complete the questionnaire, which some mothers found tedious.

Conclusion

Childhood obesity prevalence has increased and jumped these days. Child Eating Behaviors had a significant role in childhood overweight and obesity. As a result, any intervention for the management of childhood overweight and obesity should include correction of the behaviors as a cornerstone for this management.

Declarations

Competing interests: There is no conflict of interest to declare.

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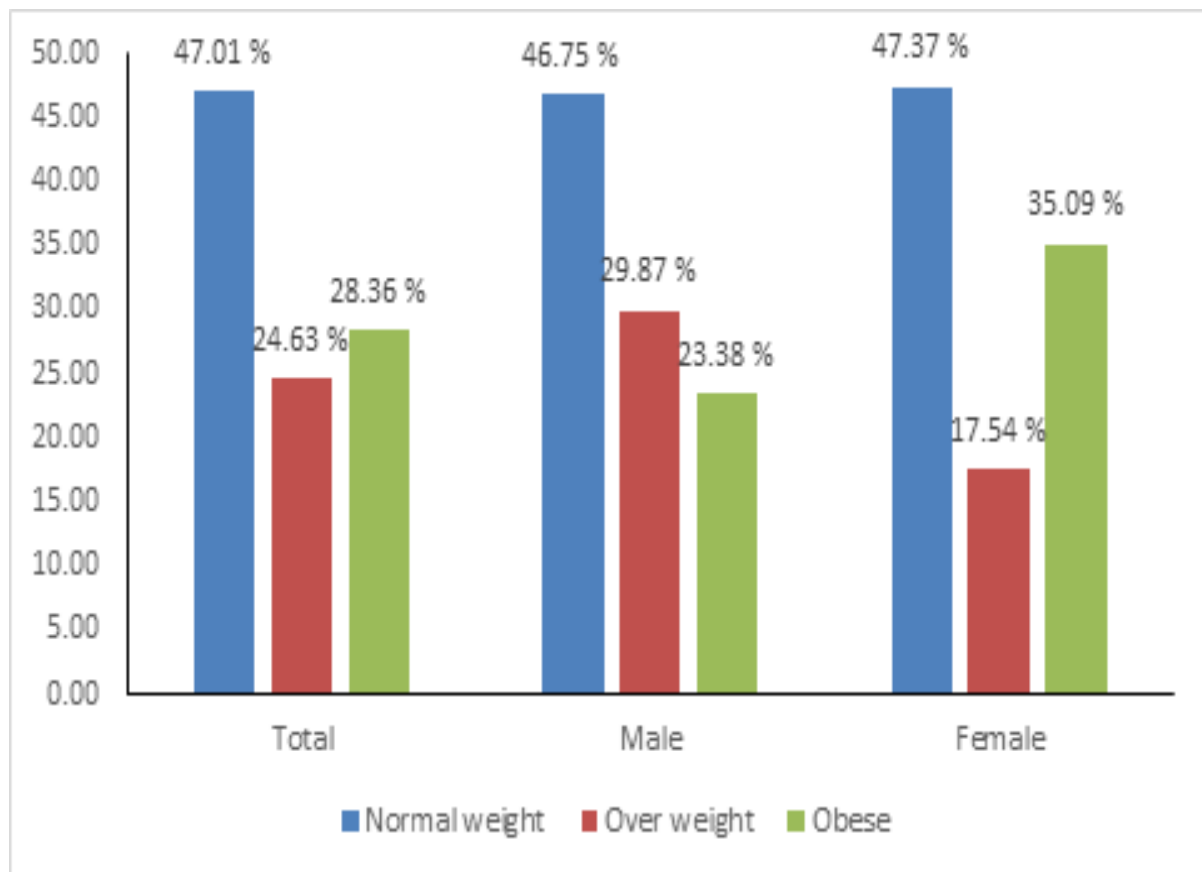


Fig. (1): Percentage distribution of the studied students regarding the weight status in the total sample and by gender.

Table (1): Socio-demographic characteristics of the studied groups (N=134)

Parameter	N	%
Child's age (years) :		
▪ Mean \pm SD = 18.820 \pm 1.803		
▪ Range = 6:13		
Child's gender:		
▪ Male	77	57.5%
▪ Female	57	42.5%
Mother's education		
▪ Secondary (general-technical)	12	9%
▪ Higher education	106	79.1%
▪ Postgraduate	16	11.9%
Mother's work		
▪ Working	66	49.3%
▪ Not working	68	50.7%
Father's education		
▪ Secondary (general-technical)	10	7.5%
▪ Higher education	99	73.9%
▪ Postgraduate	25	18.7%
Father's work		
▪ Working	132	98.5%
▪ Not working	2	1.5%
Socioeconomic status		
▪ High	4	3%
▪ Medium	85	69.4%
▪ Low	37	27.6%

N: Number

SD: standard deviation



Table (2): Relationship between children's weight status and sociodemographic characters

Parameter	Normal or underweight		Overweight		Obesity		Chi square	p value
	No (63)	%	No (33)	%	No (38)	%		
Gender								
Male	36	57.1%	23	69.7%	18	47.4%	1.110	0.574
Female	27	42.8%	10	30.3%	20	52.6%		
Mother Education							6.970	0.137
• Secondary (general-technical)	4	6.3%	2	6.1%	6	15.8%		
• Higher education	50	79.4%	25	75.8%	31	81.6%		
• Postgraduate	9	14.3%	6	18.2%	1	2.6%		
Mother's work							2.546	0.280
• Working	30	47.6%	20	60.6%	16	42.1%		
• Not working	33	52.4%	13	39.4%	22	57.9%		
Father Education							2.808	0.590
• Secondary (general-technical)	3	4.8%	2	6.1%	5	13.2%		
• Higher education	49	77.8%	24	72.7%	26	68.4%		
• Postgraduate	11	17.5%	7	21.2%	7	18.4%		
Father's work							1.110	0.574
• Working	62	98.4%	32	97%	38	100%		
• Not working	1	1.6%	1	3%	0	0%		
Socioeconomic status							3.731	0.713
• High	3	4.8%	0	0%	1	2.6%		
• Medium	44	69.9%	23	69.7%	26	68.4%		
• Low	16	25.4%	10	30.3%	11	28.9%		

N: number



Table (3): Correlation between Eating behavior Dimension and BMI

Eating Behavior Dimension	BMI
	R
Food responsiveness	0.489**
Emotional overeating	0.346**
Enjoyment of food	0.406**
Desire to drink	-0.087
Satiety responsiveness	0.136
Slowness in eating	-0.167
Emotional under eating	0.175*
Food fussiness	-0.019

r: correlation Coefficient

BMI: Body Mass Index

**. Correlation is significant at 0.01.

*. The correlation is significant at the 0.05 level.



المخلص العربي

العوامل الاجتماعية والسلوكية المرتبطة بزيادة الوزن والسمنة بين أطفال المدارس في محافظة المنوفية، مصر

مروة طارق ضيف – تغريد محمد فرحات – أية مصطفى بركات- نجوى نشأت حجازي

قسم طب الأسرة – كلية الطب – جامعة المنوفية

الخلفية: السمنة هي مشكلة صحية عامة عالمية. تعتبر قضية وبائية في جميع أنحاء العالم. تزداد معدلاتها بسرعة كبيرة وبما أن لها عواقب كثيرة تؤثر على المجتمعات بشكل كبير، فقد أصبحت من أكبر التحديات الواجب مواجهتها. تعتبر سمنة الأطفال مرضًا معقدًا ذو طابع متعدد العوامل. أظهرت الدراسات السابقة أن الجوانب السلوكية والاجتماعية والبيئية والنفسية تعتبر عوامل مسببة للسمنة لدى الأطفال. **الهدف:** تقييم مدى انتشار السمنة وتحديد العوامل الاجتماعية والسلوكية المرتبطة بزيادة الوزن والسمنة بين أطفال المدارس. **طرق البحث:** دراسة مقطعية في المدرسة المتميزة المتكاملة التجريبية للغات، شبين الكوم، محافظة المنوفية، مصر. خلال الفترة أبريل ٢٠٢٢: يوليو ٢٠٢٣. معايير الإدراج: أطفال المدارس الذين تتراوح أعمارهم بين ٦-١٤ سنة. حجم العينة ١٣٤، الاختيار عشوائيا. جمعت البيانات باستخدام استبانة لتقييم العوامل الاجتماعية والسلوكية. **النتائج:** تبين أن ٢٨,٤٪ من الأطفال كانوا يعانون من السمنة المفرطة و ٢٤,٦٪ يعانون من زيادة الوزن بينما ٤٧٪ وزنهم طبيعي، وتبين أن الاستجابة للطعام والإفراط في الأكل العاطفي والاستمتاع بالطعام وقلة الأكل العاطفي لها علاقة إحصائية إيجابية مع مؤشر كتلة الجسم، لا توجد علاقة إحصائية بين الرغبة في الشرب والشبع والاستجابة والبطء في تناول الطعام. والانزعاج الغذائي بين الأطفال ذوي الوزن الطبيعي والأطفال الذين يعانون من زيادة الوزن والسمنة. **الخلاصة:** يجب الأخذ في عين الاعتبار العوامل السلوكية عند معالجة مشكلة السمنة بين أطفال المدارس والتي تزداد بشكل كبير وملحوظ.