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Prevalence and risk factors for obesity among secondary school students in Baghdad, Iraq

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Abstract
Introduction: Obesity is a global health crisis that affects all ages and backgrounds. This study investigates the prevalence and risk factors for obesity among secondary school students in Baghdad, Al-Karkh. It emphasizes the importance of early intervention to prevent chronic diseases related to obesity.
Methods: A cross-sectional study was conducted with 500 participants from four randomly selected secondary schools (two public, two private; two male, two female) in Al-Karkh Al-Ola. The self-administered questionnaires collected data on demographics, potential risk factors, and anthropometric measurements (height, and weight). Body Mass Index (BMI) percentiles classified weight status as underweight, normal weight, overweight, or obese.
Results: The sample comprised slightly more females (60%) than males (40%). More than 60% (62.8%) were of normal weight. A concerning finding was the combined prevalence of overweight (16.3%) and obesity (17.2%), which totaled more than a third (33.5%) of the participants. Significant associations were found between obesity and gender. Females had a higher prevalence of obesity (22.0%) compared to males (10.0%), students with a positive family history had a significantly higher risk (64.5%) compared to those without a family history (1.6%), inactive students (20.0%) had a considerably higher prevalence of obesity compared to active students (4.4%), students who consumed five or more meals daily (74.4%) had a higher prevalence of obesity compared to those who consumed three meals (0.8%) or four meals (15.9%), and obese students spent significantly more time watching television and using the Internet compared to non-obese students.
Conclusions: This research underscores the alarming rise of obesity among secondary school students. The study identified family history, diet choices, physical activity levels, and screen media use as significant contributing factors. It emphasizes the necessity of multiple interventions, including promoting healthy nutrition, encouraging physical activity through parental and school participation, integrating health education into the curriculum, and raising awareness among both parents and the general public through public health initiatives.

Keywords: Prevalence, obesity, school, students, and Baghdad

Introductions

Obesity has become a major public health threat around the world, affecting people of all ages and backgrounds. This problem transcends developed nations and affects developing countries such as Iraq [1]. Baghdad, the capital city, reflects this national trend with increasing obesity rates, particularly among adolescents.

The World Health Organization (WHO) defines obesity as abnormal or excessive fat accumulation posed by a health risk. Its global prevalence has reached alarming proportions, driven by dietary changes, reduced physical activity, and urbanization [2]. The Eastern Mediterranean Region (EMR), which includes Iraq, faces a particularly worrying scenario. Studies indicate a significant increase in overweight and obesity among adolescents, with rates between 15% and 45% [3]. This trend deviates from the global average, highlighting the urgency of action within the EMR. Potential contributing factors include rapid economic transitions, increased consumption of processed foods, and decreased physical activity due to screen time [3].

Iraq, in post-conflict reconstruction, now faces a new public health challenge: increasing obesity. Although national historical data are limited, recent studies reveal an upward trajectory.

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An intermediate school study in Baghdad/ Al-Karkh found a combined prevalence of overweight and obesity that exceeded 50% [4]. This trend extends to adolescents; studies in Iraq on secondary school students show a concerning prevalence of obesity, ranging from 22.3% to 28%. A study in Kirkuk City found that more than a fifth (22.3%) of adolescents were obese. Another study in the Kurdistan region reported a combined prevalence of overweight and obesity of almost 28% [5, 6].

Baghdad, as the capital, serves as a microcosm of national trends in obesity. Within Baghdad, Al-Karkh, a highly urbanized area, presents a specific concern. Al-Karkh's demographics, with a potentially high concentration of school-aged children, coupled with the potential influences of urban living on dietary patterns and physical activity, necessitate a focused investigation. Understanding the prevalence and risk factors for obesity in this specific population can inform targeted interventions and public health strategies [4-6].

Investigating the prevalence of obesity among secondary school students in Baghdad / Al-Karkh has significant value. First, it contributes to a comprehensive understanding of the national and regional obesity epidemic. Second, identifying the prevalence within this age group allows the development of targeted prevention and management strategies within schools. Early intervention in adolescents can significantly affect their pathophysiological health, potentially preventing the development of chronic diseases related to obesity later in life [7]. Additionally, understanding this issue can inform broader public health policies that aim to promote healthy lifestyles in all age groups in Iraq.

The study objectives
1. Determine the prevalence of obesity among secondary school students in Al-Karkh, Baghdad, Iraq.
2. Identify the potential risk factors associated with obesity in this population

Methods
Study design: A cross-sectional study with an analytical component design to assess the prevalence of overweight and obesity among secondary school students in the Al-Karkh area of Baghdad.

Setting and study time: The study was carried out in four randomly selected secondary schools (two public, two private; two male, two female) in Al-Karkh Al-Ola. Data collection occurred between 2 January 2023, and the end of April 2023.

Study sample: A side of Baghdad, the Al-Karkh side, was chosen by random selection. Of the three educational directorates within Al-Karkh, Al-Karkh Al-Ola was randomly selected. A multistage random sampling approach was used to select four secondary schools within Al-Karkh Al-Ola. Two schools were selected for males and two for females, for each sex, one school was private and one school was public. This ensured the representation of both genders and types of schools (public and private).

Study population: The study population included all students (15-18 years of age) attending four randomly selected secondary schools on the Al-Karkh side of Baghdad who participated in this study during the specified

period of the study. The inclusion criteria required that students be within the designated age range and willing to participate. On the contrary, students who were pregnant had a chronic disease diagnosed, were on chronic medications, or who declined to participate were excluded from the study.

Study size: Five hundred students participated in our cross-sectional study, exceeding the minimum sample size requirement of 310. This calculation considered a confidence level of 95%, a desired error margin of 5%, and an expected prevalence of disease of 28% [2, 5] in the population. The larger sample size strengthens the study's ability to detect statistically significant results.

Data Collection: A self-administered questionnaire was used to collect the following data: (demographic data, possible risk factors for obesity, and anthropometric measurements (recorded by researchers). International age and sex-specific BMI percentiles from WHO and WHO Anthro Plus software were used to categorize weight status as follows [8]:

- Underweight ($< 5^{th}$ percentile)
- Normal weight (5th percentile to $< 85^{th}$ percentile)
- Overweight (85th percentile to $< 97^{th}$ percentile)
- Obese ($\geq 97^{th}$ percentile)

Data Analysis: Data entry and analysis were performed using the Statistical Package for Social Sciences (SPSS) version 27. Descriptive statistics were used to summarize the data, including frequencies and percentages for categorical variables. The chi-square test was used to assess the association between categorical variables (eg sex, school class, family history of obesity, physical activity, daily meals, and obesity). Independent sample T-tests were performed to evaluate significant differences between the means of continuous variables (eg, age, hours of television viewing, and Internet use). A 95% confidence level (p-value <0.05) was considered statistically significant.

Ethical Considerations: Before data collection, official and ethical approvals were obtained from Baghdad's Al-Karkh Al-Ola educational directorate to obtain their permission to conduct the study in selected schools. Written informed consent was obtained from the educational administration and the school administrator. Anonymity was ensured by replacing names with unique identifiers. The data collected were utilized solely for research objectives.

Data availability: Due to ethical considerations and privacy concerns, the data of individual participants cannot be publicly shared.

Results
This study investigated the prevalence of obesity and associated risk factors among secondary school students (n=500) in Al-Karkh, Baghdad (Table 1). The sample comprised a slightly higher proportion of females (60%) compared to males (40%). The age distribution was relatively balanced between three categories (15-16, 16-17, ≥17 years old), each representing approximately a third (33%) of the participants. This distribution was mirrored in the school-class distribution. A significant proportion (75.2%) of the students did not have a family history of

obesity. However, the levels of physical activity were alarming, with only 18% reporting being active and the majority (82%) classified as inactive. Regarding the frequency of meals, most of the students (51.6%) preferred three meals per day, followed by four meals (32.8%). A smaller group (15.6%) consumed five or more meals a day (Table 1).

Analysis of body mass index (BMI) percentiles revealed a normal weight distribution for more than 60% (62.8%) of the participants (Table 2). However, a worrying finding was the combined prevalence of overweight (16.3%) and obesity (17.2%), which totaled more than a third (33.5%) of the sample. These findings highlight the importance of implementing weight management strategies for this adolescent population (Table 2).

Table 3 explores the relationship between obesity and various factors in the student population. A statistically significant association was found between gender and obesity (p-value = 0.014). Females (22%) had a higher prevalence of obesity compared to males (10%). There were no statistically significant differences in obesity prevalence between grades (p-value = 0.833). Family history of obesity demonstrated a strong association with student obesity (p-value = 0.0001). Students with a positive family history had a significantly higher risk (64.5%) compared to those without a family history (1.6%). The level of physical activity was also significantly associated with obesity (p-value=0.0001). Inactive students (20%) had a considerably higher prevalence of obesity compared to active students (4.4%). A statistically significant association was observed between meal frequency and obesity (p-value = 0.0001). Students who consumed five or more meals daily (74.4%) had a higher prevalence of obesity compared to those who consumed three meals (0.8%) or four meals (15.9%).

As presented in Table 4, the mean age of the participants was 16.58 years (SD ± 1.27). There were no statistically significant differences in age between obese and non-obese students (p = 0.940). The average screen time (watching television and using the Internet) was 3.69 hours (SD ± 0.73). Obese students spent significantly more time watching television and using the Internet compared to non-obese students (4.97 vs 3.58 hours, p = 0.041). This suggests a positive association between increased screen time and obesity.

Discussion:
The study revealed a concerning prevalence of overweight and obesity, with 33.5% of the participants classified in these categories (16.3% overweight and 17.2% obese). This finding is consistent with observations in Erbil (30.4%) and Slemani (31.9%) [9, 10], suggesting similar trends within Iraqi cities. However, a lower prevalence was observed in Al-Mosul (19.2%) [11], highlighting potential socioeconomic disparities that could influence eating habits and levels of physical activity.

International comparisons further emphasize the global burden of childhood obesity. Studies in Chesterfield County, USA (28-38%) [12] and Italy (8.4% obese and 21.4% overweight) [13] demonstrate significant variations between regions. Furthermore, studies in Saudi Arabia (12.7% overweight, 6.7% obese) [14], Al-Khobar (20% overweight, 11% obese) [15] and Bahrain (15.6% boys, 17.4% girls overweight/obese) [16] show regional variations likely influenced by a complex interplay of demographic, ethnic, and socioeconomic factors.

The study identified a significantly higher prevalence of obesity among females compared to males. This aligns with the research by Al-Saeed et al. [17] and Musaiger et al. [18], suggesting potential influences of hormonal factors, such as higher estrogen levels in females that promote fat deposition, along with possible gender differences in participation in physical activity [24]. However, this finding contradicts studies by Vieweg et al. [13] and Mozaffari et al. [19], highlighting the need to further explore gender-specific factors in this population.

Age was not significantly associated with the prevalence of obesity in this study. This contrasts with the findings by Ogden et al. [20] in the USA, who reported a higher prevalence in older adolescents. Inconsistencies between studies concerning age could be attributed to variations in the definitions of sample size and body weight status. Regarding meal frequency, the results aligned with De Sousa et al. [21] but differed from other studies [22, 23]. This suggests that meal frequency alone may not be a strong indicator of obesity risk compared to dietary quality and quantity.

A significant association was observed between a family history of obesity and student obesity, which corroborates the findings of Musaiger et al. [18], Vieweg et al. [13], and Al-Saeed et al. [17]. This association could be attributed to the sharing of environmental and dietary patterns within families or underlying genetic factors. Furthermore, the study identified a strong positive correlation between physical activity levels and the risk of obesity, consistent with previous research [13, 18, 24, 25]. Furthermore, TV viewing time was positively associated with obesity, possibly due to reduced physical activity and increased susceptibility to food advertisements [26].

Table 1: Demographic Characteristics of Study Participants

Variable		Frequency (n= 500)	Percent (%)
Gender	Male	200	40,0
	Female	300	60.0
Age (years)	15 - < 16	164	32.8
	16 - < 17	166	33.2
	17 +	170	34.0
School Class	4th	164	32.8
	5th	166	33.2
	6th	170	34.0
Family history of Obesity	Positive	124	24.8
	Negative	376	75.2
Physical activity	Active	90	18.0
	Inactive	410	82.0
Meals per day	Three	258	51.6
	Four	164	32.8
	Five or more	78	15.6

Table 2: Distribution of the study sample by overall measurement of BMI percentile

Variable		Frequency (n= 500)	Percent (%)
BMI percentile	Underweight (< 15th percentile)	18	3.7
	Normal weight (15th percentile to < 85th percentile)	314	62.8
	Overweight (85th percentile to < 97th percentile)	82	16.3
	Obese (≥ 97th percentile)	86	17.2

Table 3: The association between obesity and demographic variables

Variable		Obese (n= 86)		Non-obese (n=414)		P value
		Freq.	%	Freq.	%	
Gender	Male	20	10	180	90	0.014
	Female	66	22	234	78	
School Class	4th	28	17.1	136	82.9	0.833
	5th	20	11.9	146	88.1	
	6th	38	22.7	132	77.3	
Family history of obesity	Positive	80	64.5	44	35.5	0.0001
	Negative	6	1.6	370	98.4	
Physical activity	Active	4	4.4	86	95.6	0.0001
	Inactive	82	20	328	80	
Meals per day	3	2	0.8	256	92.2	0.0001
	4	26	15.9	138	84.1	
	≥ 5	58	74.4	20	25.6	

Table 4: Distribution of the study sample by continuous variables and relationship with obesity

Variable	Mean	± SD	
Age (years)	16.58	1.27	
Hours of TV watching and internet using	3.69	0.73	
Variable	Obese	Non-obese	P value
	Mean ± SD	Mean ± SD	
Age (years)	16.56 ± 1.84	16.54 ± 1.70	0.940
Hours of TV watching and internet using	4.97 ± 0.81	3.58 ± 0.67	0.041

Conclusions

A study in Baghdad identified a concerning prevalence of overweight and obesity (more than 33%) among secondary school students in Al-Karkh, reflecting national trends and highlighting the need for multi-pronged interventions. The study found that more than a third of the participants were overweight or obese, with females showing a higher prevalence of obesity. Furthermore, factors such as family history of obesity, physical inactivity, high screen time, and frequent meals were significantly associated with an increased risk of obesity. To address these findings, the study recommends the implementation of multifaceted interventions in schools and communities to promote healthy lifestyles. These interventions could include nutritional education programs, healthier food options in school canteens, increased opportunities for physical activity throughout the school day, and public health campaigns aimed at raising awareness of obesity and encouraging healthy behaviors among adolescents and their families. Furthermore, the study emphasizes the need for more research to explore specific social, economic, and cultural factors that contribute to the risk of obesity in Iraqi adolescents. This knowledge will be crucial to tailoring interventions to effectively address this growing public health challenge in Iraq.

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