RESEARCH ARTICLE

Obesity among adolescents in secondary schools in Al-Karkh Baghdad, Iraq 2021

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ABSTRACT

INTRODUCTION: Obesity in adolescence is one of the global public health challenges of the 21st century in both developed and developing countries, with long-term obesity-driven negative consequences for health outcomes. In the Eastern Mediterranean Region (EMR), the status of overweight and obesity showed a marked increase among adolescents, ranging from 15% to 45%.

OBJECTIVE: To Measure the prevalence of overweight and obesity and assess factors related to them among adolescents.

METHODS: A cross-sectional study was performed among adolescents aged 12 to 18 years in public secondary schools during the educational year 2020-2021 in the city of Baghdad. The data were analysed descriptively and analytically by Chi-square using SPSS (version 21).

RESULTS: The prevalence of overweight among the studied group was 33.9%, and that of obesity was 7.6%. The overall prevalence of overweight and obesity among males was 29.2% and 6.8%, respectively (P = 0.001), and the prevalence of overweight and obesity among females was 38.5% and 8.4%, respectively (P = 0.001).

CONCLUSION: Significant predictors for overweight and obesity in adolescents were age ≥ 15 years, highly educated parents, physical inactivity, consumption of sweets and sugary beverages, and family history of obesity.

Key words: Adolescents, Childhood obesity, Sedentary lifestyle, Dietary habits, Fast food, Sugary beverages.

INTRODUCTION

Adolescence is a period of transition from childhood to adulthood, during which adolescents develop behavioural patterns and lifestyles that can affect their current and future health. Obesity is characterised by the accumulation of fat in adipose tissue to such a degree as to affect the individual's health.[1] Obesity in adolescence is one of the global public health challenges of the 21st century in both developed and developing countries, with long-term obesity-driven negative consequences for health outcomes.[2] Morbidity among obese individuals suffering from childhood or teenage obesity was 50–100% higher than diabetes mellitus, cancers, and arthritis.[1]

In the Eastern Mediterranean Region (EMR), the status of overweight/obesity showed a marked increase among adolescents, ranging from 15% to 45%.[3] Factors like child's age, fast food consumption, physical inactivity, student transport, sleep pattern, time spent watching television, skipping breakfast, consumption of sugary beverages, family history of obesity and socioeconomic status differently affected these figures.[4]

This study aimed to measure the prevalence of overweight and obesity among adolescents and to identify their underlying determinants to be addressed in designing effective preven-

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tive intervention programs.

METHODS

Setting and study design: Study design and setting: A cross-sectional study was performed among adolescents aged 12 to 18 years in public secondary schools during the academic year 2020-2021 in Al-Karkh, Baghdad.

Ethical consideration: Before the start of the study, the protocol was reviewed and approved by the ethical committee of the scientific board of community medicine. Permission was taken from the Ministry of Education, the Al-Karkh Educational Directorate and the administrations of the six secondary schools enrolled. Parents of children enrolled in this study were asked to sign a written consent before participation. Data collected was kept confidential and was not divulged except for the study purpose.

Inclusion and exclusion criteria: We included students in secondary public schools, both males and females, aged 12–18 years, with family approval. We excluded participants over 18 years or under 12 years and those with a known underlying metabolic and/or endocrine disease, chronic illness, kidney diseases and anaemias.

Sampling and sample size: The sampling technique used for this study was multistage random sampling. The third educational directorate was selected randomly from the three directorates in Al-Karkh district in Baghdad. Out of seventy secondary schools in that district, six were selected randomly; three schools for boys and three for girls. One class from each stage was selected randomly. Finally, the participants were chosen by systematic random sampling; according to the required sample size (475), eighty students were chosen from each school, approximately 13 students from each class, and by dividing the total number of students in each class by the number of students needed the interval was determined, and accordingly, the required number of students was chosen (1st student selected by simple random sampling).

Tools of the study: The data were collected in two stages; the first stage included measuring the height and weight of the student and then extracting the body mass index (BMI), and the second stage included a structured questionnaire, which has been edited, reviewed, and revised by an assigned panel of experts to meet the national needs. We applied the questionnaire to 20 students from similar schools to test its feasibility; the results were not included in the final analysis of this study. Pre-testing the questionnaire helped estimate the time taken to answer the questions and explore any ambiguity. As a result of this pre-test, minor changes to the questionnaire were made; the monthly family income was omitted because some pretested students could not answer this question.

Each subject was measured barefooted, wearing only light clothes. Weight was measured using standardised calibrated scales to the nearest 0.1 kg, and height was taken to the nearest 0.1 cm using the standardised wall-mounted height boards with a sliding headpiece according to the following protocol: no shoes, heels together, buttocks, shoulders and head touching the vertical wall surface with the line of sight aligned horizontally. Before each measurement, the digital scale was adjusted to zero. BMI was calculated as the measured weight in kilograms/ squared measured height in meters. The measured BMIs were classified into four categories according to the World Health Organization: Expert Committee on physical status: The use and interpretation of anthropometry. Geneva: WHO; 1995 as follows:

- Less than 18.5 kg/m^2 is underweight.
- Between 18.5 and 24.9 kg/m^2 is normal.
- Between 25 and 29.9 kg/m^2 is overweight.
- BMI 30 kg/m2 or over is obese.

The structured questionnaire revealed information on demographic and socioeconomic variables, eating habits, physical activity and sedentary time. The level of socioeconomic status was measured by the level of parents' education, occupation, and the crowding index that was calculated by dividing the number of

family members by the number of rooms apart from the kitchen and bathrooms. The crowding index was categorised as low when two individuals or fewer per room or high when more than two per room.[5] Parents' education level was categorised into three groups: parents who had never attended school or only primary school were considered to have a low educational level, a medium level of education corresponded to secondary education, and a high educational level corresponded to university or higher education.

Questions about physical activity included the frequency of participating in sports activities, daily walking distance and means of getting to school (by walking, bicycle or car) during a typical week. Sedentary time was assessed as time spent watching television (hours per day), computer usage (hours per day), time spent playing video games (hours per day), and social media. The questionnaire also addressed dietary habits, the frequency of missing breakfast and the frequency of consumption of certain types of fast foods, sweets and sugary beverages per week. It also included a question about family history of obesity (maternal, paternal, parental).

Data Management: Before the data entry and analysis, it was checked to ensure it did not contain errors or omissions.

Data entry: The checked questionnaire forms were entered into a computer-supported database and statistical software programs using database management analysis software and a spreadsheet (Excel). The data extracted from the summed questionnaires were collected, collated, coded and entered into the SPSS.

Statistical analysis: Data analysis was carried out using the available statistical package of SPSS 21 (statistical packages for Social Sciences-version 21). Categorical variables were presented in simple frequency, percentages, and proportion. At the same time, continuous variables were shown in mean ± standard deviation and the range (minimum-maximum values). The Pearson chi-square test was used to test the association between the dependent and independent variables. A P-value equal to or less than 0.05 was considered statistically significant.

RESULTS

The age and anthropometric characteristics of the study population are shown in table 1. Four hundred and seventy-five participants were enrolled in this study. The mean age was 15.8 ± 1.6 years (range 12 - 18). The mean weight and height were 64.6 ± 10.1 kg and 161.6 ± 5.7 cm , respectively, and the mean BMI was 24.7 ± 3.3. Sex distribution revealed approximately equal numbers of females and males among the studied group; 239 (50.3%) and 236 (49.7%), respectively, giving a female-to-male ratio of 1.01: 1. The prevalence of obesity was 7.6%, as shown in figure 1.

Age older than 15 years, female sex, and higher education of fathers were statistically significantly associated with obesity. The details are shown in table 2.

Table 1 | Demographic characteristics of the study group

Variable	Mean ± SD
Age (years)	15.8 ±1.6
Weight (Kg)	64.6 ± 10.1
Height (cm)	161.6 ± 5.7
BMI (kg/m²)	24.7 ± 3.3

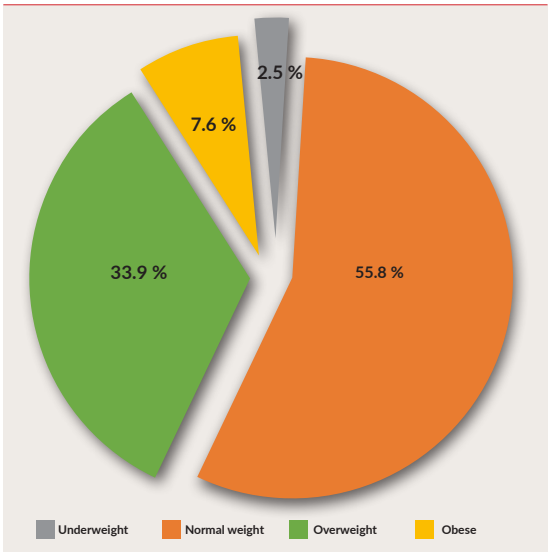

Figure 1 | Prevalence of overweight and obesity in the study group.

Table 2 | Frequency distribution of socio-demographic characteristics

Variable	Overweight/obesity (%)	Total (%)	2, d.f. , P value
Age in years			58.960, 1, 0.000
<15	53 (23.5)	226 (47.6)	
≥ 15	145 (58.2)	249 (52.4)	
Sex			6.197, 1, 0.013
Males	85 (36.0)	236 (49.7)	
Females	113 (47.3)	239 (50.3)	
Education of the father			7.892, 2, 0.019
Low	11 (23.4)	47 (9.9)	
Middle	86 (46.0)	187 (39.4)	
High	101 (41.9)	241 (50.7)	
Education of the mother			7.565, 2. 0.023
Low	19 (28.8)	66 (13.9)	
Middle	83 (40.1)	207 (43.6)	
High	96 (47.5)	202 (42.5)	
Occupation of the father			
Employed	99 (46.7)	212 (44.6)	3.971, 2, 0.137
Private work	82 (37.8)	217 (45.7)	
Retired	17 (37.0)	46 (9.7)	
Occupation of the mother			
Employed	64 (45.1)	142 (29.9)	3.153, 2, 0.207
Housewife	110 (38.6)	285 (60.0)	
Retired	24 (50.0)	48 (10.1)	
Crowding index			
≤ 2	135 (44.0)	307 (64.6)	1.872, 1, 0.102
> 2	63 (37.5)	168 (35.4)	

Regarding physical activities, those who walked less than one hour and reached school by car were more likely to be obese; the association was statistically significant. Concerning sedentary activities, those who spent more than two hours on social media, the internet, and digital games were more likely to be obese; the association was statistically significant. The details are shown in table 3.

Frequent consumption of soft drinks, sweets, sugary beverages and fast food were more likely to be obese; the association was statistically significant, as shown in table 4. Adolescents who had a family history of obesity were more prone to be obese than their fellows who had no such history. The statistical association was highly significant. The details are shown in table 5.

Table 3 | Frequency distribution of the study group by physical activity and sedentary activities

Variable	Overweight/obesity (%)	Total (%)	2, d.f. , P value
Hours per week spent in sports			2.563, 2, 0.278
< 2	170 (43.0)	395 (83.2)	
≥ 2 - <7	22 (32.8)	67 (14.1)	
≥7	6 (46.2)	13 (2.7)	
Hours per day spent in walking			21.855, 2, 0.001
< 1 hr	134 (50.4)	266 (56.0)	
1- <2	42 (27.1)	155 (32.6)	
≥2	22 (40.7)	54 (11.4)	
Reach to school			21.027, 2, 0.001
By car	111 (53.1)	209 (44.0)	
By bicycle	7 (24.1)	29 (6.1)	
Walking	80 (33.8)	237 (49.9)	
Hours watching TV			2.212, 2, 0.331
< 1	36 (35.3)	102 (21.5)	
1	145 (43.3)	335 (70.5)	
>2	17 (44.7)	38 (8.0)	
Hours spent on social media, internet and digital games			15.756, 2, 0.001
< 1	6 (33.3)	18 (3.8)	
1	82 (33.6)	244 (51.4)	
>2	110 (51.6)	213 (44.8)	

Table 4 | Frequency distribution of the study group by dietary habits

Variable	Overweight/obesity (%)	Total (%)	2, d.f. , P value
Skipping breakfast			0.598, 1, 0.439
Yes	127 (43.1)	295 (62.1)	
No	71 (39.4)	180 (37.9)	
Ingestion of soft drinks, sweets and sugary beverages			83.150, 2, 0.001
Rarely	26 (17.1)	152 (32.0)	
Occasionally	102 (44.2)	231 (48.6)	
Frequently	70 (76.1)	92 (19.4)	
Fast food consumption			18.289, 1, 0.001
Rarely	102 (34.2)	298 (62.7)	
Frequently	96 (54.2)	177 (37.3)	

Table 5 | Frequency distribution of the sample by family history of obesity

Variable	Overweight/obesity (%)	Total (%)	2, d.f. , P value
Paternal obesity	38 (48.1)	79 (16.6)	55.916, 3, 0.001
Maternal obesity	83 (55.0)	151 (31.8)	
Parental obesity	25 (78.1)	32 (6.7)	
No parental Obesity	52 (24.4)	213 (44.8)	

DISCUSSION

Obesity in adolescence is a well-known risk factor for many non-communicable diseases in adulthood which in turn become the main causes of morbidity and mortality, creating a high economic and health burden for the health authorities. In the present study, the prevalence of obesity was 7.6%. It is a bit lower than that reported in Jordan (8.7%)[6] and Syria (11.1%)[7] and higher than that reported in Iran (5.4%).[8] The observed rate is lower than that

reported in Saudi Arabia (17.4%).[9] Variations in the prevalence of obesity might be explained by the differences in cultures, environments, and food choices.

In our study sample, the age group ≥ 15 years had a higher rate of obesity (58.2%) than the younger age group (23.3%), with a highly significant association (P= 0.001). A similar finding was reported in Jordan.[10] This observation is possibly attributed to the persistence of paediatric obesity during adolescence and the progression of overweight children to obese adolescents.

The rate of both overweight and obesity was higher in girls than boys, 38.5% and 8.4%, compared to 29.2% and 6.8%, respectively, with a statistically significant association (P= 0.008). This finding is similar to a study from the A-Diwaniyah Governorate in the Middle of Iraq.[11] It is inconsistent with that in Syria.[7] This might be explained by socio-cultural norms in which plumpness is considered healthy and a sign of beauty and affluence. An unhealthy diet and cultural barriers against practising sports might also play a role.

The frequency rate of overweight and obesity among the studied group was more among those whose mothers were highly educated than those with low educational attainment, with a highly significant statistical association (P=0.023). The frequency rate of overweight and obesity among the studied group was more among those with highly educated fathers than those with fathers of low educational attainments, also with a highly significant statistical association(P=0.019). The result was consistent with that reported in Bahrain[12] but inconsistent with that reported in Kuwait.[13] The association may be explained by the fact that educated parents are more likely to be employed; thus, the family relies more on ordering food from restaurants or dining out because less time is spent on shopping or cooking at home.

Our study did not find a significant association between the frequency rate of overweight and obesity and the occupation of the father (P= 0.137) and the mother (P= 0.207). This is consistent with that reported in Iran[14] and inconsistent with that reported in Lebanon.[15]

The frequency rate of overweight and obesity in our study group was not related to the crowding index status i.e. there were no significant differences in the frequency rate of overweight and obesity between low and high crowding index (P=0.10). This finding is in line with that reported in Syria[7] and is in contrast to that reported in Spain.[16] The recent change in Iraqi society's economic and cultural characteristics might explain the variations in the rate of overweight and obesity. It is documented that in the 1st half of the last century, there were clear, distinct lines between social classes in Iraqi families. This distinction is largely non-existing nowadays.[17]

Time spent viewing TV has no statistically significant association with the frequency of overweight and obesity (P= 0.33); this is in line with that reported from Saudi Arabia[18] but contrasts with that from the USA.[19] On the other hand, the association was statistically significant between the frequency of overweight and obesity and the time spent on social media, the internet, computer and digital games (P = 0.001). It is similar to that reported in Kuwait[20] and inconsistent with that reported in Bahrain.[12] This finding might be attributed to the advance of technology; adolescents no more rely on TV viewing as a means of entertainment; instead, they rely on social media that they can access on cell phones and other gadgets.

The impact of time spent on walking and school reach on the development of overweight and obesity was statistically significant (P= 0.001), similar to what is reported in Kuwait[20] and different from what is reported in Egypt.[21]

In the present study, there was no significant impact of skipping breakfast on the frequency of overweight and obesity (P=0.43). The finding is consistent with that in Lebanon[15] and contrasts that reported in a systematic review and meta-analysis study.[22] This might be explained by the fact that adolescents who skip breakfast tend to consume unhealthy foods high in sweets, carbohydrates, and fats

later during school hours.

The current study showed that obesity was significantly more prevalent among adolescents who frequently consumed fast food than those who rarely dined out, with a statistically significant association (P= 0.001). This finding agrees with that reported in Kuwait[23] and disagrees with that reported in the USA.[24] This variation might be attributed to the socioeconomic gradient in the nutritional transition resulting in adopting modernised, westernised eating habits in the more affluent households.

The present study revealed that the frequency of overweight and obesity predominates among those who consume large amounts of sweets and sugary beverages, and the association was highly significant (P= 0.001). The finding is consistent with that reported in Lebanon.[15] This could be due to changing economy and the availability of industrial sweets in the Iraqi markets with no quality control.

The present study showed the familial trend in obesity; the frequency rate of overweight and obesity predominates among adolescents who had a family history of parental obesity, followed by those who had a family history of maternal obesity. The association was highly significant (P= 0.001). The finding agrees with that reported in Syria[7] but is inconsistent with that reported in Iran.[25] This observation may be because, in our culture, children's food environment is usually shaped more by mothers. In addition to genetic resemblance, family members show similar behavioural lifestyles and environmental determinants associated with overweight and obesity.

This study was conducted in a time of conflict, and the threat of the Corona Pandemic; the potential for recall bias in the frequency of physical activity, sedentary behaviours and dietary habits cannot be completely excluded.

CONCLUSION

The prevalence of obesity among adolescents in Baghdad was high. Age ≥ 15 years, female gender, highly educated parents, the number of hours spent daily on social media and digital games, physical inactivity, consumption of sweets and sugary beverages, consumption of fast food, and presence of a family history of obesity were all factors associated with overweight and obesity.

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Abbreviations list: Body mass index (**BMI**), Crowding Index (**CI**), Eastern Mediterranean Region (**EMR**), Socioeconomic Status (**SES**), Statistical Packages for Social Sciences-version 21 (**SPSS 21**), World Health Organization (**WHO**).

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