PDF version

Aisha Al-Saadi[1], Laila Al Yahiaee[2], Ehab Ahmed[3], Raya Al Manee[2], Laila Al Saadi[2], Nazar Mohamed [4] and Majid Al-Maqbali [5]

[1]Directorate General of Health Services, Directorate of Planning and Studies, Al Buraimi, Oman. [2]Directorate General of Health Services, Directorate of Primary Healthcare, Al Buraimi, Oman. [3]Biostatistics Department, Arab Open University-Kuwait, Kuwait. [4]Directorate General of Planning and Studies, Health Policy Department, Ministry of Health, Muscat, Oman. [5]

Directorate General of Health Services, Al-Buraimi, Oman. (Correspondence to Aisha N. Al-Saadi: aishaalsaadi7@gmail.com).

## Abstract

**Background**: Many countries are experiencing an increasing prevalence of childhood obesity and this needs to be carefully addressed.

**Aims**: To determine the prevalence of overweight and obesity and the sociodemographic factors and lifestyle risk behaviours associated with obesity among in-school children in Al Buraimi Governorate, Oman.

**Methods**: We conducted a cross-sectional study among 714 male and female in-school children aged 6–17 years in 14 government schools in Al Buraimi Governorate, Oman, from April to July 2019. Data were collected on the sociodemographic characteristics and lifestyle of the students using a self-administered questionnaire. The students' height, weight and waist circumference were also measured. The BMI-for-age growth charts cutoff reference standards of the WHO were used to determine weight category. Central obesity was assessed by calculating the waist-to-height ratio, and the waist-to-height ratio cutoff of 0.50 was used to identify central obesity in both boys and girls. Data analysis was conducted using SPSS version 21, involving both descriptive and inferential statistics.

**Results**: A total of 714 students were included. The prevalence of overweight and obesity was 12.3% and 16.3% respectively, and 21.4% of the students had central obesity. Lifestyle risk behaviours were significantly associated with student's age, sex and mother's education (P

**Conclusion**: There is a need for effective health promotion programmes targeting in-school children in Oman, as well as regular monitoring of lifestyle behaviours associated with overweight and obesity among the younger populations. Larger studies are needed to understand the predictors of overweight and obesity among in-school children in Oman and to design relevant school-based interventions to prevent obesity among young Omanis.

Keywords: overweight, paediatric obesity, in-school children, lifestyle, Oman.

Citation: Al-Saadi A, Al Yahiaee L, Ahmed E, Al Manee R, Al Saadi, Mohamed N, et al. Obesity and lifestyle behaviours among in-school children in Oman. East Mediterr Health J. 2023;29(9):716–724. https://doi.org/10.26719/emhj.23.095 Received: 04/08/22; Accepted: 24/01/23

Copyright © Authors 2023; Licensee: World Health Organization. EMHJ is an open access journal. This paper is available under the Creative Commons Attribution Non-Commercial ShareAlike 3.0 IGO licence (CC BY-NC-SA 3.0 IGO; https://creativecommons.org/licenses/by-nc-sa/3.0/igo ).

## Introduction

Overweight and obesity have been a problem in high-income countries; however, this problem is increasing in low- and middle-income countries, particularly in urban settings, due to changes in dietary habits and an increasingly sedentary lifestyle. (1). Middle Eastern countries are experiencing some of the largest increases in obesity rates in the world. Studies in Bahrain, Egypt, Islamic Republic of Iran, Kuwait, Palestine and Saudi Arabia showed an upward trend in childhood obesity compared with a decade ago (2,3). Studies have shown that the prevalence of obesity is influenced by many factors such as lifestyle, and sociodemographic and economic factors (4–6). Important determinants of childhood obesity are higher socioeconomic status, urban residency, female sex, lack of awareness of and misconceptions about nutrition, short sleep duration and inadequate amount of physical activity (4–7). Overweight and obese children are likely to remain obese in adolescence and most obese adolescents become obese adults (8). Without intervention, obese children are likely to develop noncommunicable diseases (9).

Studies have shown an association between childhood obesity and increased prevalence of high blood pressure, diabetes, respiratory diseases, orthopaedic conditions and psychosocial disorders (10,11). Cardiovascular disease and diabetes are two chronic diseases that are increasing rapidly worldwide including in Oman (12). Compared with the global prevalence of diabetes (9.3%), the prevalence in the Eastern Mediterranean region is higher (13.9%) (13). Early identification of at-risk children and obesity-related risk factors is required for effective prevention and management of adolescent obesity.

WHO has advocated focusing on childhood obesity (14). However, the prevalence of childhood obesity and factors influencing childhood obesity in Oman have not been thoroughly studied. Having data on the prevalence of childhood obesity is an important step in tackling its challenges. Therefore, this study aimed to: (i) determine the prevalence of overweight and obesity among schoolchildren and adolescents in Al Buraimi governorate in Oman, and (ii) assess the sociodemographic and behavioural factors influencing childhood obesity, such as unhealthy dietary habits, physical inactivity, high screen (computer, television, smart phone and gaming devices) usage and insufficient night-time sleep.

## Methods

This cross-sectional study was conducted from April to July 2019 in Al Buraimi Governorate, Oman. The study sample comprised in-school children aged 6 to 17 years who were selected using stratified random sampling. Thus, 14 government schools were randomly selected from 31 such schools in Al Buraimi Governorate to represent both sexes in elementary, middle and secondary schools. The sample size (744 students) was calculated using Raosoft software and based on a 95% confidence level and a design effect of 2 (15). The study included both sexes and all nationalities. Exclusion criteria were: age younger than 6 years or older than 17 years; presence of health problems; and no written informed consent of the parents.

Data were collected through a self-administered questionnaire in Arabic developed by the research team, and anthropometric measurement were taken. A pilot study was conducted on 30 students (not included in our study) to test the validity and reliability of the questionnaire. Content validity was checked by an expert from the Ministry of Health and internal consistency was measured with the Cronbach alpha, which varied between 0.60 and 0.73 for the different subscales.

The purpose of the study was explained to the students and their parents and their written consent was obtained. After agreement to participate in the study, a questionnaire was filled out electronically. Parents of students aged 6 to 12 years were asked to complete the questionnaire because children in this age group may not be able to reliably and accurately report their

physical activity patterns, screen times and sleep times. The older students (13–17 years) completed the questionnaire themselves.

The questionnaire had three sections (27 items). In the first section, sociodemographic information was collected, namely: sex, age, nationality, place of residence, father's education, mother's education and monthly family income. The second section assessed lifestyle risk behaviours identified ( Table 2 ): unhealthy eating habits; physical activity; screen-based sedentary behaviour; and sleep duration. The third section assessed obesity among siblings, mother and father.

The 10 dietary risks were: skipping breakfast, irregular meal times, eating fast food at home or in a restaurant (2 times/week), drinking sugar-sweetened carbonated drinks (2 times/week), drinking sugar-sweetened drinks (2 times/week), drinking power drinks (2 times/week), eating unhealthy snacks after school (2 times/week), eating fruits (

Participants who did not achieve the recommended physical activity level of 420 minutes a week (1 hour/day) were classified as inactive (16). Screen time of ≥ 3 hours a day was considered to exceed the recommended length of time and was classified as high screen use (17). Less than 9 hours of sleep a night was considered insufficient night-time sleep in children aged 6 to 12 years and less than 8 hours a night was considered insufficient in adolescents aged 13 to 17 years (18).

Trained school nurses took the anthropometric measurements: height, weight and waist circumference. Height was measured with a calibrated measuring rod (Seca rod) with an accuracy of 0.1 cm. Measurements were taken barefoot, ensuring that the heels, buttocks, shoulders and head were close to the vertical wall surface. Body weight was measured in light school clothes using a Seca digital scale with an accuracy of 0.1 kg. Waist circumference was measured with a non-elastic band, 1 inch above the navel, midway between the bottom of the last palpable rib and the top of the iliac crest. Body mass index (BMI) was calculated for general obesity and plotted in centiles on BMI age charts for girls and boys. The BMI-for-age growth charts cut-off reference standards of the WHO were used to determine weight category (19). Central obesity was assessed by calculating the waist-to-height ratio. The waist-to-height ratio cut-off of 0.50 was used to identify central obesity in both boys and girls (20).

SPSS, version 21 was used for all analyses. Descriptive statistics (frequencies, percentages, means and standard deviations) were used to summarize the data. The t-test was used to examine differences between the means of continuous variables and the chi-squared test was used to examine differences between categorical variables. Logistic regression analysis was

used to assess the main factors influencing the prevalence of health-related risk behaviours and predictors of overweight or obesity in school students. A P-value of 0.05 was considered statistically significant.

This study was approved by the Research Ethical Review and Approval Committee of the General Directorate of Health Services of Al Buraimi Governorate, Oman. It was explained to the students and parents that participation in the study was voluntary and their data would be anonymized. All anthropometric measurements were performed individually in private rooms in the school clinics.

## Results

Of 744 students selected, 714 completed the self-assessment questionnaire (response rate of 96.0%). Just over half the students were males 56.0% (400/714). In the analysis, students were divided into two age groups: children (6–12 years) and adolescents (13–17 years). Of the 714 student, 307 (43.0%) were between 13 and 17 years old and 229 (32.1%) were between 10 and 12 years. Almost a quarter of the participants (24.9%; 178) were 6 to 9 years old. As regards parental education, 42.9% (306/714) of the students' fathers had a secondary education and 32.4% (231/714) had a college degree, while 39.6% (283/714) of the students' mothers had a secondary education and 28.4% (203/714) had a college degree ( Table 1 ).

As shown in Table 2 , the proportion of overweight female students was slightly lower than that of male students (11.5% versus 13.0%), while the proportion of obese female students was greater than that of male students (17.8% versus 15.0%). However, these differences were not significant (P > 0.05). The proportions of males and females with central obesity were similar (21.8% versus 21.0%). A greater proportion of females had unhealthy eating habits than males (P

Screen-based sedentary behaviour was significantly associated with sex; males spent more time engaged in screen-based activity – mean (SD) duration 8.22 hours a day (5.94) for males versus 7.32 hours a day (5.39) for females (P Table 2). The association between sex and sleep duration was significant among children (P

Table 3 shows the prevalence of health-related risk behaviours by student characteristics. Age was significantly associated with sleep duration, unhealthy eating habits, and sedentary screen-based behaviour but not with physical inactivity. Children were less likely to be sleep-deprived than adolescents (odds ratio (OR) = 0.53; 95% confidence intervals (CI): 0.34–0.83), to have unhealthy dietary habits (OR = 0.19; 95% CI: 0.10–0.35), and to be high screen users (OR = 0.36; 95% CI: 0.26–0.50).

Sex was significantly associated with physical activity, sleep duration and dietary behaviour. Males were less likely to have insufficient physical activity (OR = 0.60; 95% CI: 0.40–0.87) and unhealthy eating habits (OR =0.30; 95% CI:0.23-1.45) than females. On the other hand, males were significantly more likely to be sleep-deprived (OR = 3.05; 95% CI: 1.83–5.07) and be high screen users (OR= 1.38; 95% C.I.: 1.00–1.89) than females.

Mother's educational level was significantly associated with physical activity. Compared with children of mothers with a higher education, children whose mothers had a secondary education were more likely to be inactive (OR = 0.50; 95% CI: 0.30–0.81). In addition, children of mothers with elementary school, middle school and secondary school education were more likely to be sleep-deprived than children whose mothers had a higher education: OR = 4.58 (95% CI: 1.95–10.77); OR = 3.76 (95% CI: 1.58–8.96) and OR = 2.56 (95% CI: 1.25–5.23), respectively.

Mother's level of education was associated with dietary behaviour. Children of mothers with elementary school or middle school certificates were more likely to have unhealthy eating habits than children of mothers with a higher education: OR = 2.82 (95% CI: 1.18–6.76) and OR = 3.29 (95% CI: 1.31–8.24), respectively. No association was found between the mother's level of education and sedentary screen-based behaviour (P > 0.05).

As shown in Table 4 , unhealthy dietary habits and high screen usage put a child at higher risk of being overweight or obese (both P

## Discussion

The prevalence of overweight and obesity in our study among schoolchildren aged 6–17 years was 12.3% and 16.3%, respectively; thus 28.6% of the children and adolescents were overweight or obese. According to WHR calculations, 21.8% of males and 21.0% of females had central obesity. The prevalence of obesity and overweight did not differ significantly between males and females. Similar findings have been reported in other studies (21,22). However, a number of studies have found a significant relationship between sex and overweight and obesity, with some reporting that girls had a significantly higher prevalence of overweight than boys (22,23), while others reported the opposite (23,24).

Childhood obesity research in Oman is limited. The Oman health annual reports for 2012 and 2019 showed that overweight and obesity rates had increased from 3.5% to 4.2% among children in the first grade (ages 6–7 years), from 12.8% to 15.5% among students in the seventh grade (ages 12–13 years) and from 12.5% to 16.6% among children in the tenth grade

(ages 15–16 years) (25,26). A recent study in 5 provinces of Oman found that 17.4% of children aged 6–10 years were overweight or obese (27). These findings indicate that overweight and obesity are becoming increasingly common across Oman as in neighbouring countries. The prevalence of overweight and obesity among children and adolescents in countries of the Gulf Cooperation Council is high (28): 50% of Kuwait adolescents are obese (29) and 45.6% of students aged 5–19 years in Qatar are obese (30). In the United Arab Emirates, overweight and obesity among students aged 11–14 years is 41.2% and 24.3%, respectively (31).

The prevention of obesity can be largely achieved by modifying the unhealthy lifestyles (32). Lifestyle risk behaviours in our study were common among students and were significantly influenced by sex. Female students were more likely than male students to have unhealthy dietary behaviours. More than half of the females had 3 to 4 dietary behaviours, while approximately one-third had 5 or more. Male students were found to sleep less than they should for their age and more likely to engage in sedentary screen-based activities. The results of this study are consistent with those of other studies that found that females were less physically active (33-34) and that male students spent more time on screen and slept for a shorter time (5,35).

The prevalence of unhealthy lifestyle behaviours among the students differed by age. Children were significantly less likely than adolescents to sleep less than the recommended number of hours, have unhealthy eating habits and use screens excessively when compared with adolescents. Similar results have been reported in other studies (5,30,36).

Family income and father’s education were not significantly associated with unhealthy lifestyle behaviours in this study. On the other hand, mother’s education was an important factor. Children of mothers with high-school education or lower were more likely to be physically inactive, have unhealthy eating habits and not sleep enough than children of mothers with a college education or higher. Several studies, including one in Bahrain, also reported that mother’s education level played a significant role in children’s lifestyle behaviour which could potentially affect childhood obesity (4,37). The significant predictors of overweight and obesity in our study were unhealthy eating habits, sedentary screen-based activities, insufficient sleep, and obesity among siblings, father and mother. These results are similar to those of other studies (4,34,38).

The fact that low physical activity was not significantly associated with overweight and obesity in our study is surprising. A previous study in Oman also found no significant correlation between physical activity and BMI (27), although both studies calculated BMI using different centiles. The association between obesity and lifestyle-related factors in the paediatric population in Oman

may be better captured by having national BMI z-scores which can precisely estimate the BMI.

Adolescent health in Oman can be promoted in school settings by school nurses offering health-related services, teaching healthy lifestyles and educating parents about risk factors. Establishing childhood obesity monitoring systems in schools will ensure regular weight and height measurements of children and timely referrals to specialists for preventive interventions.

The strengths of our study include: the use of an adequate sample size; the wide range of ages (6–17 years); objective measurement of body weight; and height and waist circumference measured by trained school nurses. Limitations of the study include its cross-sectional design, which does not permit examination of causality, and the self-reported data on sleep duration and physical activity which were not verified by objective measures. Parental and sibling obesity status was not assessed by actual measurement but was reported by the respondents in the questionnaires. This can present potential issues such as recall bias and misreporting.

To conclude, we found a relatively high prevalence of overweight and obesity among students aged 6 to 17 years in Oman. The factor associated with this prevalence were unhealthy eating habits, greater time spent on sedentary screen-based activities, insufficient sleep, and obesity among siblings, father and mother. The findings suggest the need for effective health promotion programmes targeting children and adolescents in Oman, and regular monitoring of trends in lifestyle behaviour associated with overweight and obesity among younger populations in Oman to inform national health policy programmes. Further studies are needed to generate Omani population-specific paediatric BMI z-scores, which can better capture the correlation between obesity and lifestyle behaviours among the young people in Oman. Studies are also needed to explore factors responsible for the high prevalence of unhealthy lifestyle behaviour among adolescents and female students in Oman.

**Funding**: None.

**Competing interests**: None declared.

## Obésité et comportements liés au mode de vie chez les enfants scolarisés à Oman

### Résumé

**Contexte** : De nombreux pays sont confrontés à une prévalence croissante de l'obésité de l'enfant et il convient de prendre des mesures appropriées pour y remédier.

**Objectif** : Déterminer la prévalence du surpoids et de l'obésité ainsi que les facteurs sociodémographiques et les comportements à risque liés au mode de vie associé à l'obésité chez les enfants scolarisés dans le Gouvernorat d'Al Buraimi, Oman.

**Méthodes** : Nous avons mené une étude transversale auprès de 714 garçons et filles scolarisés âgés de 6 à 17 ans dans 14 écoles gouvernementales du Gouvernorat d'Al Buraimi (Oman) entre avril et juillet 2019. Des données concernant les caractéristiques sociodémographiques et le mode de vie des élèves ont été collectées à l'aide d'un questionnaire auto-administré. Les élèves ont également été pesés, leur taille et leur tour de taille ont été mesurés. Les normes de références de l'OMS relatives aux diagrammes de croissance de l'IMC pour l'âge ont été utilisées pour déterminer la catégorie de poids. L'obésité centrale a été évaluée en calculant le rapport tour de taille sur taille, et le seuil de 0,50 pour le rapport tour de taille sur taille a servi à identifier l'obésité centrale chez les filles et chez les garçons. Une analyse des données a été réalisée à l'aide du logiciel SPSS, version 21, impliquant des statistiques descriptives et inférentielles.

**Résultats** : Sept cent quatorze élèves au total ont été inclus. La prévalence du surpoids et de l'obésité était respectivement de 12,3 % et 16,3 %, et 21,4 % des étudiants avaient une obésité centrale. Les comportements à risque liés au mode de vie étaient fortement corrélés à l'âge de l'élève, à son sexe et au niveau d'études de sa mère (p