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The Association between Fast-Food Consumption and Childhood Obesity in Oman: A Cross-Sectional Study

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Abstract

Objective: Childhood obesity is a global, multifactorial public health problem. Several studies examined the association between fast food consumption and childhood obesity, and the results are variable across nations. This study aims to examine the association between fast-food consumption and childhood obesity in a nationally representative sample of school-age children in Oman.

Methods: Using secondary data from the 2015 Oman Global School-Based Student Health Survey (GSHS), an analytical cross-sectional study was conducted. The study participants were schoolchildren aged 13-17 years. Descriptive and comparative data were presented to examine the association between fast-food consumption and childhood overweight/obesity (defined as body mass index (BMI) ≥ 1 standard deviation (SD) from the median by age and sex). After adjusting for sociodemographic and health-related factors, multivariable logistic regression analysis was performed to examine the association between fast-food consumption (≥ 3 times a week) and childhood overweight/obesity. The level of significance was set at $p < 0.05$.

Results: Total of 3468 students aged 13-17 were recruited in the parent study (response rate = 92.0%). Nearly one-third of the study population were affected by overweight (16.6%) or obesity (13.2%). One-quarter (23.9%) of students consumed fast-food at least three times a week, and nearly half (43.1%) drank carbonated soft drinks at least twice a week. The univariate analysis showed a significant association between fast-food consumption and childhood overweight/obesity, p=0.016. After controlling for possible confounders, students who consumed fast-food more frequently (≥ 3 times a week) were 25.0% more likely to develop overweight/obesity (AOR = 1.25, p = 0.035).

Conclusion: This study showed a significantly positive association between fast-food consumption and childhood overweight/obesity after controlling for possible confounders. A comprehensive multi-sectoral effort is required to tackle the wider food environment that influences children's food choices and combat childhood obesity. Further longitudinal studies are required to better understand the causal association between fast-food consumption and childhood obesity.

Keywords: Fast-food; Childhood overweight; Childhood obesity; Oman

Introduction

Childhood obesity is a significant public health problem worldwide, rising from 4% in 1975 to over 18% in 2016 [1]. The overall number of children aged 5-19 years old living with obesity is predicted to increase from 158 million in 2020 to 254 million in 2030 [2]. Children who are overweight or obese are more likely to remain obese into adulthood, increasing their risk of developing noncommunicable diseases, musculoskeletal disorders, and several types of cancer at a younger age [1, 3]. The overall increase in childhood obesity can be attributed to sociodemographic and behavioural factors, as well as societal advancements and policies that foster an obesogenic environment [1]. Thus, childhood obesity has shifted from being an individual problem to a societal problem that demands a population-based multisectoral, multidisciplinary and culturally relevant approach.

The proportion of children living with obesity in the Eastern Mediterranean region is anticipated to rise from 12% (10 million) in 2020 to 15% (13 million) in 2030 for children aged 5-9 years and from 8% (12 million) in 2020 to 13% (22 million) in 2030 for children aged 10-19 years [4]. There is a dearth of good epidemiological data on childhood overweight and obesity in the Gulf Cooperation Council (GCC) countries (Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, and the United Arab Emirates); however, the overall trend is increasing over time [5]. According to the most recent estimate, the overall prevalence of childhood obesity (5-19 years) across GCC countries in 2030 is projected to range from 22% to 27%. The burden of obesity in the GCC countries is unknown due to variances in population structure, culture, lifestyle habits, education, and occupation [5].

In Oman, both adult and childhood obesity are endemic problems, with prevalence increasing over the last few decades, yet "population-based interventions" are suboptimal [6, 7]. The prevalence of adult obesity has increased from 10.5% in 1990 to 23.2% in 2017; with female prevalence almost double that of male prevalence [6]. Childhood obesity affects 12.5% of children in Oman, with no significant sex differences [7]. The overall rate of childhood obesity is anticipated to rise even further to 19.5% by 2025, which will translate into higher health expenditures to address obesity-related problems at a later stage of a child's life [6, 7]. The overall economic impact attributed to obesity in Oman was 2.19% of the total GDP in 2020 and is expected to grow further given the current trend if no active measures are taken to tackle the root cause of the problem [8].

The World Health Organization (WHO) warns of a growing obesity rate in Eastern Mediterranean countries due to a nutrition

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transition. This shift, characterized by increased consumption of unhealthy foods and obesity prevalence, is linked to urbanization, modern lifestyles, fast food consumption, and sedentary lifestyles, all of which have serious implications for public health, economic growth, and international nutrition policy [9]. In recent years, there has been a substantial transformation in eating patterns in Oman, with a shift from the traditional diet to a Western diet rich in salt and fat and poor in nutrients, aided by economic growth, urbanisation, and globalisation [10]. Ultra-processed fast-food retail outlets, both local and multinational corporations, have proliferated because of this transition, particularly in urban areas [11]. Furthermore, the outlets' promotional activities, which specifically target young children, have a greater impact on their eating habits, dietary preferences, and food choices. Despite the notion that infrequent fast-food consumption by parents may have a protective effect on children's fast-food intake, research suggests that child-targeted fast-food advertising may mitigate that benefit [12].

Fast-food consumption is linked to obesity due to several factors, including unhealthy ingredients, larger portion sizes, affordability, and availability [1]. It is also linked to various noncommunicable diseases and certain types of cancer, including breast and colorectal cancers [11, 13, 14]. Thus, addressing fast-food regulation as part of a larger societal intervention to combat obesity is important at this stage to control childhood obesity and subsequently reverse the obesity trend in Oman. Although the association between fast-food and obesity is well established, its impact is variable across nations. To the best of the author's knowledge, no research has investigated the association between fast-food consumption and childhood obesity in Oman. This study aims to examine the sociodemographic and health-related factors of obesity in school-age children in Oman and specifically investigate the association between fast-food intake and obesity in this study population.

Methods

Study population

The study population consisted of children aged 13 to 17 who participated in the 2015 Oman Global School-Based Student Health Survey (GSHS) [15]. The primary survey was conducted using a two-stage cluster sampling procedure [15]. A self-administered questionnaire was used, and weight and height were measured by qualified staff. At the first stage, schools were chosen with a probability proportionate to enrolment size. At the second stage, classes were chosen at random, and all students in those classes were eligible to participate. A total of 3468 students were recruited for the primary survey, with an overall response rate of 92.0% [15]. Ethical approval was obtained by the Health Studies and Research Approval Committee, Ministry of Health, Oman.

Study design

The study design is an analytical, cross-sectional study.

Dependent variable

The dependent variable was childhood obesity as defined according to WHO criteria (standard deviation (SD) from the median for BMI by age and sex) [16]. Using the WHO's criteria for children aged 5- 19, obesity is defined as a BMI ≥ 2SD above the WHO growth standard median age and sex, overweight is defined as a BMI ≥ 1SD above the WHO growth standard median age and sex, and underweight is defined as a BMI < -2SD above the WHO growth standard median age and sex [16]. For the purposes of the current study's univariate and multivariable analysis, a binary variable was used to define obesity indicators, with normal weight defined as BMI < 1SD from the median by age and sex and overweight/obesity defined as BMI ≥ 1SD from the median by age and sex.

Independent variable

The independent variable was the frequency of fast-food consumption in the last seven days of the survey, which was defined in the parent survey as eating from burger places, pizza places, or shawarma places. In univariate and multivariate analysis and after reviewing the existing literature [17-20], a binary variable for fast-food was created: "less than three times in the last seven days" and "three times or more in the last seven days.

Data analysis

Descriptive data on sociodemographic factors (age and sex) and health-related factors (fruit consumption, vegetable consumption, fast-food consumption, carbonated soft drink consumption, active travel to and from school, not being physically active at home, spending at least three hours in a day setting at home, and attending physical education class at school) were initially presented. The categorical variables were presented as (n/%). A univariate analysis was carried out to examine the association between childhood obesity and sociodemographic and health-related factors. The difference in percentage between groups was compared using the Pearson chi-square ($\chi 2$) test. Multivariable binary logistic regression analysis was conducted to examine the association between fast-food consumption and the obesity indicator (with overweight/obesity defined as a BMI ≥ 1SD from the median by age and sex and normal weight defined as a BMI < 1SD from the median by age and sex). Adjustments were made for sociodemographic and health-related variables. The results were presented as an adjusted odds ratio with a 95% confidence interval (95% CI) and p value. Statistical Package for Social Sciences (SPSS) version 24 was used to run the analysis. The level of confidence was defined as a p-value of less than 0.05.

Results

Table 1 displays the baseline sociodemographic and health-related characteristics of the study population. In total, 3456 students were enrolled in the primary survey, with a 92.0% response rate. Around three-quarters (72.0%) of the study population was aged 15 and older. Females made up more than half (52.3%) of the study population. Almost one-third of youngsters were affected by overweight (16.6%) or obesity (13.2%).

Around two-thirds of the study population consumed fruits or vegetables fewer than twice per day in the last 30 days of the survey, 63.0% and 68.0%, respectively. Three-quarters (76.1%) of the study population consumed fast-food less than three times in the last seven days of the survey. Nearly half (43.1%) of the study participants drank carbonated soft drinks at least twice daily in the last 30 days of the survey. Almost one-third (28.0%) of the population surveyed walked or rode a bike to or from school. One in three students (39.8%) spent at least three hours every day sitting at home. At school, almost one-quarter (22.5%) of students did not attend physical education class during the school year.

Table 2 displays the prevalence of childhood obesity in Oman by age and sex. Almost one-third of the study population was affected by overweight (16.6%) or obesity (13.2%). Both childhoods overweight and obesity are more prevalent in younger age groups compared to older age groups. When examining childhood obesity by sex, no significant

Table 1: The baseline sociodemographic and health-related characteristics of the study population (n=3456).

Variable	Denominator	n	%
Age (year)	3456		
≥ 15-year-old		2488	72.0%
<15-year-old		968	28.0%
Sex	3404		
Male		1623	47.7%
Female		1781	52.3%
Grade	3360		
Grade 8-10		2022	60.2%
Grade 11-12		1338	39.8%
Fruit consumption[1]	3387		
< 2 times per day in the past 30 days		2134	63.0%
≥ 2 times per day in the past 30 days		1253	37.0%
Vegetable consumption[1]	3453		
< 2 times per day in the past 30 days		2347	68.0%
≥ 2 times per day in the past 30 days		1106	32.0%
Fast-food consumption[2]	3449		
< 3 days in the past 7 days		2624	76.1%
≥ 3 days in the past 7 days		825	23.9%
Carbonated soft drink consumption[1]	3430		
< 2 days in the past 30 days		1950	56.9%
≥ 2 days in the past 30 days		1480	43.1%
Active travel to or from school[3]	3388		
Yes		950	28.0%
No		2438	72.0%
Physically inactivity[4]	3407		
Yes		526	15.4%
No		2881	84.6%
Spending at least 3 hours setting in a day[5]	3421		
Yes		1360	39.8%
No		2061	60.2%
Attending physical education class each week[6]	3400		
Yes		2635	76.5%
No		765	22.5%
BMI by age and sex[7]	3161		
Underweight (< -2SD from median)		210	6.6%
Normal weight		2011	63.6%
Overweight (≥ 1 SD to <2SD from median)		524	16.6%
Obese (≥ 2SD from median)		416	13.2%

[1]during the last 30 days prior to the survey; [2]during the last 7 days before the survey; [3]walk or ride bicycle to or from school during the past 7 days before the survey; [4] not physically active for at least 60 minutes per day on any day during the 7 days before the survey; [5]sitting activities (sitting and watching television, playing computer games, talking with friends when not in school or doing homework during a typical or usual day); [6]during this school year; [7]According to WHO criteria (standard deviation (SD) from the median for BMI by age and sex.

sex difference was found, with one out of every three children being affected by overweight or obesity.

The univariate analysis of sociodemographic and health-related variables and childhood overweight/obesity (defined as BMI 1 ≥SD over the median for BMI by age and sex) is shown in Table 3. There is a significant association between childhood overweight/obesity and age, with approximately one-third (32.8%) of the children aged 15 years and younger suffering from childhood overweight/obesity, p = 0.026. One in every three (30.9%) children who consumed fast-food at least three times per week had childhood overweight/obesity, which is statistically significant, p = 0.013. One in every four (26.1%) children

Table 2: Prevalence of childhood obesity by age and sex in Oman according to WHO criteria (standard deviation (SD) from the median for BMI by age and sex) (n=3161).

Variable	Normal weight <1SD	Overweight ≥1SD to < 2SD	Obesity ≥ 2SD
Age(year)	**2221(70.3%)**	**524(16.6%)**	**416(13.2%)**
11 years or younger (n=14)	8(57.1%)	3(21.4%)	3(21.4%)
12years (n=33)	19(57.6%)	9(27.3%)	5(15.2%)
13years (n=318)	200(62.9%)	71(22.3%)	47(14.8%)
14 years (n=465)	331(71.2%)	79(17.0%)	55(11.8%)
15 years (n=695)	483(69.5%)	124(17.8%)	88(12.7%)
16 years (n=715)	526(73.6%)	100(14.0%)	89(12.7%)
17 years (n=688)	509(74.0%)	95(13.8%)	84(12.2%)
18 years or older	145(62.2%)	43(18.5%)	45(19.3%)
Sex	**221(70.3%)**	**524(16.6%)**	**416(13.2%)**
Male	1059(70.9%)	252(16.9%)	183(12.2%)
Female	1162(69.7%)	272(16.3%)	233(14.0%)

who consumed carbonated soft drinks at least twice a week in the last 30 days of the study had childhood overweight/obesity, which was statistically significant, p = 0.016. Almost one-third (28.5%) of children who did not participate in weekly physical education classes at school suffered from childhood overweight/obesity, which was statistically significant, p = 0.012.

There is no significant association between childhood obesity indicator and sex, fruit and vegetable consumption, or physical inactivity among this cohort group. Walking or riding a bicycle to or from school had no significant association with obesity indicator. Similarly, no significant association was observed between sedentary lifestyle (sitting for more than 3 hours a day) and obesity indicators in this study population.

Table 4 displays the results of a logistic regression analysis of sociodemographic and health-related variables and childhood overweight/obesity (defined as BMI 1 ≥SD over the median for BMI by age and sex). After controlling for sociodemographic (age, sex) and health-related factors (fruit consumption, vegetable consumption, carbonated soft drink consumption, active travel, sedentary behaviour, physical inactivity, and attending physical education class at school), students who consume fast-food at least three times a week were 25.0% more likely to suffer from overweight/obesity than less frequent consumers, AOR = 1.25, p = 0.035. Similarly, and after adjusting for possible confounders, frequent carbonated soft drink consumers (≥ 2 times a day) were 32.0% more likely to suffer from overweight/obesity than less frequent consumers, AOR = 1.32, p = 0.012. Furthermore, those who did not attend physical education classes were 34.0% more likely to suffer from overweight/obesity than those who attended at least one session each week, AOR = 1.34, p = 0.004. The current study found that age was independently associated with obesity indicators, with children under the age of 15 being more likely to suffer from overweight/obesity than older children, AOR = 1.25, p = 0.02.

Discussion

According to the current study, almost one-third of the study population suffered from overweight (16.6%) or obesity (13.2%), with no significant sex differences. The prevalence of overweight and obesity is increasing with age in this cohort of study population. One out of every four students consumed fast-food at least three times a week in the last seven days of the survey. Nearly half of the students consumed carbonated soft drinks two times a week in the last 30 days of the survey. In univariate analysis, there was a significant association between fast-

Table 3: Univariate analysis of sociodemographic and health-related factors and childhood obesity.

Variable	Denominator	SD from the median for BMI by age and sex (n/%)		
		< 1 SD	≥ 1 SD[a]	p value
Age (year)	3161			**0.026**
< 15 years		558 (67.2%)	272(32.8%)	
≥ 15 years and older		1663(71.3%)	668(28.7%)	
Sex	3161			0.470
Male		1059(70.9%)	435(29.1%)	
Female		1162(69.7%)	505(30.3%)	
Fruit consumption[1]	3099			0.522
< 2 times per day in the past 30 days		1385(70.8%)	570(29.2%)	
≥ 2 times per day in the past 30 days		798(69.8%)	346(30.2%)	
Vegetable consumption[1]	3149			0.297
< 2 times per day in the past 30 days		1522(70.9%)	626(29.1%)	
≥ 2 times per day in the past 30 days		691(69.0%)	310(31.0%)	
Fast-food consumption[2]	3150			**0.013**
< 3 days in the past 7 days		558(73.8%)	198(26.2%)	
≥ 3 days in the past 7 days		1654(69.1%)	740(30.9%)	
Carbonated soft drink consumption[1]	3138			**0.016**
< 2 days in the past 30 days		1671(69.2%)	743(30.8%)	
≥ 2 days in the past 30 days		535(73.9%)	189(26.1%)	
Active travel to or from school[3]	3101			0.532
Yes		620(69.4%)	273(30.6%)	
No		1558(70.6%)	650(29.4%)	
Physically inactivity[4]	3108			0.846
Yes		614(70.5%)	257(29.5%)	
No		1569(70.1%)	668(29.9%)	
Spending at least 3 hours setting in a day[5]	3122			0.495
Yes		865(69.6%)	378(30.4%)	
No		1329(70.7%)	550(29.3%)	
Attending physical education class each week[6]	3097			**0.012**
Yes		465(66.6%)	233(33.4%)	
No		1716(71.5%)	683(28.5%)	

[a] both childhood overweight and obesity; [1]during the last 30 days prior to the survey; [2]during the last 7 days before the survey; [3]walk or ride bicycle to or from school during the past 7 days before the survey; [4]not physically active for at least 60 minutes per day on any day during the 7 days before the survey; [5]sitting activities (sitting and watching television, playing computer games, talking with friends when not in school or doing homework during a typical or usual day); [6]during this school year. Level of significance *p <0.05*

food consumption, carbonated soft drink consumption, and attending physical education classes and the obesity indicator. In multivariate analysis and after adjusting for possible confounders, students who consumed fast-food more frequently (≥ 3 times in the last 7 days) were 25% more likely to suffer from childhood overweight/obesity than less frequent fast-food consumers, AOR = 1.25, p = 0.035. Similarly, there was a positive and significant association between carbonated soft drink consumption and childhood overweight/obesity, AOR = 1.32, p = 0.012. Students who did not participate in physical education classes at school were 34% more likely to be affected by obesity, AOR = 1.34, p = 0.004.

Frequent fast-food consumption is associated with childhood obesity

This study found a significant association between fast-food consumption and childhood obesity, which is consistent with the existing literature [17-20]. A cross-sectional study of Saudi children aged 9-12 years revealed a significant association between fast-food consumption and obesity, with regular fast-food consumers being more likely to suffer from obesity and eating larger meal portions (17). A multicentre, multi-country, cross-sectional study from 17 nations looked at the association between fast-food consumption over a 12-month period and obesity (as measured by BMI) in children and adolescents. Results showed that children who ate fast-food frequently (1 - 2 times per week) and very frequently (≥ 3 times per week) had significantly higher BMIs than the infrequent group [20]. Several prospective cohort studies indicate a "causal association" between fast-food intake and childhood obesity [21]. Children who ate fast-food consumed more overall energy than those who did not, leading to weight gain [22]. As time passes, less energy is consumed at home and more is obtained from fast-food establishments [23], with most of these products being high in saturated fats, trans fats, simple carbs, and sodium, all of which are nutrients linked to hypertension, cardiovascular disease, and type 2 diabetes mellitus [1, 24]. This calls for active measures to limit exposure to these products at a younger age and thereby minimise the likelihood of developing childhood obesity and its subsequent health implications.

The current study did not include all the fast-food options; thus, the estimated impact of different ultra-processed fast-food consumption is not clear. According to one study, there were 41 international retail locations specialising in pizza, 60 specialising in fried chicken, and 10 specialising in burgers in Oman, with the majority located in the capital (Muscat) [11, 25]. Several factors have contributed to an increase in fast-food consumption, including delectable flavours, quick preparation, affordability, availability, food delivery applications, and globalisation, all of which make it more accessible and acceptable among children and

Table 4: Multivariate binary logistic regression comparison of fast-food consumption and childhood obesity (i.e., BMI 1 ≥SD over the median for BMI by age and sex).

Variable	AOR[$]	95% CI		p value
		Lower	Higher	
Age (year)				
≥ 15 years and older	1.00			
< 15 years	1.25	1.036	1.513	**0.020**
Sex				
Male	1.00			
Female	1.08	0.910	1.283	0.376
Fruit consumption[1]				
≥ 2 times per day	1.00			
< 2 times per day	0.99	0.820	1.193	0.910
Vegetable consumption[1]				
≥ 2 times per day	1.00			
< 2 times per day	0.88	0.728	1.073	0.214
Fast-food Consumption[2]				
< 3 times in the last 7 days	1.00			
≥ 3 times in the last 7 days	1.25	1.016	1.546	**0.035**
Carbonated soft drink consumption[1]				
< 2 times per day	1.00			
≥ 2 times per day	1.32	1.063	1.641	**0.012**
Active travel to or from school[3]				
Yes	1.00			
No	0.93	0.771	1.126	0.464
Physically inactivity[4]				
Yes	1.00			
No	0.96	0.794	1.154	0.645
Spending at least 3 hours setting in a day[5]				
No	1.00			
Yes	1.13	0.946	1.337	0.183
Attending physical education class each week[6]				
Yes	1.00			
No	1.34	1.095	1.639	**0.004**

*both childhood overweight and obesity; [1]during the last 30 days prior to the survey; [2]during the last 7 days before survey; [3]walked or rode bicycle to or from school during the past 7 days before the survey; [4]not physically active for at least 60 minutes per day on any day during the 7 days before the survey; [5]sitting activities (sitting and watching television, playing computer games, talking with friends when not in school or doing homework during a typical or usual day); [6]during this school year. [$]Adjusted Odd Ratio, Nagelkerke R Square 0.016, Hosmerand Lemeshow test 0.696 (i.e., good model fit); Level of significance *p <0.05*

young adults [10, 26]. Furthermore, aggressive fast-food marketing, such as price promotions and sponsorship of sporting or cultural events with enticing prizes, has been linked to an increase in fast-food consumption [26]. In 2021, it was estimated that the global market for fast-food was worth USD 593.3 billion and is predicted to expand at a compound annual growth rate of 4.6% from 2021 to 2028 [27], with most of the market targeting children and young adults. Additionally, the lack of counteracting awareness of the adverse effects of these products has led to an increase in popularity and acceptability among different age groups. In the absence of public health awareness about the nutritional and health effects of ultra-processed fast-food, the knowledge gap will increase further at the individual and policyholder levels.

Fast-food consumption is linked to an unhealthy lifestyle

Although the current study did not examine the association between fast-food consumption and unhealthy lifestyles, other studies have found that fast-food consumption is linked with unhealthy food choices and health outcomes [19, 28]. The current study found that a significant proportion of students who suffered from overweight and obesity were drinking carbonated soft drinks and were less likely to attend physical education class. A study of Greek students aged 8 to 17 revealed that frequent fast-food intake was linked to an unhealthy lifestyle profile in children and adolescents. The findings lend support to the development of programmes to assist youngsters in adopting healthy eating habits [28]. Another study looked at the association between overweight and obesity for fast-food compared with the dietary pattern for the remainder of intake. Results showed that both low consumers (0.1-30% of energy from fast-food) and high consumers (>30% of energy from fast-food) were more likely to consume western dietary patterns for the remaining intake compared to non-consumers (0% of energy from fast-food) [19]. Frequent fast-food consumption has an impact on the availability of fast, unhealthy foods at home, increasing the availability of soda and chips and decreasing the likelihood of consuming vegetables or milk with meals [29, 30]. More effort is required to support the development of programmes that assist young people in adopting healthy eating habits by making healthy alternatives more widely available and limiting the spread of fast-food retail outlets. To encourage people to make healthy decisions at the individual, societal, and educational levels, it is also necessary to raise public awareness about the detrimental effects of fast food at every opportunity.

Access to fast-food retail outlets and childhood obesity

The current study did not examine the effect of fast-food retail outlet distribution on obesity indicators, as it was not reported in the primary survey. However, research has shown that the local food environment around the child's household has a significant impact on the child's food choices and, subsequently, weight status [31-33]. A prospective study conducted in the United Kingdom investigates the association between the density of fast-food outlets and grocery stores in schoolchildren's home and school environments and obesity indicators. Results showed that fast-food outlets close to home had a significant association with childhood obesity, especially in girls [33]. However, when looking at fast-food retail outlets near schools, this association was not statistically significant [33]. Similarly, a prospective cohort study over a six-year period observed a strong association between neighbourhood availability of fast-food and obesity among nationally representative children aged 14 years or younger in Sweden, with children living near fast-food outlets having a 14% higher chance of developing childhood obesity compared to those with no accessibility to fast-food retail outlets [32].

On the other hand, access to retail outlets that offer more healthy food, such as fruit/vegetable markets (FVMs), can have a great impact on children's adoption of healthier eating habits and, as a result, lower the risk of childhood obesity. A systematic review showed a negative association between access to fruit and vegetable markets (FVM) in children's residential and school neighbourhoods and weight-related behaviours [34]. A study in Australia found that an increased number of healthy food outlets within 800 metres of a child's house is significantly associated with a lower chance of suffering from overweight or obesity [35]. Limiting the number of fast-food outlets in residential areas and increasing access to healthy food outlets could have a significant effect on adopting healthy-food choices and subsequently lowering the risk of childhood obesity.

Study implication

Several implications can be drawn from this study. First, raising public awareness of the negative health effects of fast-food consumption and the tactics used by fast food retail outlets to sell their products

is important, particularly among parents, teachers, and children. This can help improve their food choices and de-normalize fast food consumption. Second, active measures should be taken to regulate fast-food retail outlet distribution near residential areas and educational facilities. Imposing such regulation can limit children's access to these products and further lower their fast-food consumption. Third, more stringent measures should be taken around fast-food advertising, promotion, and sponsorship, as these activities may influence their food preferences and encourage fast-food consumption. In the United Kingdom, new regulations restrict the web and television promotion of foods high in fat, salt, and sugar (HFSS) before 9:00 p.m. as a measure to combat childhood obesity [36]. Additionally, banning the sponsorship of fast-food chains at educational and sporting events can help improve the public's perception of these products and further reduce fast-food consumption [27]. Fourth, creating a nationwide healthy meal programme at school that prohibits serving fast-food and other junk food in schools and promotes more healthy options can help improve the children's perception of these products and further reduce fast-food consumption [37]. Several EU countries have created action plans to combat childhood obesity, which include school food policies that prohibit the sale of unhealthy foods, such as fast-food, in schools [37]. Commercial food activities are prohibited in several European elementary schools; however, beverages may be distributed to secondary school pupils in these nations with the active engagement of educators and parents [38]. Finally, multisectoral efforts are needed to increase public awareness of the negative health effects of consuming fast-food on one's health [24].

Strengths and limitations

The current study is the first to use a nationally representative sample to explore the association between fast-food consumption and childhood obesity among school-age children in Oman; nevertheless, it has some limitations. First, the study design precluded inferring a causal association between fast-food intake and childhood obesity. Second, the study used GSHS 2015 data, which may not exactly reflect current fast-food consumption patterns among school-age children. Third, the study did not examine the effect of the distribution of fast-food retail outlets or the discrepancy in childhood obesity across different geographical locations, as these were not provided in the parent survey. Fourth, the 7-day recall period for fast-food consumption was very short and did not consider the seasonal variation of fast-food consumption. Additionally, it did not look at the parental sociodemographic factors that may influence children's choices. Lastly, the self-administered questionnaire might potentially result in misinterpretations or missing variables.

Conclusion

The current analytical cross-sectional study found a significant association between consumption of fast-food and childhood obesity among a nationally representative school-age sample in Oman. A comprehensive multi-sectorial effort is required to address the wider food environment that influences children's food choices and combat childhood obesity. Raising public health awareness about the effects of fast-food consumption and creating effective fast-food retail outlet regulation near residential areas are crucial to mitigating the short- and long-term effects of increased fast-food consumption. More prospective research is required in Oman to better understand the relationship between fast-food and childhood obesity.

Conflict of Interest

The author has no conflict of interest. No funding was received for this study.

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