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Association between obesity and eating habits among female adolescents attending middle and high schools in National Guard Compound, Riyadh

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ABSTRACT:

Background: *Obesity among adolescents is at an alarming increase, and in order to achieve effective management, an association between obesity and lifestyle must be established. This study aimed to determine prevalence and association between obesity and dietary habits among female adolescents attending middle and high schools in National Guard Compound, Riyadh.*
Methodology: *A cross-sectional study was conducted in Riyadh on female students attending National Guard middle and high schools. Ages ranged from 11 – 18 years. A qualified nurse took anthropometric measurements which included weight, height, and waist circumference. Other data that could have an impact on weight such as TV habits and vegetable consumption were gathered by using a self-reported questionnaire.*
Results: *400 female students, with an average age of 14.8 ±1.2 years, were included in the study. BMI showed that 98 (25%) were overweight and 61 (15%) were obese. Eating habits revealed that 50% of normal/underweight students tend to eat breakfast on both weekend days as compared to 33% of overweight/obese students (p=0.005). Also, 102 (64%) of obese/overweight students rarely eat vegetables as compared to 119 (50%) of normal/underweight (p=0.03). There were 22 (65%) students who were obese/overweight whose fathers were unemployed, as compared to 137 (38%) students whose fathers were employed (p=0.003).*
Conclusion: *Obesity and overweight is high among female adolescents with an overall prevalence of 40%. In turn, we recommend implementing national prevention programs emphasizing on lifestyle modification, reduced television viewing, and avoiding unhealthy dietary habits, such as skipping breakfast on weekends and infrequent vegetable consumption.*

Keywords: *Adolescent, Anthropometric Measurements, Nutrition, Obesity, Saudi Arabia.*

1. Introduction

The World Health Organization (WHO) defines obesity and overweight as "a BMI greater than or equal to 25 kg/m^2 is overweight and a BMI greater than or equal to 30 kg/m^2 is obesity" [1]. To generalize, it is abnormal and excessive fat accumulation that might affect health. There have been several studies that estimated the magnitude of the problem and how it is increasing and affecting different age groups among populations all over the world [1-3]. As per the recent fact sheet of WHO on obesity the worldwide prevalence of obesity became more than two folds between 1980 and 2014 [4].

In 2014, around 1.9 billion adults (aged 18 years or more) were overweight, and about 600 million, were obese worldwide [4]. Overall, 13% of the world's adult population is obese. According to the same report approximately 11% of men and 15% of women were obese in 2014, which is a large population and gives a hint about how this problem is getting worse for different reasons worldwide. On the other hand, 42 million children who were still under 5 years of age were classified as "Overweight" or "Obese" in 2013 as per this report [4]. Some studies show that people who are overweight and obese are linked to more deaths worldwide than underweight [4].

There are different factors that can influence obesity. Some studies show that the high-income countries have higher levels of obesity and overweight compared to middle and low-income countries (this classification of income level was by the World Bank as lower, medial and high income). The rate of obesity is increasing in high-income countries by 30% more than the middle and low-income countries [5,6]. Even disregarding the role of income on obesity, rates are still high when taking into account studies done on government-funded schools which have a mosaic aggregation of students from different incomes.

In 2010, a study was conducted among male students ranging from age 18 to 24 years, who were randomly chosen from the College of Health Sciences at Al-Qassim University in Al-Rass, Al-Qassim. It showed that 22% of the students were classified as overweight and 16% were classified as obese. Other similar studies conducted in different western and Middle Eastern countries showed consistent findings [7]. A recent school based study of adolescents conducted in three major cities Al-Khobar, Jeddah and Riyadh of Saudi Arabia showed a prevalence of overweight of 20% in males and 21% in females while that of obesity was 24% in males and 14% in females. The prevalence was higher overall in private schools, a very high prevalence of overweight, obesity and abdominal obesity was observed in the Saudi adolescents [8].

There is a strong association between obesity and dietary habits in children and adolescents. But, there is a paucity of data on this aspect in adolescents of Saudi Arabia. The aim of this study was to determine the association between obesity and dietary habits among female adolescents attending middle and high schools in National Guard compound, Riyadh.

2. Methods

2.1. Design and Sample

A cross-sectional study was conducted in King Abdul-Aziz Residential City at a school clinic. The number of schools involved was 12, all schools are from King Abdul-Aziz Residential City, Riyadh.
Female students aged 11-18 years participated in the study after their legal guardian signed a written consent form. All chosen students were at a transitional period from primary school to middle school, and from middle school to high school. Convenient sampling method was used by including all female students attending the clinic until reaching the number of interest. The study was approved by King Abdullah International Medical Research Center.

2.2. Data Collection

Self-reported questionnaire and anthropometric measurements were used for data collection. The questionnaire was designed to study demographic, parents' education and occupational status, screen time, and dietary habits among female students, and its use in that respect had been standardized. Prior to filling out the questionnaire, the students were informed about the study and were given instructions on how to fill out the questionnaire. The response rate was 84%.

2.3. Anthropometric measurements

Trained nurses performed the anthropometric measurements in the morning and according to standardized procedures. Weight was measured to the nearest 100 g, using a calibrated portable scale. Measurements were done with minimal clothing and without shoes. Height was measured to the nearest cm, without shoes, using a calibrated measuring rod. Body mass index (BMI) was calculated as a ratio of weight in kg by height in meter squared. The age- and sex-specific BMI cutoff reference standards of the International Obesity Task Force (IOTF) were used in identifying overweight and obesity in adolescents between the age of 11 and 17 years. For participants aged 18 years, we used cutoff points of 25-29.9 kg/ m**2** for overweight and 30 kg/m**2** and higher for obesity. Waist-circumference (WC) was measured horizontally to the nearest 0.1 cm at the level of umbilicus, using a non-stretchable measuring tape. Participants were measured in private at the clinic. For cultural reasons, WC was measured in girls with light shirt on.Waist-to- height ratio (WHtR) was calculated, dividing WC (in cm) by height (in cm). A WHtR cutoff point of 0.50 was used for defining abdominal obesity in females.

2.4. Data Analysis

The data was analyzed by using the Statistical Package or Social Sciences (SPSS) version 20. Categorical data is presented as frequencies and percentages. Numerical data is presented as mean ± standard deviation. The association between obesity and life-style/dietary habits among adolescents was determined by using the Chi-square and One-way ANOVA for comparing BMI/WHtR between age groups. A p-value <0.05 was considered statistical significant, while a 0.05<p-value<0.10 was considered suggestive.

3. Results

Characteristics of the participated students are presented in Table 1. A total of 400 female students, with an average age of 14.8 ± 1.2 years, were included in the current study. The mean weight and height of the students were 57.3 ± 14.2 kg and 155 ± 0.06 cm respectively. The average BMI and Waist-to-Height ratio (WHtR) of the participant were 23.86 ± 5.34 kg/m^2 and 0.48 ± 0.07 respectively.

Table 1. Characteristics of the participants (n= 400)

Variables	Mean ± SD	Median (IQR)
AGE (years)	14.8 ± 1.2	15 (15, 15)
WEIGHT (kg)	57.3 ± 14.2	54.5 (47.5 64.6)
HEIGHT (cm)	155 ± 0.6	155 (151, 159)
BMI (kg/m^2)	23.8 ± 5.3	22.8 (20.1, 26.6)
Waist circumference	73.8 ± 11.4	72 (65, 80)
Waist to height ratio (WHtR)	0.47 ± 0.07	0.46 (0.43, 0.52)

3.1. Anthropometry

Anthropometric measurements and prevalence of overweight plus obesity in Saudi female adolescents according to age groups are presented in Table 2. The comparing of BMI and age groups revealed that there is no difference. Based on Waist Height Ratio: 139 (35%) of students had a WHtR of 0.5 or more. The measurements of BMI indicated that 159 (40%) of female students are overweight/obese. Of 400 female students, overweight and obese subjects represented 98 (25%) and 61 (15%) of the students respectively.

Table 2. Anthropometric measurements in Saudi female adolescents relative to age. (N=399)

Variables	Age in years			P value
	11 - 13 (n= 41)	14 – 15 (n= 268)	16 – 18 (n= 90)	
BMI (kg/m²)	22.2 ± 5.5	23.8 ± 5.2	24.8 ± 5.5	0.61
Waist to height ratio (WHtR)	0.48 ± 0.07	0.48 ± 0.07	0.48 ± 0.08	0.76
Overweight + Obese (%)	19 (46%)	98 (37%)	42 (47%)	0.16

Table 3. Association between BMI categories and lifestyle /dietary variables*

Questions	Total	BMI categories		P-value
		Obese/Overweight (n= 159)	Normal weight/ underweight (n= 240)	
Father's occupational status? • Working • Not working	362 34	137 (86%) **22 (14%)**	225 (95%) 12 (5%)	0.003
How many days of the weekend do you usually eat breakfast? • None • On one day only • Both days	112 114 172	54 (34%) 52 (33%) 53 (33%)	58 (24%) 62 (26%) **119 (50%)**	0.005
Are there usually breakfast products at your home? • Yes, always • Often / Sometimes • Not often / Never	184 164 51	76 (48%) 56 (35%) 27 (17%)	108 (45%) **108 (45%)** 24 (10%)	0.049
How often do you eat Vegetables? • Never / Rarely • Few times a week but not daily • One-time daily • Two-time daily	221 45 81 52	**102 (64%)** 13 (8%) 28 (18%) 16 (10%)	119 (50%) 32 (13%) 53 (22%) 36 (15%)	0.03
How many hours per day do you spend watching TV? • Less than one hour • 1-2 hours a day • More than 2 hours	127 110 155	48 (30%) 37 (23%) **73 (46%)**	79 (34%) 73 (31%) 82 (35%)	0.07
Do you have a TV in your bedroom? • Yes • No	68 331	**35 (22%)** 124 (78%)	33 (14%) 207 (86%)	0.03

3.2. Eating habits (N=400)

The majority of female students 239 (60%) reported eating breakfast, during school days, daily or three to four times per workdays. The two most common reasons to skip breakfast were "I'm not hungry in the morning" 124 (31%) and "I don't have enough time" 88 (22%). There were 169 (42%) female students who never or rarely eat breakfast together with their parents or siblings. There were 61 (15%) female students who eat three meals per day, while151 (38%) eat two meals per day, and 144 (36%) eat one meal per day.

Vegetables and fruits were not frequently consumed, the percentage of female students who rarely or never eat vegetables and fruits were 221 (55%) and 228 (57%) respectively. Almost half of the participants, 195 (49%), rarely or never drink milk. A high proportion of participants 141 (35%) drink sweetened carbonated beverages one or more times daily (Fig 1).

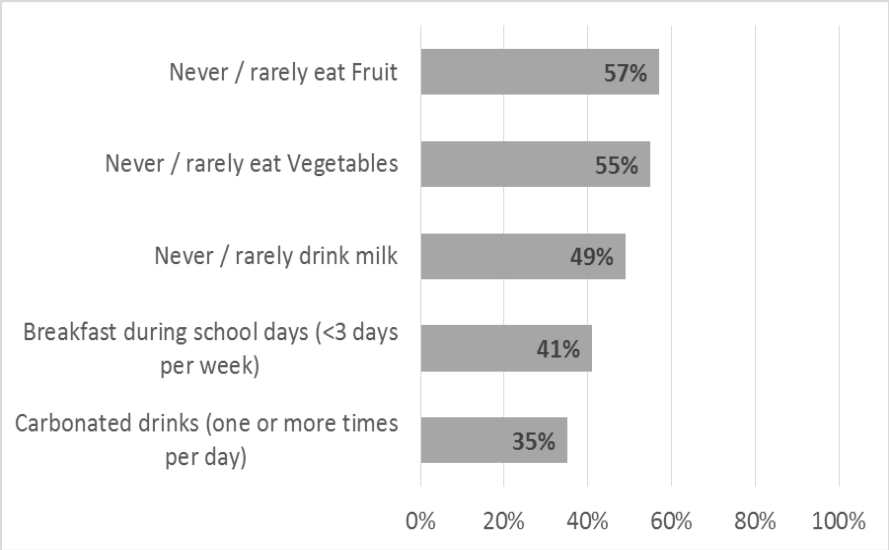

Figure. 1: Frequency of non-healthy nutrition habits among female adolescents

3.3. Association between BMI status and eating habits

Comparison of the students' anthropometric measurements with their eating habits (Tables 3) revealed that 22 (14%) of the obese/overweight students had fathers who were employed as compare to 12 (5%) in normal/underweight students (p= 0.003). There were 119 (33%) normal/underweight female students who tend to eat on both weekend days as compared to 53 (33%) obese/overweight female students (p= 0.005). It also showed that 102 (64%) obese/overweight female students rarely/never eat vegetables compared to 119 (50%) normal/underweight students (p= 0.03).

Of 159 obese/overweight students, 35 (22%) of them have TV in their bedroom as compared to 33 (14%) out of 240 normal/underweight female students (p= 0.03). There were 73 (46%) obese/overweight students who spent two hours or more watching TV compared to 82 (35%) normal/underweight students who spent less time watching TV (p= 0.07).

4. Discussion

This research was designed to analyze and assess the relation between eating habits and its association with obesity among adolescent girls attending schools in the National Guard residential city in Riyadh, Saudi Arabia. This study showed that two-fifth of female students were overweight or obese. In detail, overweight student's composed 25% of the study participants, while obese students came out at 15% of the total study participants.

Other research studies have showed similar results to ours while others had some degree of variance, especially in international studies [10, 13, 14]. A study done in Rass, Qassim showed similar findings, with an overweight percentage of 22% and an obese percentage of 16% [7]. Another local study that showed similar results conducted in Riyadh, Khobar, and Jeddah showed that female overweight and obese proportions were 21% and 14% respectively [8]. On a regional scale, a study in Kuwait showed overweight and obese percentages as 32% and 9% respectively. In Lebanon, it showed 38% for overweight students and 13% for obese students [11].

A study done in the United States by the National Health and Nutrition Examination Survey (NHANES) showed a combined 34% prevalence of overweight and obesity among US adolescents [12]. Another study done in India on 1375 adolescent girls showed the prevalence of obesity among school girls attending schools in the West Bengal region to be 10.6%, [13]. A study done in the Kumasi Metropolis in Ghana done on 500 students showed an overall obesity prevalence among them to be 12% [14].

Being obese/overweight was found to be more significantly associated with fathers being unemployed. The study results also tell us that half of normal/underweight female students tend to eat on both weekend days compared to about one-third for obese/overweight individuals. In addition, around two-thirds of obese/overweight students reported that they never or rarely eat vegetables; as is also mentioned in another study from Saudi Arabia [7], but other studies in Lebanon and China show that students consume vegetables three times a week [9, 10]. A recent systematic review concluded that increased fruit and vegetable intake contributed to reduced adiposity among overweight and obese individuals [15].

Students who reported watching TV for two or more hours were more likely to be obese, other studies locally and internationally also agree on this point due to a combination of inactivity and a disturbed sleeping schedule [15-17]. Two-fifths of students reported that they never or rarely eat breakfast during school days. Among all the dietary habits assessed in our study, overweight and obesity was significantly associated with less frequent consumption of breakfast, which is also a strong predictor of obesity in other countries such as Iran and Italy [17,18].

In our opinion, the modernization of Saudi Arabia that lead to the widespread of fast food restaurant chains all across the nation and the influx of the digital and mobile era led to an increase in the amount of sedentary life-style among adolescents. This was due to increased time spent on sitting and playing with mobile devices, watching TV, playing video games, decreased physical activity, and unhealthy fast food consumption that are usually extremely high in caloric amounts and multiple studies suggest the same [15,16].

The study's limitation is that the students who were enrolled were attending a school clinic for routine screening and were at a transitional period going from primary school to middle school, and from middle school to high school, thus the age was limited to 12-17 years.

5. Conclusion

The state of becoming obese and overweight is high among adolescents with an overall overweight/obesity prevalence of 40%. Therefore, the goal of reducing such a state is of considerable importance towards achieving proper public health. In turn, we recommend implementing national prevention programs emphasize on lifestyle modification, including reducing television viewing and avoiding unhealthy dietary habits, such as skipping breakfast in weekend days and infrequent consumption of vegetables.

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