

## PREVALENCE OF OBESITY IN FEMALE SCHOOLCHILDREN, RISK FACTORS, AND RELATION TO LIFESTYLE IN TABUK, SAUDI ARABIA

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### ABSTRACT

Overweight and obesity are defined as excessive fat accumulation that causes a risk to one's well-being. Recognition of the avoidable risk factors for obesity in children will prevent their serious consequences during adulthood. This study aimed to measure the prevalence and risk factors of obesity in a population of female school students from 12-18 years in Tabuk, Saudi Arabia. This study was a cross-sectional study among 102 female students aged (12-18 years old) from schools in Tabuk City, Saudi Arabia. A structured questionnaire containing demographic, socioeconomic, and full history was used to collect the information. The parents signed the informed consent and the students filled out the questionnaire, and then general examination together with anthropometric measurements was done using Saudi growth charts of the corresponding age and sex. Being overweight and obese were found in 29.4% 8.8% respectively and were significantly associated with a family history of obesity, drinking too much soda/coffee/tea, frequent lunch meals, an absence of satisfaction about body configuration, and the thinking that their family is overweight. Consanguinity, number of meals/days, and regular eating times were not significant. Obesity is prevalent among girls in Tabuk City, Saudi Arabia. Risk factors include: drinking too much soda/coffee/tea, frequent lunch meal, an absence of satisfaction about body configuration, and the thinking that their family is overweight. Prevention programs involving school children and adolescents and their whole families should be implemented for controlling the current epidemic of obesity.

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### Introduction

Obesity is alarming rising worldwide, the figure jumped from 4% to 18% in the age group 5-19 (1975-2016). Obesity put children at a high cardiometabolic disorders in adult age. In addition, obesity predisposes to stroke, musculoskeletal disorders, and various types of malignancy [1, 2]. Obesity is a chronic disease resulting from lifestyle and environmental interplay [3-5].

Importantly, 38.2 million children below five years of age were either obese or overweight and the highest rate was reported in Asia. Saudi Arabia is not an exception, an increasing trend was observed in the last twenty years mainly due to the adoption of high-calorie consumption and physical inactivity [6].

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A high rate of childhood obesity was observed in Saudi Arabia, United Arab Emirates, and Nepal, 18.2%, 7%, and 17.4% respectively [7-9]. Saudi Arabia reported an increasing prevalence of obesity in the last 20 years [4]. Physical inactivity and maternal obesity are strong predictors of obesity, an interesting study reported obesity of 87% middle socioeconomic background [10-14]. No gender differences were reported among obese children in Saudi Arabia [2].

Obesity is an epidemic and an integral part of the metabolic syndrome; children with obesity are at increased risk of physical and mental disorders including metabolic-associated fatty liver disease, diabetes and impaired glucose tolerance, hypertension, and depression. In addition, obesity causes two million deaths/per year [15-17]. No countries are immune, the increasing rate involved The USA [18], Canada [19], and Australia [17]. Screening and lifestyle advice is recommended by the American Academy of Paediatrics [20]. Obesity is on the rise in all Gulf Countries and in particular Saudi Arabia. Therefore, the current study aimed to assess the Prevalence of obesity in female schoolchildren and its risk factors and relation to lifestyle behaviours in Tabuk City of Saudi Arabia.

## Materials and Methods

This cross-sectional, questionnaire-based research was conducted among 102 public intermediate and high school females (12-18 years) during the period 2019-2020. We choose three classes one from each level to complete the sample size. For every student, we distributed the questionnaires. Confidentiality was resorted according to Helsinki Declaration. The exclusion criteria were children aged < 12 or > 18 years, unknown birth dates, those who refused participation, and incomplete questionnaires.

A structured questionnaire based on sociodemographic factors (age, gender, nationality, level of education, and residence for both children and their parents). In addition, dietary habits, exercise, and self-esteem among children and parents were recorded. The questionnaire included a family history of obesity and parents' awareness of obesity in their children. The third part of the questionnaire is related to the school environment. The components of the questionnaire were either yes/no or multiple choices. A meeting was held with the school's headmasters, the students, and the parents, and the purpose of the research was explained to them. The teachers were attending the questionnaire filling to solve any difficulty. Weight and height were measured to estimate the body mass index. Children were weighed while wearing minimal clothing and without shoes. The researchers used a suitable electronic balance (Detecto type, USA). The height and weight were measured according to the standard guidelines as follows:

- Underweight (< 5th percentile)
- Healthy weight (> 5th percentile and < 85<sup>th</sup>)
- Overweight (> 85th percentile and < 95th percentile)
- Obese (> 95th percentile).

### Data Analysis

They used the Social Sciences (IBM, SPSS, version 21, New York) for data analysis. The data were presented as Mean  $\pm$  SD and percentages. The Chi-square and T-test were used when appropriate. A P-value of <0.05 was considered significant.

### Ethical Issues

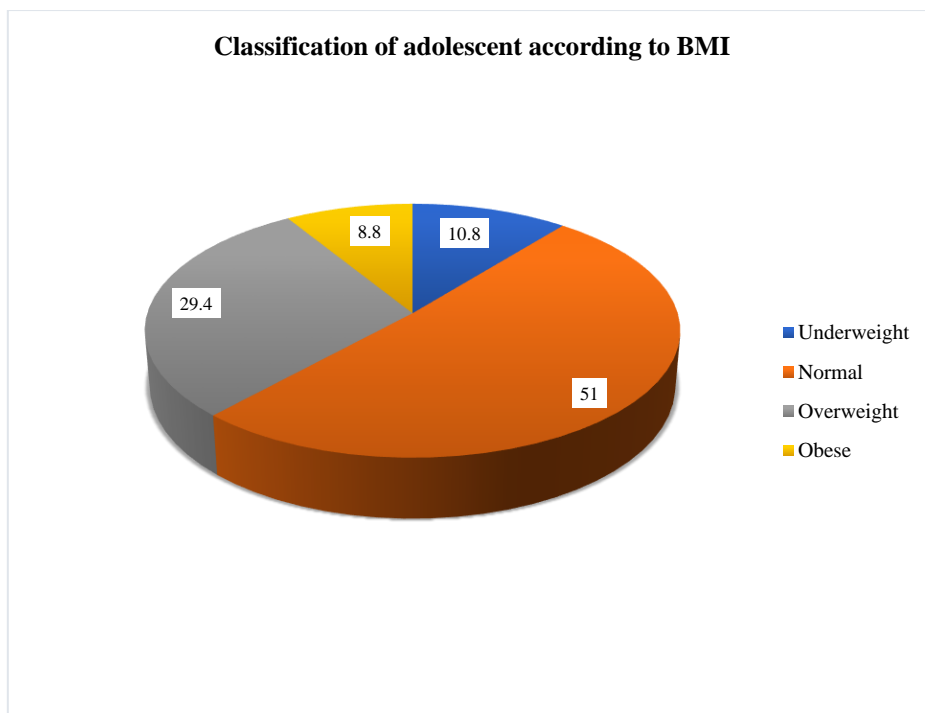
The ethical committee of the University of Tabuk and the Ministry of Higher Education in Tabuk approved the research and all the children and parents signed written informed consent.

## Results and Discussion

This study included 102 participants; all of them were female students. The mean age and standard deviation of the participants were  $15.5 \pm 1.8$  years (Range 12-18 years). The analysis of socio-demographic variables is summarized in **Table 1**. The mean and standard deviation of the anthropometric measurements for the included children were as Weight:  $58.5 \pm 12.9$  kg; Height:  $157.3 \pm 5.01$  cm; and for BMI:  $23.6 \pm 4.9$  kg/m<sup>2</sup>. Among the 102 participants, 29.4% were either overweight, 8.8% were obese, and on the other hand, 10.8 % of them were underweight. 51% of the total participants were normal weight. The details are shown in **Figure 1**. When measuring the association between overweight and obese children and their socio-demographic characteristics, it was found that there was a statistically significant association between the presence of overweight and obesity and positive family history of obesity (P-value < 0.05) meaning that the increase in father's and/or mother's weight or any family member's weight substantially led to increasing in the child's BMI. Moreover, It was found that the lack of satisfaction about body configuration and thinking that family is overweight had a significant association with the child being overweight and obese. Moreover, the prevalence of overweight/obesity was positively increased with a higher number of carbonated drinks, coffee, and tea consumption. The percentage of overweight/obese children was constantly increasing with the number of cans consumed daily. There was also a significant association between having lunch regularly and obesity. However, there was no statistically significant association with birth order, consanguinity, practicing exercise, number of meals, eating between meals, crying spells, or sleep disturbance when compared with non-obese ones.

**Table 1.** Basic characters of schoolchildren

	Underweight N(11)	Normal N(52)	Overweight & obese N(39)		
<b>Age</b>	15.55±2.1	15.35±1.8	15.8±1.7	0.416	0.742
<b>Birth order</b>					
1st	4(36.4%)	18(34.6%)	19(48.7%)	2.336	0.674
2nd	2(18.2%)	9(17.3%)	7(17.9%)		
≥ 3th	5(45.5%)	25(48.1%)	13(33.3%)		
<b>Health problem</b>					
Present	0(0%)	5(9.6%)	1(2.6%)	2.77	0.25
Absent	11(100%)	47(90.4%)	38(97.4%)		
<b>Consanguinity</b>					
Yes	7(63.6%)	22(42.3%)	19(48.7%)	1.728	0.422
No	4(36.4%)	30(57.7%)	20(51.3%)		
<b>Family history of obesity</b>					
Yes	1(9.1%)	10(19.2%)	24/61.5	6.08	0.048
No	10(90.9%)	42(80.8%)	15/38.5		

**Figure 1.** Classification of adolescents according to BMI**Table 2.** Body mass index among female schoolchildren in Tabuk, Saudi Arabia

	Frequency	Percent
.00	11	10.8
1.00	52	51.0
2.00	30	29.4
3.00	9	8.8

**Table 3.** The association of obesity and eating patterns of the study group

	Underweight N(11)	Normal N(52)	Overweight & Obese N (39)		
<b>Practicing exercise</b>					
No	4(34.4%)	19(36.5%)	12(30.8%)	0.352	0.839
Yes	7(63.4%)	33(63.5%)	27(69.2%)		

<b>Current mood</b>					
Stable	1(9.1%)	3(5.8%)	2(5.1%)	0.387	0.983
Anxious	8(72.7%)	40(76.9%)	29(74.4%)		
Unstable	2(18.2%)	9(17.3%)	8(20.5%)		
<b>Preferred food</b>					
unhealthy	7(63.6%)	35(67.3%)	25(64.1%)	0.125	0.94
healthy	4(36.4%)	17(32.7%)	14(35.9%)		
<b>Number of meals per day</b>					
One meal	2(18.2%)	8(15.4%)	2(5.1%)	3.19	0.526
2-3 meals	4(36.4%)	24(46.2%)	18(46.2%)		
Furthermore	5(45.5%)	20(38.5%)	19(48.7%)		
<b>Eating between meals</b>					
No	3(27.3%)	17(32.7%)	17(43.6%)	1.58	0.455
Yes	8(72.7%)	35(67.3%)	22(56.4%)		
<b>Drinking soda/tea/coffee</b>					
Yes	5(45.5%)	19(36.5%)	25(64.1%)	6.8	0.033
No	6(54.5%)	33(63.5%)	14(35.9%)		

**Table 4.** Obesity's relationship to appetite, medications use, losing energy, crying spells, sleep disturbances, and attitude toward body image.

	<b>Underweight N(11)</b>	<b>Normal N(52)</b>	<b>Overweight &amp; Obese N (39)</b>		
<b>Change appetite</b>					
No	1(9.1%)	20(38.5%)	12(30.8%)	3.65	0.161
Yes	10(90.9%)	32(61.5%)	27(69.2%)		
<b>Consume medications</b>					
No	10(90.9%)	45(86.5%)	34(87.2%)	0.156	0.925
Yes	1(9.1%)	7(13.5%)	5(12.8%)		
<b>Losing energy</b>					
No	2(18.2%)	22(42.3%)	11(28.2%)	3.39	0.184
Yes	9(81.8%)	30(57.7%)	28(71.8%)		
<b>Crying spell</b>					
No	11(100)	40(76.9)	28(71.8)	3.9	0.14
Yes	0	12(23.1)	11(28.2)		
<b>Sleep disturbance</b>					
No	7(63.6)	22(42.3)	20(51.3)	1.92	0.383
Yes	4(36.4)	30(57.7)	19(48.7)		
<b>Satisfaction about body configuration</b>					
Underweight	5(45.5)	4(7.7)	0	61.2	<0.001
within normal	6(54.5)	37(72.1)	6(13.3)		
Overweight	0	11(21.2)	33(86.7)		
<b>Wishing better body</b>					
No	1/9.1	6/11.5	1\2.6	2.5	0.285
Yes	10/90.9	46/88.5	29/96.7		
<b>Improve body</b>					
No	5(45.5)	22(42.3)	11(28.2)	2.76	0.599
Diet regimen	4(36.4)	16(30.8)	14(35.9)		
Exercise	2(18.2)	14(26.9)	14(35.9)		
<b>Barriers to a healthy life</b>					
Lack of energy	6(54.5)	32(61.6)	25(64.1)	4.57	0.334
Pressures during the day	4(36.4)	13(25)	5(12.8)		
No support (family and friends)	1(9.1)	7(13.5)	9(23.1)		
<b>Do you think your family is overweight</b>					
No	10/90.9	42/80.8	24/61.5	6.08	0.048
Yes	1/9.1	10/19.2	15/38.5		
<b>Feeling about family members</b>					
Nothing	8(72.7)	34/65.4	24/61.5	2.224	0.695
Try to protect myself	0	5/9.6	2/5.1		
Not obese	3/27.3	13/25	13/33.3		

**Table 5.** The association of obesity with dietary and sleep habits.

	<b>Underweight N(11)</b>	<b>Normal N(52)</b>	<b>Overweight &amp; Obese N(39)</b>
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<b>Breakfast</b>					
No	5/45.5%	17/32.7%	11/28.2%		
Sometimes	1/9.1%	15/28.8%	7/17.9%	4.127	0.389
Regularly	5/45.5%	20/38.5%	21/53.8%		
<b>Lunch</b>					
No	2/18.2	14/26.9	7/17.9		
Sometimes	3/27.3	31/59.6	27/69.2	12.9	0.012
Regularly	6/54.5	7/13.5	5/12.8		
<b>Fast food</b>					
Less than 1-2 /	7/63.6	34/65.4	21/53.8		
Weekly	4/36.4	18/34.6	18/46.2	1.287	0.526
<b>Timing of last meal</b>	20.4±2.3	18.7±6.4	18.8±5.6	0.388	0.679
<b>Time of Sleeping</b>	14.6±5.7	12.3±8.7	13.2±8.2	0.388	0.679
<b>Hours of sleeping</b>	7.6±2.01	7.6±3.2	7.8±2.4	0.047	0.954

The results of our study revealed that the overall prevalence of overweight and obesity among intermediate and high school children was 38.2% (29.4% for overweight and 8.8% for obesity). The current results are similar to previous studies conducted in Saudi Arabia [21, 22] and found obesity and overweight rates of 38.3% and 34.4% respectively). Another study published in the United Arab Emirates showed a prevalence of overweight/obesity in 33.6% (14.7% overweight and 18.9% obese) [23].

The current findings were lower than studies conducted in Eastern Saudi Arabia 42.3% (19.0% were overweight and 23.3% were obese) [14], and Kuwait, 45.3% (30.7% were overweight and 14.6% were obese) [24]. Moreover, our findings were lower than studies from America 48.0% (16.5% were obese, and 31.5% were overweight) [25] and in twelve countries from Europe, 18.4%-42.5% of girls (aged 6-9 years) were overweight. However, the prevalence of obesity ranged from 4.6% to 17.3% among girls [26].

On the other hand, a study conducted in another Gulf country reported overweight in 6% and obesity in 3.5% [27]. Another study conducted in the Eastern Region of Saudi Arabia among 1270 adolescents concluded obesity in 19.1% and 17.7% and overweight in 16.8% and 18.8% for men and women respectively [28].

Plausible explanations might be due to genes, lifestyles, the definition of obesity, and age groups included [29].

Family history as a predictor of obesity and overweight was reported by the current study supporting previous observations [30]. Genetic and unhealthy diets might explain our findings [31]. Carbonated drink consumption was a significant predictor of overweight and obesity and was in line with previous findings [32].

The association between several number of meals and snacks was discussed controversially with some studies showing no association [28, 33], while others showed a positive correlation [34]. In the current study, no statistically significant relationship was shown between meals number and body weight. Additionally, our study showed no association between snack number and obesity and overweight in contradiction to studies published in the previous decade and found a positive association between snack number, overweight, and obesity [35, 36].

Fast food is a main contributor to childhood obesity as reported by studies published in Riyadh, Saudi Arabia, Kuwait, and the USA [37-39]. The current findings were in contradiction to the previous findings. The findings might be explained by the different calories, frequency of fast food consumption, and type of processed fast food taken. The explanation might be the cheap prices and palatable taste of such fast foods and drinks make them more desirable for children and adolescents. Chronic stress was associated with the tendency to consume high-energy food and hence obesity and overweight [40]. In the present study, no association was found between stress and body mass index. The contradiction might be explained by the difference in sample size; in addition, we assessed only females.

The role of physical activity in weight reduction among children (all age groups) is well documented in particular when they are handled by professional trainers [41, 42]. The present study showed also an insignificant association between the prevalence of overweight/obesity and the extent of physical activity during physical education classes. Importantly, our findings of an insignificant association of between obesity, screen timing contradicted previous studies regarding late-night screen time and the duration of video games [43-45], chronotype, and circadian misalignment might explain the contradiction [46].

In the present study, breakfast skipping and late sleeping habits were prevalent among girls in Tabuk City, in similarity to a previous study conducted among medical students in Saudi Arabia [47]. Our findings were in contradiction to a recent study published in Japan [48]. Plausible explanations might be the majority of students in our sample used to consume dinner earlier and consume less junk food which should be encouraged.

## Conclusion

Obesity is prevalent among girls in Tabuk City, Saudi Arabia. Risk factors include: drinking too much soda/coffee/tea, frequent lunch meal, an absence of satisfaction about body configuration, and the thinking that their family is overweight

The prevention programs involving school children and adolescents and their whole families should be implemented for controlling the current epidemic of obesity.

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**Conflict of interest:** None

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**Ethics statement:** Approval letter from the ethics committee of the University of Tabuk, Saudi Arabia (dated 10/9/2019).

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