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Lifestyle Factors Associated with Obesity among Female Adolescents in Tabuk, Kingdom of Saudi Arabia

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Abstract: Obesity is a health problem in the majority of the developed countries and is emerging as a serious problem in the developed countries all over the world. This study aims to evaluate the associations between obesity and several lifestyle factors, including physical activity (PA), dietary habits and time spent on watching television (TV) among Saudi female adolescents (n=250) aged between (14–19) years, studying at intermediate and secondary schools in Tabuk City. A questionnaire was applied to collect the data and anthropometric measurements were taken, too. The study found, with the growing evidence, that physical inactivity is a leading factor in obesity during adolescence and there was statistically significant effect of the (PA and time spent watching TV) on the degree of obesity among the study sample, that the time spent on sedentary activities watching TV was more than twice the recommended for this age group. In addition, the study found that there was a statistically significant effect of the waist-to-hip ratio (WHR) on the degree of obesity among the participants. Findings from a cross-sectional survey of adolescents aged (14–19) years demonstrated that PA levels were low. According to the results of the study, the researcher provided a number of recommendations, including that the school-based program must be reconstructed to provide nutrition education program and physical exercise educational programs for the students, encourage family intervention through parent counseling to encourage healthy eating habits and to make the regular PA as a routine part of a healthy lifestyle and encourage governmental policymakers alongside decision-makers in the Saudi community to support a healthy lifestyle for children and adolescents through local media.

Key words: Adolescents · Dietary Habits · Lifestyle · Overweight · Obesity · Physical Activity · Sedentary Behaviors

INTRODUCTION

The World Health Organization (WHO) [1] identifies adolescence as the period in human growth and development that falls between childhood and adulthood, from age 10 to 19. Adolescent development can be divided into three stages as follows: early (10-13) years, middle (14-17) years and late adolescence (17-19) years. Adolescence is a critical period in life and entails many physiological and psychological developments that have an effect on nutritional requirements and behaviors and may result in overweight or even obesity [2].

Normal, healthy weight is a body weight appropriate for one's height and beneficial to health. One measurement to help determine whether someone is underweight, at a healthy weight, overweight, or obese is the Body Mass Index (BMI) [3].

According to Flegal *et al*. [4], overweight means that a person has more body fat than an optimally healthy person. While obesity is identified as there is excess adipose tissue; it is one of the most common disorders encountered in clinical practice, with major public health consequences. Unfortunately, it is also one of the most difficult and frustrating disorders to manage successfully [5].

Teenagers are up to (20%) of the world's total population. Prevailing overweight and obesity in children and teenagers is a worldwide phenomenon, most increases observed in developed countries. At present, in Saudi Arabia, overweight and obesity are also becoming

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more prevalent, particularly in adolescent females in comparison with boys [6, 7].

Twenty-four percent of Saudi females are in the (12) to (19) age range [8]. It is well known that multiple influences on teenagers' eating behavior make them especially prone to nutritional disorders such as obesity and anorexia. Such may predispose teenagers to long-term health problems. Adolescence is a time period to shape and consolidate healthy eating and lifestyle behaviors, thus preventing nutrition-related chronic diseases in adulthood [9].

Additionally, the occurrence of overweight and obesity has gone up worldwide in the last few years [10] with the US having the highest obesity among the developed countries. From 1980 to 2002, adolescents suffering from overweight and obesity tripled. From 2003 to 2004, (17.1%) of teenagers were overweight and (32.2%) were obese. Currently, around (119 million), or (64.5%) of US teenagers, are suffering from overweight or obesity [11].

It is clear that obesity is a health problem among all Saudi teenagers [12]. Overweight and obesity among the Saudi adolescent population were reported in various studies with the range of male overweight being (26-34%) and of obesity (12-23%), the range of female overweight and obesity were (24-29%) and (19-41%) respectively [12, 13].

Information detailing lifestyle factors related to obesity among teenagers in Saudi Arabia is insufficient and the available data indicated that unhealthy dietary choices and lack of physical activities were generally associated with higher BMI in Saudi children and teenagers [14, 15]. However, local studies based on representative samples and valid instruments to assess lifestyle factors are scarce. This is quite surprising, despite the fact that Saudi Arabia has experienced enormous lifestyle changes in recent decades, accompanied by a remarkable increase in childhood obesity [16, 17].

Although the statistics on the status of school health in the Kingdom of Saudi Arabia (KSA) are scarce, a few studies have confirmed the occurrence of obesity among teenagers and children in the last few years. As early as 1991, Al-Sekait *et al*. [18] suggested that the occurrence of overweight and obesity in Saudi reached as high as (9.5%), while for girls overweight was (20.5%), male school children were (17.6%) and (11.3%) respectively. Five years later, Al-Nuaim [13] found that the occurrence of overweight and obesity among school boys was (11.7%) and (15.8%) respectively.

Such high occurrence of overweight and obesity is a growing concern, as obesity is related to several risks that increase both illness and death, such as type (2) diabetes mellitus, cardiovascular disease, hypertension, stroke, gallbladder disease, certain types of cancers, sleep apnea, obesity hypoventilation syndrome, depression and low self-esteem [19].

Upon being stated above, obesity has a multifactorial cause including genetic, demographic parameters and lifestyle elements [20, 21]. Genetic and demographic parameters such as family history of obesity, age, ethnicity and sex cannot be modified. However, a specific lifestyle causing obesity is modifiable. Therefore, a better understanding of the association between obesity and lifestyle is necessary for effective prevention and management of obesity in teenagers.

In line with the above and for the purpose of this study, the researcher seeks to evaluate the associations between obesity and several lifestyle factors, including PA, dietary habits and time spent viewing TV among Saudi female adolescents aged between (14–19) years.

MATERIALS AND METHODS

This cross-sectional study was conducted in 2014AD among students at intermediate and secondary schools in Tabuk city, KSA.

Study Population: The study population included Saudi female adolescents between (14-19) years of age, studying at intermediate and secondary schools in Tabuk City.

Sample Size: A multistage stratified cluster random sampling technique was applied to select the sample. In the first stage, a systematic random sampling procedure was applied to select the schools. Then, the selection of schools and students was proportional to population size in four geographical areas. Four schools were selected from each of the four geographical areas (East, North, South and West). At the second stage, classes were selected at each grade (level) using a simple random sampling design. The total sample size consisted of (250) female adolescents (10% of the total). The following criteria were applied for selecting the sample: The female adolescent students should be free from any chronic disease, Saudi nationality and the BMI for female adolescent students (BMI = 30).

Data Collection: Two instruments were designed to collect the necessary data for the study:

A Structured Self-administered Questionnaire to Collect Data about the Participants, Including the Following Parts: 1) Socio-demographic characteristics related to adolescents, such as age, marital status, educational level, number of family members and socio-demographic data related to parental education, occupation and income. 2) Student's family history of obesity. 3) Female student practices regarding PA (Collect information on duration, frequency and type of PA during a typical week), screen time (Including TV viewing) and smoking. 3) Dietary habits by semi-quantitative Food Frequency Questionnaire (FFQ) for dietary intake assessment:

Also, the retrospective dietary intake of the study participants was asked to report the frequency and portion size for each food item consumed over the past (6) months. This period was chosen to take into account the seasonal variation in food consumption. The different food groups included in the questionnaire were as follows: cereals (Breads), fruits, vegetables (Cooked and uncooked), meat, Eggs, milk and dairy products, oils (Sauces), beverages (Soft drinks), snacks (donuts, cakes, sweets and chocolates) and fast foods.

The fast foods in this regard included some examples from Arabic fast foods such as Shawarma (It is grilled meat or chicken in pita bread with some salad). The method categories ranging from zero intake (Never) to a maximum intake of days per week (Every day) and include portion size estimates where respondents are asked to indicate the frequency of consumption of specific quantities of foods (e.g. ½ a cup, ¾ cup etc.) or to assess their usual portion size based on a specified measure. Diet quality was evaluated by comparing (Mean) intake servings from the cereals, fruits, vegetables, meat, milk and oils groups from the (FFQ) with MyPlate number of serving recommendations, was evaluated according to the Dietary Guidelines for Americans (2011). The Dietary Guidelines and MyPlate [22], food group serving recommendations were applied given the lack of comparable dietary recommendations specific to KSA.

Anthropometric Measurements: The researcher applied these instruments to determine four measurements: height, weight, waist circumference and hip circumference. A digital measurement with a height rod and clear LCD display (MDW-300L Person Measurement, Adam *Equipment* Co. Ltd., UK) was applied for measuring weight and height as in:

- Weight measurement: Measurements of weight were obtained in kilograms to the nearest (0.1) kg, while the student is standing motionless in the middle of the measurement platform with the feet slightly apart and the body weight distributed equally on both feet without shoes and in light clothes.
- Height measurement: Measurements of height were obtained in centimeters to the nearest (0.1) cm, to the highest point of the head with enough pressure to compress the hair and while the student is barefoot and in light clothes, standing with heels together, arms to the side, legs straight, shoulders relaxed and head in the Frankfort horizontal plane.
  BMI was computed by the formula:
  BMI = Weight in kilograms divided by (Height in meters)^2
- Waist circumference: measurements of waist circumference were measured by using plastic nonstretchable tape (cm) as the point midway between the costal margin and iliac crest in the mid-axillary line, the student was asked to stand, breathe normally and was recorded to the nearest (0.5) cm.
- Hip circumference: measurements of hip circumference were measured by using plastic nonstretchable tape (cm) at the widest point around the greater trochanter and were recorded to the nearest 0.5 cm.
  WHR was computed by the formula:
  WHR = waist measurement (cm) divided by the hip measurement (cm).

Table 1: Weight classification by BMI

Weight classification	Obesity class	BMI (kg/m)^2	Risk of disease
Obesity	I	30 – 34.9	High
Obesity	II	35 – 39.9	Very high
Extreme Obesity	III	= 40	Extreme high

Source: American Academy of Pediatrics Committee on Nutrition (2003) [23].

Table 2: WHR classification

Waist –to- hip classification	Risk of disease
0,80 or below	Low risk
Between 0,81 - 0,85	Moderate risk
Above 0,85	High risk

Source: WHO [24].

Instrument Validity: Six expert Academic professional staff in the field of Food and Nutrition department (4 academic staff) and Statistical department (2 academic staff), were selected and chosen to test the clarity of instruments.

The Pilot Study: A pilot study was carried out with (10%) of female students to test the clarity of the questions and to estimate the time required for each student and

accordingly modification was done. These students were not included in the actual study.

The Actual Study: Collecting data for the current study was done during the period from March (2014) to the end of May (2014).

The average time spent for collecting data from each student was approximately (15-20) minutes for the questionnaire sheet and (10) minutes for anthropometric measurements. Collecting data was conducted in the classroom in the morning time. The simple explanation was given to fulfill the questionnaire sheet. Then, anthropometric measurements were carried out by the researcher after the students fulfill the questionnaire.

Statistical Analysis: The various methods applied for data analysis. The collected data were coded, organized and tabulated into specially designed formats to be suitable for computer filling. It has then been analyzed by using SPSS for Windows, Version 20 (SPSS Inc, Chicago, IL, USA). For quantitative data, percentage distribution of frequency, mean and standard deviation were also computed by the researcher. For qualitative data, the number and percent distribution. Chi-square and analysis of variance (ANOVA) test were applied to compare the weight classification by BMI among the study sample. Significance was adopted at p □ 0.05 for interpretation tests.

RESULTS

Anthropometric Measurements of the Studied Sample: Table (3) shows the mean and standard deviation of the participants according to different anthropometric measurements. As regards to studied sample's mean of height was (158.67±12.075), a mean of weight was (87.20±14.764), a mean of BMI was (34.64±5.187), a mean of waist circumference was (92.14±13.400), a mean of hip circumference was (109.28±14.863) and a mean of WHR was (.84115±.035657) as well.

Table (4) shows the percent distribution of the participants according to their weight classification by BMI. Concerning to BMI slightly more than half (62.8%) of the participants were obese I (High risk), while (13.6%) were obese II (Very high risk) and (23.6%) were obese III (Extremely high risk).

Table (5) shows the percent distribution of the participants according to their classification of WHR. Concerning to WHR slightly more than half (64.8%) of the participants was between 0.81-0.85 (Moderate risk), while (30.0%) were above 0.85 (high risk) and (5.2%) were 0.80 or below (low risk).

Correlations: Table (6) shows the relationship between the social-demographic characteristics of the participants and their weight classification by BMI, where we note that there was no statistically significant effect of the (Age, Educational level, number of family

Table 3: Means and standard deviations according to different anthropometric measurements.

Measurements	Mean	Std. Deviation
Height (cm)	158.67	12.075
Weight (kg)	87.20	14.764
BMI (Kg / mI)	34.64	5.187
Waist circumference (cm)	92.14	13.400
Hip circumference (cm)	109.28	14.863
WHR (cm)	.84115	.035657

Table 4: Percent distribution of the participants according to their weight classification by BMI

		(n=250)	
Weight classification	Risk of disease	No	%
Obesity I	High	157	62.8
Obesity II	Very high	34	13.6
Extreme Obesity III	Extremely high	59	23.6

Table 5: Percent distribution of the participants according to their classification of WHR.

		(n=250)	
Waist –to- hip classification	Risk of disease	No	%
0.80 or below	Low risk	13	5.2
Between 0.81 – 0.85	Moderate risk	162	64.8
Above 0.85	High risk	75	30.0

Table 6: Percent distribution and Chi-square of the Socio-demographic characteristics.

Socio -demographic characteristics			Weight classification by BMI						
			Obesity I	Obesity II	Obesity III	Total	P-value	df	Ch2
Age	14-15	Count	79	13	25	117	0.661	4	2.408
		%of Total	31.6%	5.2%	10.0%	46.8%			
	16-17	Count	37	9	16	62			
		%of Total	14.8%	3.6%	6.4%	24.8%			
	18-19	Count	41	12	18	71			
		%of Total	16.4%	4.8%	7.2%	28,4%			
Total		Count	157	34	59	250			
		%of Total	62,8%	13.6%	23.6%	100.0%			
Educational level	Intermediate stage	Count	95	18	33	146	0.653	2	0.853
		%of Total	38.0%	7.2%	13.2%	58.4%			
	Secondary stage	Count	62	16	26	104			
		%of Total	24.8%	6.4%	10.4%	41.6%			
Total		Count	157	34	59	250			
		%of Total	62,8%	13.6%	23.6%	100.0%			
Number of family members	Less than 3 members	Count	14	5	8	27	0.092	4	0.092
		%of Total	5.6%	2.0%	3.2%	10.8%			
	4-6 members	Count	45	16	15	76			
		%of Total	18.0%	6.4%	6.0%	30.4%			
	7& more members	Count	98	13	36	147			
		%of Total	39.2%	5.2%	14.4%	58.8%			
Total	Count	157	34	59	250				
	%of Total	62,8%	13.6%	23.6%	100.0%				
Marital status	Single	Count	146	31	51	228	0.317	3	0.317
		%of Total	85.4%	12.4%	20.4%	91.2%			
	Married	Count	11	3	8	22			
		%of Total	4.4%	1.2%	3.2%	8.8%			
Total	Count	157	34	59	250				
	%of Total	62,8%	13.6%	23.6%	100.0%				

* The level of significance at (p <0.05)

members and marital status) on the degree of obesity in the study sample, as the value of P (0.661, 0.653, 0.092, 0.317) respectively, which is greater than (0.05).

Table (7) shows the relationship between the social-demographic characteristics of the parents according to their weight classification by BMI to studied sample, where we note that there was no statistically significant effect of the (Father's education, Father's occupation and Monthly income) on the degree of obesity among participants, as the value of P (0.828, 0.473, 0.369) respectively, which is greater than (0.05). Moreover, there was a statistically significant effect of the (Mother's education and Mother's occupation) on the degree of obesity in the study sample, as the value of P (0.001, 0.035) respectively, which is less than (0.05).

Table (8) shows the relationship between the student's family history of obesity among the participants and their weight classification by BMI, where we note that there was no statistically significant effect between obesity family history and the degree of obesity among the participants, as the value of P (0.227) which is greater than (0.05).

Table (9) shows the relationship between the practices regarding PA and screen time of the participants and their weight classification by BMI, where we note that there was a statistically significant effect of the (PA and time spent watching TV) on the degree of obesity in the study sample, as the value of P (0.01, 0.000) respectively, which is less than (0.05).

Table (10) shows the relationship between the classification of WHR of the participants and their weight classification by BMI, where we note that there was a statistically significant effect of the classification of WHR on the degree of obesity in the study sample, as the value of P (0.001) which is less than (0.05).

Table 7: Percent distribution and Chi-square of the Socio-demographic characteristics of the parents

Socio -demographic characteristics			Weight classification by BMI						
			Obesity I	Obesity II	Obesity III	Total	P-value	df	Ch2
Father's education	Illiterate	Count	12	3	4	19	0.828	12	7.429
		%of Total	4.8%	1.2%	1.6%	7.6%			
	Reads and write	Count	20	3	7	30			
		%of Total	8.0%	1.2%	2.8%	12.0%			
	Primary	Count	17	1	4	22			
		%of Total	6.8%	0.4%	1.6%	8.8%			
	Intermediate	Count	30	7	13	50			
		%of Total	12.0%	2.8%	5.2%	20.0%			
	Secondary	Count	47	13	18	78			
		%of Total	18.8%	5.2%	7.2%	31.2%			
	University	Count	21	2	8	31			
		%of Total	8.4%	0.8%	3.2%	12.4%			
	Above university	Count	10	5	5	20			
		%of Total	4.0%	2.0%	2.0%	8.0%			
Total		Count	157	34	59	250			
		%of Total	62,8%	13.6%	23.6%	100.0%			
Father's occupation	Employed	Count	102	25	36	163	0.473	2	1.498
		%of Total	40.8%	10.0%	14.4%	65.2%			
	Unemployed	Count	55	9	23	87			
		%of Total	22.0%	3.6%	9.2%	34.8%			
Total		Count	157	34	59	250			
		%of Total	62,8%	13.6%	23.6%	100.0%			
Father's type of work	Educational	Count	12	2	3	17	0.820	6	2.914
		%of Total	7.4%	1.2%	1.8%	10.4%			
	Administrative	Count	19	3	7	29			
		%of Total	11.7%	1.8%	4.3%	17.8%			
	Military	Count	54	12	18	84			
		%of Total	33.1%	7.4%	11.0%	51.5%			
	Free	Count	17	7	9	33			
		%of Total	10.4%	4.3%	5.5%	20.2%			
Total		Count	102	24	37	163			
		%of Total	62,6%	14.7%	22.7%	100.0%			
Mother's education	Illiterate	Count	22	4	1	27	0.001*	12	34.019
		%of Total	8.8%	1.6%	0.4%	10.8%			
	Reads and write	Count	21	2	8	31			
		%of Total	8.4%	0.8%	3.2%	12.4%			
	Primary	Count	22	4	5	31			
		%of Total	8.8%	1.6%	2.0%	12.4%			
	Intermediate	Count	24	3	9	36			
		%of Total	9.6%	1.2%	3.6%	14.4%			
	Secondary	Count	39	14	22	75			
		%of Total	15.6%	5.6%	8.8%	30.0%			
	University	Count	25	1	13	39			
		%of Total	10.0%	0.4%	5.2%	15.6%			
	Above university	Count	4	6	1	11			
		%of Total	1.6%	2.4%	0.4%	4.4%			
Total		Count	157	34	59	250			
		%of Total	62,8%	13.6%	23.6%	100.0%			
Mother's occupation	Employed	Count	33	14	18	65	0.035*	2	6.718
		%of Total	13.2%	5.6%	7.2%	26.0%			
	Housewife	Count	124	20	41	185			
		%of Total	49.6%	8.0%	16.4%	74.0%			
Total		Count	157	34	59	250			
		%of Total	62,8%	13.6%	23.6%	100.0%			

Table 7: Continued

Socio -demographic characteristics			Weight classification by BMI						
			Obesity I	Obesity II	Obesity III	Total	P-value	df	Ch2
Mother's type of work	Educational	Count	24	6	10	40	0.17	6	9.064
		%of Total	36.9%	9.2%	15.4%	61.5%			
	Administrative	Count	4	4	5	13			
		%of Total	6.2%	6.2%	7.7%	20.0%			
	Free	Count	2	4	2	8			
		%of Total	3.1%	6.2%	3.1%	12.3%			
Total		Count	33	14	18	65			
		%of Total	50.8%	21.5%	27.7%	100.0%			
Monthly income	Less than 3000	Count	54	6	13	73	0.369	6	6.504
		%of Total	21.6%	2.4%	5.2%	29.2%			
	3000-5000	Count	28	9	13	50			
		%of Total	11.2%	3.6%	5.2%	20.0%			
	5000-10000	Count	52	12	21	85			
		%of Total	20.8%	4.8%	8.4%	30.0%			
	More than 10000	Count	23	7	12	42			
		%of Total	9.2%	2.8%	4.8%	16.8%			
Total		Count	157	34	59	250			
		%of Total	62,8%	13.6%	23.6%	100.0%			

*The level of significance at (p <0.05)

Table 8: Percent distribution and Chi-square of the student's family history of obesity of the participants.

Health history regarding family			Weight classification by BMI						
			Obesity I	Obesity II	Obesity III	Total	P-value	df	Ch2
Obesity	Father only	Count	14	4	4	22	0.227	6	8.159
		%of Total	5.6%	1.6%	1.6%	8.8%			
	Mother only	Count	33	2	16	51			
		%of Total	13.2%	0.8%	6.4%	20.4%			
	Both parents	Count	30	11	13	54			
		%of Total	12.0%	4.4%	5.2%	21.6%			
	There is no	Count	80	17	26	123			
		%of Total	32.0%	6.8%	10.4%	49.2%			
Total		Count	157	34	59	250			
		%of Total	62,8%	13.6%	23.6%	100.0%			

*The level of significance at (p <0.05)

Table 9: Percent distribution and Chi-square of the practices regarding PA and screen time of the participants

Practices regarding PA and screen time			Weight classification by BMI						
			Obesity I	Obesity II	Obesity III	Total	P-value	df	Ch2
Making exercise	Yes	Count	48	3	21	72	0.01*	2	8.18
		%of Total	19.2%	1.2%	8.4%	28.8%			
	No	Count	109	31	38	178			
		%of Total	43.6%	12.4%	15.2%	71.2%			
Total		Count	157	34	59	250			
		%of Total	62,8%	13.6%	23.6%	100.0%			
Type of exercise	Walking	Count	37	2	12	51	0.232	8	10.48
		%of Total	51.4%	2.8%	16.7%	70.8%			
	Streaming	Count	2	1	3	6			
		%of Total	2.8%	1.4%	4.2%	8.3%			
	Swimming	Count	1	0	3	4			
		%of Total	1.4%	0.0%	4.2%	5.6%			
	Bike ride	Count	2	0	0	2			
		%of Total	2.8%	0.0%	0.0%	2.8%			
	Football	Count	6	0	3	9			
		%of Total	8.3%	0.0%	4.2%	12.5%			
Total		Count	48	3	21	72			
		%of Total	66.7%	4.2%	29.2%	100.0%			

Table 9: Continued

Practices regarding PA and screen time			Weight classification by BMI						
			Obesity I	Obesity II	Obesity III	Total	P-value	df	Ch2
Frequency of exercise	One time / week	Count	21	1	5	27	0.641	4	2.518
		%of Total	29.2%	1.4%	6.9%	37.5%			
	Two times / week	Count	13	1	8	22			
		%of Total	18.1%	1.4%	11.1%	30.6%			
	Three times or more	Count	14	1	8	23			
		%of Total	19.4%	1.4%	11.1%	31.9%			
Total		Count	48	3	21	72			
		%of Total	66.7%	4.2%	29.2%	100.0%			
Duration of exercise	Less than half an hour	Count	30	1	7	7	0.13	6	9.874
		%of Total	41.7%	1.4%	9.7%	9.7%			
	30 min	Count	12	1	6	6			
		%of Total	16.7%	1.4%	8.3%	8.3%			
	1 hour	Count	3	1	3	3			
		%of Total	4.2%	1.4%	4.2%	4.2%			
	An hour and a half	Count	3	0	5	5			
		%of Total	4.2%	0.0%	6.9%	6.9%			
Total		Count	48	3	21	72			
		%of Total	66.7%	4.2%	29.2%	100.0%			
Watching TV	1 hour/ day	Count	55	10	1	66	0.000*	4	27.726
		%of Total	22%	4.0%	0.4%	26.4%			
	2 hours/ day	Count	23	2	9	34			
		%of Total	9.2%	0.8%	3.6%	13.6%			
	3 hours or more/ day	Count	79	22	49	150			
		%of Total	31.6%	8.8%	19.6%	60.0%			
Total		Count	157	34	59	250			
		%of Total	62.8%	13.6%	23.6%	100.0%			

*The level of significance at (p <0.05)

Table 10: Percent distribution and Chi-square of the classification of the WHR of the participants.

Waist –to- hip classification			Weight classification by BMI						
			Obesity I	Obesity II	Obesity III	Total	P-value	df	Ch2
Risk of disease	0.80 or below	Count	13	0	0	13	.001*	4	19.67
	Low risk	%of Total	5.2%	0.0%	0.0%	5.2%			
	Between 0.81–0.85	Count	107	25	30	162			
	Moderate risk	%of Total	42.8%	10.0%	12.0%	64.8%			
	Above 0,85	Count	37	9	29	75			
	High risk	%of Total	14.8%	3.6%	11.6%	30.0%			
Total		Count	157	34	59	250			
		%of Total	62.8%	13.6%	23.6%	100.0%			

* The level of significance at (p <0.05)

Table 11: Percent distribution and one way ANOVA test of the FFQ of the participants.

Variables	Weight classification by BMI	N.	Mean	Std. Deviation	F-value	P-value	df
Grain	Obesity I	157	3.7743	1.26906	6.06	0.003	2
	Obesity II	34	4.2904	1.70829			
	Obesity III	59	4.4949	1.69789			
	Total	250	4.0146	1.47265			
Fruits	Obesity I	157	4.8921	2.82953	2.185	0.115	2
	Obesity II	34	5.7267	2.48071			
	Obesity III	59	5.6101	2.85949			
	Total	250	5.1751	2.80589			

Table 11: Continued

Variables	Weight classification by BMI	N.	Mean	Std. Deviation	F-value	P-value	df
Vegetables	Obesity I	157	5.0837	2.48162	3.014	0.051	2
	Obesity II	34	5.9854	2.05024			
	Obesity III	59	5.7100	2.00251			
	Total	250	5.3542	2.34094			
Dairy	Obesity I	157	2.6122	1.43923	5.119	0.007*	2
	Obesity II	34	3.2303	1.35524			
	Obesity III	59	3.1909	1.39404			
	Total	250	2.8328	1.44099			
Meats	Obesity I	157	4.9305	2.10164	6.365	0.002*	2
	Obesity II	34	5.0897	1.66727			
	Obesity III	59	5.9913	1.68877			
	Total	250	5.2025	1.99877			
Oils	Obesity I	157	5.9080	3.84902	8.070	0.000*	2
	Obesity II	34	7.5856	4.06106			
	Obesity III	59	8.0645	3.54631			
	Total	250	6.6451	3.91632			

*The level of significance at (p <0.05)

Table 12: Percent distribution and one way ANOVA test of the anthropometric measurements

Variables	Weight classification by BMI	No	Mean	Std. Deviation	F-value	P-value	df
Height	Obesity I	157	160.94	13.707	9.937	0.000*	2
	Obesity II	34	157.93	8.260			
	Obesity III	59	153.03	5.935			
	Total	250	158.67	12.075			
Weight	Obesity I	157	81.29	13.292	52.326	0.000*	2
	Obesity II	34	92.06	9.865			
	Obesity III	59	100.13	11.255			
	Total	250	87.20	14.764			
Waist circumference	Obesity I	157	84.66	8.277	172.750	0.000*	2
	Obesity II	34	97.97	10.268			
	Obesity III	59	108.68	8.782			
	Total	250	92.14	13.400			
Hip circumference	Obesity I	157	100.57	9.492	198.538	0.000*	2
	Obesity II	34	117.94	11.758			
	Obesity III	59	127.44	6.534			
	Total	250	109.28	14.863			
waist –to-hip ratio	Obesity I	157	.84047	.034905	4.249	0.015*	2
	Obesity II	34	.82842	.026545			
	Obesity III	59	.85031	.039987			
	Total	250	.84115	.035657			

*The level of significance at (p <0.05)

Table (11) shows the relationship between the FFQ of the participants and their weight classification by BMI, where we note that there was a statistically significant effect of the FFQ on the degree of obesity among participants, bearing n mind that all values at the level of significance were less than (0.05).

Table (12) shows the relationship between the anthropometric measurements of the participants and their weight classification by BMI, where we note that there was a statistically significant effect of the anthropometric measurements on the degree of obesity among participants. It is worth noting that all values at the level of significance were less than (0.05).

DISCUSSION

The present study revealed dietary habits among Saudi female adolescents aged (14–19) years, reflecting the dietary patterns of their families. The results revealed that there was no statistically significant effect of the

(Father's education, Father's occupation and Monthly income) on the degree of obesity, whereas there was a statistically significant effect of the (Mother's education and Mother's occupation) on the degree of obesity. This could be due to that the sons spend most of their time with mother that affect female adolescents obesity, as the educated mothers may have more information about healthy eating, the dangers of obesity and nutritional awareness and the mother's occupation can affect obesity female adolescents in that if the mother spends a lot of time at work leads to reliance on fast food or ready-made and that increases the weight.

Moreover, there was no statistically significant effect between obesity family history and the degree of obesity. This result might be attributed to that female adolescents at the present time are interested in weight loss and do not like obesity in honor to personalities who watched on TV. Girls in this age, however, even if they had a susceptibility to obesity due to genetic causes, they had interested in following the diet and stay away from foods that cause obesity.

The present findings are clearly consistent with the evidence, showing that physical inactivity is a leading factor in obesity during adolescence; these results are consistent with the study results of Al-Hazzaa *et al*. [25], Al-Hazzaa *et al*. [26], Kelishadi *et al.* [27] and Janssen *et al*. [28].

The current study showed that there was a statistically significant effect of the (PA and time spent watching TV) on the degree of obesity, that the time spent on sedentary activities watching TV and playing computer games, was more than twice the recommended time for this age group.

Many previous studies have confirmed the impact of watching TV on adolescence obesity, e.g., the study of Tammelin *et al.* [29] and Bathrellou *et al*. [30]. This result attributed to the fact that sitting before TV for a long time without moving around and effort wasted opportunity to calories and fat consumption, as well as food and beverages with high calories that may be taken during the follow-up of TV programs. This habit may have both short- and long-term effects on health and greater efforts to reduce sedentary activities from an early age are critical national priorities.

Loucaides *et al.* [31] revealed that adolescent Finns watch TV (48%) boys and (44%) girls more than (2) hours a day. The prevalence of (2) hours or more screen time per day for Chinese boys and girls aged (13-18) years was (44.3%) and (34.7%), respectively Cui *et al*. [32]. The proportion of US youth who met the TV-watching guideline of (2) hours or less per day is ranged from (65% to 71%) [33]. Among Canadian youth, (41%) girls and (34%) boys at grades (6-10) watched TV (2) hours or less per day. In a study conducted by Hamar *et al*. [34] much less time, with an average of (4.7) hours per week, was spent on all sedentary activities by Hungarian youth aged (13-19) years.

There was a statistically significant effect of the FFQ on the degree of obesity. Another study by Al-Hazzaa *et al*. [25] have confirmed results showed Logistic regression analysis that overweight/ obesity (Based on BMI categories) or abdominal obesity (Based on waist-to-height ratio (WHtR) categories) were significantly and inversely associated with vigorous PA levels.

In a similar vein, Troiano *et al*. [35] conducted a study to detect the relationship between the types of food, rather than total energy intake and obesity explored, it is believed that the contribution of soft drinks to energy intake was higher among overweight children. In a prospective analysis, Ludwig *et al*. [36] observed an association between the consumption of sugar-sweetened beverages and the odds of becoming obese over the follow-up period.

Several studies examined differences in total energy intake among obese and nonobese children; few have examined the consumption of specific foods in relation to weight status among youth. e.g., Phillips *et al.* [37] examined the intake of Energy-dense snack (EDS) foods among obese and nonobese adolescents.

In cross-sectional analyses, energy intake has been positively associated with consumption of nondiet soft drinks. Cross-sectional data from the Third Nutrition Examination Surveys (NHANES) showed that the contribution of soft drinks to energy intake was higher among overweight children [35].

In the study outlined in Janssen *et al*. [38] it is conducted to compare overweight and obesity prevalence at school-aged youth from 34 countries with their relationships with PA and dietary patterns, that most countries PA levels were lower and TV viewing times were higher in overweight compared to normal weight youth. In (91%) of the countries examined, the frequency of sweets intake was lower in overweight than normal weight youth. Overweight status was not associated with the intake of fruits, vegetables and soft drinks or time spent on the computer.

The results of the study conducted by Al-Hazzaa *et al*. [26] showed that a very high proportion (84%) of males and (91.2%) of females of Saudi adolescents spent more than (2) hours on screen time daily and almost half of the males and three-quarters of the females did not meet daily PA guidelines.

The majority of adolescents did not have a daily intake of breakfast, fruit, vegetables and milk. Females were significantly ($p<0.05$) more sedentary, much less physically active, especially with vigorous PA and there were fewer days per week when they consumed breakfast, fruit, milk and dairy products, sugar-sweetened drinks, fast foods and energy drinks than did males.

However, the females' intake of French fries and potato chips, cakes and donuts and candy and chocolate was significantly ($p<0.05$) higher than the males'. Screen time was significantly ($p<0.05$) correlated inversely with the intake of breakfast, vegetables and fruit. PA had a significant ($p<0.05$) positive relationship with fruit and vegetable intake but not with sedentary behaviors.

The current study showed that there was a statistically significant effect of the WHR on the degree obesity. This ratio reflects the content of fat in the abdominal area, where waist circumference ratio mainly reflects the tissue fat in the abdominal area of while hip circumference measurement in this ratio reflects muscle mass and skeletal tissue. This is consistent with what was confirmed by in the study of Taylor *et al.* [39] that the 80th percentile for waist circumference correctly identified (89%) girls and (87%) boys with high trunk fat mass (Sensitivity) and (94%) girls and (92%) boys with low trunk fat mass (Specificity).

In the work of Cole *et al*. [40] it reveals the measurements which were performed in the morning, using standardized procedures. Body weight was measured to the nearest (100) g, with minimal clothing and without shoes, using a calibrated portable measurement. Height was measured to the nearest cm with the subject in the full standing position without shoes using calibrated portable measuring rod.

BMI was computed as body weight in kg divided by height squared in meters. The International Obesity Task Force (IOTF) age- and sex-specific BMI reference values were applied to define overweight and obesity in adolescents aged (14–17) years.

Findings from a cross-sectional survey of adolescents aged (14–19) years demonstrated that PA levels were lower. Referring to the Al-Rukban [15] a study in Saudi Arabia also showed that inadequate PA was associated with obesity in adolescents (OR 1.6; 95% CI 1.01–2.62).

Similarly, Mahfouz *et al*. [41] showed a lack of exercise was a significant risk factor for obesity among adolescents from southwestern Saudi Arabia (aOR 1.35; 95% CI 1.06–1.94). For example, Patrick *et al.* [42] studied a group of adolescents aged (11–15) years from the United States and found a significant association between overweight and vigorous-intensity PA but not with moderate-intensity PA.

Furthermore, Moliner-Urdiales *et al*. [43] compared with moderate-intensity physical activity; a stronger negative association was reported between vigorous-intensity physical activity and total and central body fat in Spanish adolescents.

In addition, a review of Parikh and Stratton [44] the influence of PA on adiposity among (5–18) year olds concluded that a reduction in adiposity and an increase in aerobic capacity were observed when more time was spent on performing the vigorous-intensity PA.

Like other scholars, Ludwig *et al.* [36] in a longitudinal study of non-obese adolescent girls, reported that soda beverages were the only energy-dense snack food to be significantly associated with BMI z-scores over the (10-year) study. It has been suggested that sugar-sweetened beverages in liquid form could lead to increased caloric intake because they are less satiating than solid foods containing similar energy content.

It is possible, however, that the overweight/obese adolescents underestimated their intake of sugar-sweetened beverages and sweets. Another explanation is that overweight/obese adolescents might have been dieting and were switching to reduced-calorie beverages.

In a (5-year) longitudinal study, Vanselow *et al.* [45] found no association between sweetened beverage consumption and adolescent weight gain during the (5-year study). A study of Ledoux *et al.* [46] on the role of fruit and vegetable intake and obesity in children and adults, concluded that increased fruit and vegetable consumption contributed to reduced adiposity among overweight or obese adults, but not among children, in experimental studies.

On the other hand, longitudinal studies of overweight adults showed marked associations between increased consumption of fruits and vegetables and slower weight gain, but only one-half of the children longitudinal studies indicated significant inverse associations between fruit and vegetable intake and obesity.

CONCLUSION

Having identified the aim and the procedures of the present study, the researcher revealed some factors that have an effect on the food pattern among Saudi adolescent aged (14-18) years in Tabuk City, reflecting the dietary habits of their families too. Based on the the present study, the following recommendations are suggested:

- The school-based program must be reconstructed to provide nutrition education program and physical exercise educational programs for students;
- The school must encourage environmental support for behavioral changes through school meal programs that provide students with a balanced and healthy meal;
- Encourage family intervention through parent counseling to encourage healthy eating habits and to make the regular PA as a routine part of a healthy life for all;
- Develop and disseminate appropriate pamphlets/ purchases/ guidelines with specific information and pictures about healthy food;
- Encourage governmental policymakers and other decision-makers in the Saudi community to support a healthy lifestyle for children and adolescents through local media; and
- Attention to local media to decrease their commercial for junk food, food with highly sweet and sugar and fast food, replace them with healthy and balanced type.

REFERENCES

1. World Health Organization, 2009. Child and Adolescents health and development, Geneva: World Health Organization.
2. Rice, F.P. and G. Dolgin, 2002. Adolescents in theoretical culture, Boston: Allyn and Bacon.
3. Ferrera, L.A., (Eds.), 2005. Body mass index: New research. New York: Nova Publishers.
4. Flegal, K.M., M.D. Carroll, C.L. Ogden and L.R. Curtin, 2010. Prevalence and trends in obesity among US adults, 1999-2008. JAMA, 303(3): 235-241.
5. Gidding, S.S., R.L. Leibel, S. Daniels, M. Rosenbaum, L. Van Horn and G.R. Marx, 1996. Understanding obesity in youth: a statement for healthcare professionals from the Committee on Atherosclerosis and Hypertension in the Young of the Council on Cardiovascular Disease in the Young and the Nutrition Committee, American Heart Association. Circulation, 94(12): 3383-3387.
6. Al-Saeed, W.Y., K.M. Al-Dawood, I.A Bukhari and A. Bahnassy, 2007. Prevalence and socioeconomic risk factors of obesity among urban female students in Al-Khobar city, Eastern Saudi Arabia, Obesity Reviews, 8 (2): 93-99.
7. El Mouzan, M.I., P.J. Foster, A.S. Al Herbish, A.A. Al Salloum, A.A. Al Omer, M.M. Qurachi and T. Kecojevic, 2010. Prevalence of overweight and obesity in Saudi children and adolescents. Annals of Saudi Medicine, 30(3): 203-208.
8. Ministry of Economy and Planning of Saudi Arabia, 2007. The Population Pyramid for Saudi. Accessed, Dec 2009. [Online] http:// www.cdsi.gov.sa/ asp/DemographicMap
9. Williams, C.L., M. Bollella and E.L. Wynder, 1995. A new recommendation for dietary fiber in childhood, Pediatrics, 96(5): 985-988.
10. Al-Isa, A.N., 1997 Changes in Body Mass Index and prevalence of obesity among adult Kuwaiti women attending health clinics, Annals of Saudi Medicine, 17: 307-311.
11. Ogden, C.L., M.D. Carroll, L.R. Curtin, M.A. McDowell, C.J. Tabak and K.M. Flegal, 2006. Prevalence of overweight and obesity in the United States, 1999-2004, JAMA, 295(13): 1549-1555.
12. Al-Shammari, S.A., T.A. Khoja and M.A. Al-Maatouq, 1996. The prevalence of obesity among Saudi males in the Riyadh region, Annals of Saudi Medicine, 16(3): 269-273.
13. Al-Nuaim, A.R., 1997. Population-based epidemiological study of the prevalence of overweight and obesity in Saudi Arabia, regional variation, Annals of Saudi Medicine, 17(2): 195-199.
14. Collison, K.S., M.Z. Zaidi, S.N. Subhani, K. Al-Rubeaan, M. Shoukri and F.A. Al-Mohanna, 2010. Sugar-sweetened carbonated beverage consumption correlates with BMI, waist circumference and poor dietary choices in schoolchildren. BMC Public Health, 10(1): 234-247.
15. Al-Rukban, M.O., 2003. Obesity among Saudi male adolescents in Riyadh, Saudi Arabia. Saudi Medical Journal, 24(1): 27-33.
16. Abalkhail, B., 2002. Overweight and obesity among Saudi Arabian children and adolescents between 1994 and 2000, Eastern Mediterranean Health Journal, 8(4/5): 470-479.
17. Al-Hazzaa, H.M., 2007. Prevalence and trends in obesity among school boys in Central Saudi Arabia between 1988 and 2005, Saudi Medical Journal, 28(10): 1569-1574.
18. Al-Sekait, M.A., A.N. Al-Nasser and E.A. Bamgboye, 1992. The growth pattern of schoolchildren in Saudi Arabia, Saudi Medical Journal, 13(2): 141-146.

19. Monteiro, C.A., W.L. Conde and B.M. Popkin, 2001. Independent effects of income and education on the risk of obesity in the Brazilian adult population, The Journal of Nutrition, 131(3): 881-886.
20. Lobstein, T., L. Baur and R. Uauy, 2004. Obesity in children and young people: a crisis in public health, Obesity Reviews, 5(s1): 4-85.
21. Barlow, S.E., 2007, Expert Committee: Expert committee recommendations regarding the prevention, assessment and treatment of child and adolescent overweight and obesity: summary report, Pediatrics, 120(Supplement 4): 164-192.
22. US Department of Health and Human Services, 2011. Dietary guidelines for Americans. USA: Skyhorse Publishing Inc.
23. American Academy of Pediatrics Committee on Nutrition, 2003. Prevention of pediatric overweight and obesity, Pediatrics, 104(5): 1152-1157.
24. World Health Organization, 2008. Waist circumference and waist-hip ratio. World Health Organization: Geneva.
25. Al-Hazzaa, H.M., N.A. Abahussain, H.I. Al-Sobayel, D.M. Qahwaji and A.O. Musaiger, 2012. Lifestyle factors associated with overweight and obesity among Saudi adolescents, BMC Public Health, 12(1): 354-365.
26. Al-Hazzaa, H.M., N.A. Abahussain, H.I. Al-Sobayel, D.M. Qahwaji and A.O. Musaiger, 2011. Physical activity, sedentary behaviors and dietary habits among Saudi adolescents relative to age, gender and region, International Journal of Behavioral Nutrition and Physical Activity, 8(1): 140-154.
27. Kelishadi, R., G. Ardalan, R. Gheiratmand, M.M. Gouya, E.M. Razaghi, A. Delavari, R. Majdzadeh, R. Heshmat, M. Motaghian, H. Barekati, M.S. Mahmoud-Arabi and M.M. Riazi, 2007. Association of physical activity and dietary behaviors in relation to the body mass index in a national sample of Iranian children and adolescents: CASPIAN Study, Bulletin of the World Health Organization, 85(1): 19-26.
28. Janssen, I., P.T. Katzmarzyk, W.F. Boyce, M.A. King and W. Pickett, 2004. Overweight and obesity in Canadian adolescents and their associations with dietary habits and physical activity patterns, Journal of Adolescent Health, 35(5): 360-367.
29. Tammelin, T., U. Ekelund, J. Remes and S. Nayha, 2007. Physical activity and sedentary behaviors among Finnish youth, Medicine and Science in Sports and Exercise, 39(7): 1067-1074.
30. Bathrellou, E., C. Lazarou, D.B. Panagiotakos and L. S. Sidossis, 2007. Physical activity patterns and sedentary behaviors of children from urban and rural areas of Cyprus. Central European Journal of Public Health, 15(2): 66-70.
31. Loucaides, C.A., R. Jago and M. Theophanous, 2011. Physical activity and sedentary behaviors in Greek-Cypriot children and adolescents: a cross-sectional study, International Journal of Behavioral Nutrition and Physical Activity, 8(1): 90-101.
32. Cui, Z., L.L. Hardy, M.J. Dibley and A. Bauman, 2011. Temporal trends and recent correlates in sedentary behaviours in Chinese children, International Journal of Behavioral Nutrition and Physical Activity, 8(1): 93-101.
33. Fulton, J.E., X. Wang, M.M. Yore, S.A. Carlson, D.A. Galuska and C.J. Caspersen, 2009. Television viewing, computer use and BMI among US children and adolescents. Journal of Physical Activity and Health, 6(s1): 28-35.
34. Hamar, P., S. Biddle, I. Soos, B. Takacs and A. Huszar, 2010. The prevalence of sedentary behaviours and physical activity in Hungarian youth, European Journal of Public Health, 20(1): 85-90.
35. Troiano, R.P., R.R. Briefel, M.D. Carroll and K. Bialostosky, 2000. Energy and fat intakes of children and adolescents in the United States: data from the National Health and Nutrition Examination Surveys–, The American Journal of Clinical Nutrition, 72(5): 1343-1353.
36. Ludwig, D.S., K.E. Peterson and S.L. Gortmaker, 2001. Relation between consumption of sugar-sweetened drinks and childhood obesity: a prospective, observational analysis, The Lancet, 357(9255): 505-508.
37. Phillips, S.M., L.G. Bandini, E.N. Naumova, H. Cyr, S. Colclough, W.H. Dietz and A. Must, 2004. Energy-dense snack food intake in adolescence: longitudinal relationship to weight and fatness, Obesity, 12(3): 461-472.
38. Janssen, I., P.T. Katzmarzyk, W.F. Boyce, C. Vereecken, C. Mulvihill, C. Roberts and W. Pickett, 2005. Comparison of overweight and obesity prevalence in school-aged youth from 34 countries and their relationships with physical activity and dietary patterns, Obesity Reviews, 6(2): 123-132.

39. Taylor, R.W., I.E. Jones, S.M. Williams and A. Goulding, 2000. Evaluation of waist circumference, waist-to-hip ratio and the conicity index as screening instruments for high trunk fat mass, as measured by dual-energy X-ray absorptiometry, in children aged 3–19 y, The American Journal of Clinical Nutrition, 72(2): 490-495.
40. Cole, T.J., M.C. Bellizzi, K.M. Flegal and W.H. Dietz, 2000. Establishing a standard definition for child overweight and obesity worldwide: International Survey, BMJ, 320(7244): 1240-1243.
41. Mahfouz, A.A., I. Abdelmoneim, M.Y. Khan, A.A. Daffalla, M.M. Diab, K.S. Al-Gelban and H. Moussa, 2008. Obesity and related behaviors among adolescent school boys in Abha City, Southwestern Saudi Arabia. Journal of Tropical Pediatrics, 54(2): 120-124.
42. Patrick, K., G.J. Norman, K.J. Calfas, J.F. Sallis, M.F. Zabinski, J. Rupp and J. Cella, 2004. Diet, physical activity and sedentary behaviors as risk factors for overweight in adolescence, Archives of Pediatrics & Adolescent Medicine, 158(4): 385-390.
43. Moliner-Urdiales, D., J.R. Ruiz, F.B. Ortega, J.P. Rey-Lopez, G. Vicente-Rodriguez, V. Espana-Romero and L.A. Moreno, 2009. Association of objectively assessed physical activity with total and central body fat in Spanish adolescents; the HELENA Study, International Journal of Obesity, 33(10): 1126-1135.
44. Parikh, T. and G. Stratton, 2011. Influence of intensity of physical activity on adiposity and cardiorespiratory fitness in 5–18 year olds, Sports Medicine, 41(6): 477-488.
45. Vanselow, M.S., M.A. Pereira, D. Neumark-Sztainer and S.K. Raatz, 2009. Adolescent beverage habits and changes in weight over time: findings from Project EAT, The American Journal of Clinical Nutrition, 90(6): 1489-1495.
46. Ledoux, T.A., M.D. Hingle and T. Baranowski, 2011. Relationship of fruit and vegetable intake with adiposity: a systematic review, Obesity Reviews, 12(5): 143-150.