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Prevalence of Obesity and Some Related Attributes among Umm Al-Qura University Female Students in Makkah, Saudi Arabia

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Abstract: The prevalence of obesity is increasing worldwide at an alarming rate in both developing and developed countries. It has become a serious epidemic health problem, estimated to be the fifth leading cause of mortality at global level. This study was designed to determine the prevalence of obesity among students at Umm Al-Qura University in Makkah, Saudi Arabia and to investigate some of the epidemiologic risk factors contributing to it. A cross sectional study was conducted during the academic year 2009-2010. The study included 224 randomly selected students enrolled at Umm Al-Qura University. Data were collected using a pretested, structured self-administered questionnaire. Weight, height, waist hip ratio and Body Mass Index (BMI) were recorded for each student. Statistical analysis was done using SPSS version 16. The prevalence of overweight and obesity among the studied students was 25% (19.2%, were overweight and 5.8% were obese). Factors behind overweight and obesity were; high family monthly income, family history of obesity, eating while bored, depressed and upset. The association between physical activity, dietary factors and obesity were not observed in this study. Our findings suggest the need for strategies and coordinated efforts at all levels to reduce the tendency of overweight and obesity and to promote healthy eating habits in our youth.

Key words: Prevalence, body mass index, obesity, university students, food habits, Saudi Arabia

INTRODUCTION

Obesity is a chronic disease prevalent in both developed and developing countries, it is a complex multi-factorial chronic disease that develops from an interaction of genotype and environment (Cynthia *et al*., 2006). Worldwide, the World Health Organization (WHO) indicates that there were at least 400 million obese adults in 2005; by 2015, this will have almost doubled to 700 million (Lean and Mullan, 2007).

Obesity is associated with more than 30 medical conditions and scientific evidence has established a strong relationship with at least 15 of those conditions. According to a recent study by the Research and Development (RAND) organization, obesity is more damaging to health than smoking, high levels of alcohol drinking and poverty (Gopalakrishnan *et al*., 2012). Our understanding of how and why obesity develops is incomplete but involves the integration of social, behavioral, cultural, physiological, metabolic and genetic factors. (Cynthia *et al*., 2006). Obesity increases one's risk of developing conditions such as high blood pressure, diabetes (type 2), heart disease, stroke, gallbladder disease and cancer of the breast, prostate and colon (Gopalakrishnan *et al*., 2012). Moreover, coronary heart disease constitutes one of the main health problems in Saudi Arabia, representing the third most common cause of hospital-based mortality after accident and senility (Al-Shehri *et al*., 2004). The tendency toward obesity fostered by our environment: lack of physical activity combined with high-calorie, low-cost foods (Gopalakrishnan *et al*., 2012).

Overweight and obesity are global health problems. In Canada, recent reports have indicated that 57% of adult men and 35% of adult women are overweight or obese (Canning *et al*., 2004). Furthermore, the results of a study in Tehran shows that 40% of the adult sample populations were overweight and 23.1% of them were obese (Rezaeian and Salem, 2007).

According to statistics from the WHO, Kuwait ranks 9th in the world and first amongst Arabic-speaking countries in female obesity. The rank order in Arabic-speaking countries for obesity in females is Kuwait (55.2%), Egypt (48%) and UAE (42%) which is higher than all the European countries and about the same as USA (48.3%) and Mexico (41%). Countries such as Bahrain (37.9%), Jordan (37.9%), Saudi Arabia (36.4%) and Lebanon (27.4%) have higher obesity rates in females than UK (26.3%), and Greece (26.4%) (WHO, 2010). Thus, the identification of individuals at higher risk at an early age will help in the design of a prevention program against obesity. The present study was designed to determine the prevalence of obesity among students

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enrolled at Umm Al-Qura University in Makkah, Saudi Arabia and investigate some of the epidemiologic risk factors contributing to it.

MATERIALS AND METHODS

Subjects: A cross sectional study was conducted during the academic year (2009-2010). The study included 224 randomly selected students enrolled at Umm Al-Qura University in Makkah. Students who agreed to participate were included. Pregnant and breast-feeding females were excluded.

Self-administered questionnaire: A pretested, structured self-administered questionnaire was designed to collect data about:

a) **Socio-demographic characteristics:** Age, marital status, parents' education, monthly income …etc.

b) **Medical and family histories**

c) **Physical activity:** frequency and intensity of regular physical exercise and Physical Activity Level (PAL): PAL of subjects was divided into three activity groups (sedentary or light activity lifestyles, moderately active lifestyles, vigorously active lifestyles (FAO, 2001).

d) **Food frequency:** To assess the frequency with which selected food items, obesogenic foods and snacks, were consumed during a specified time period (Amin *et al*., 2008).

Anthropometric measurements

Height: every student's height was measured in centimeters to the nearest 0.1 cm while the participant stood without shoes (Yalcin *et al*., 2004), the student was asked to stand straight with the head in the Frankfurt plane, feet together, knee straight and heels buttocks and shoulder blades in contact with the vertical surface of the stadiometer and wall (Gibson, 2005).

Weight: Weight was measured in kilograms to the nearest 0.1 kg with electronic weight scale (Yalcin *et al*., 2004) while the participant stood without shoes and lightly clothing. The balance was placed on a hard, flat surface (not carpet) and checked and adjusted for zero-balance before each measurement. The subject stood in the center of the flat form and looked straight ahead, standing unassisted and relaxed (Gibson, 2005).

Body Mass Index (BMI): BMI, also known as the Quetelet index was calculated with the metric system, the formula for BMI is weight in kilograms divided by the square of height (in meters) (CDC, 2000). Subjects were categorized according to their BMI according to the criteria of WHO; (<18.5) underweight (18.5 to 24.9) desirable weight (25 to 29.9) overweight (30 to 34.9) obese I (35 to 39.9) obese II and (≥ 40) Obese III (morbidly obese) (Gee *et al*., 2008).

Waist Hip Ratio (WHR): Waist circumference was measured in centimeters at the midpoint between the button of the ribs and the top of iliac crest. Hip circumference was measured at the largest posterior extension of the buttocks. Waist hip ratio will be calculated by dividing these two values with each other. WHR was categorized according to relative cardiovascular risk for females as; (0.80 or less) low risk (0.81 to 0.85) moderate risk and (>0.85) high risk (Yalcin *et al*., 2004).

Statistical analysis: Statistical analysis was performed using the Statistical Package of Social Science (SPSS) version 16 (SPSS Inc., Chicago, IL, USA.). For analytical purpose students were grouped into two categories: overweight and obese and none obese. The students were considered overweight and obese when their BMI ≥ 25, while none obese were those who had a BMI of less than 25 (Musaiger *et al*., 2003). For the quantitative variables, compliance with the normal distribution was assessed using the Kolmogorov-Smirnoff test, as appropriate. In case of continuous variables, t-test was chosen if the distribution was normal, otherwise a non-parametric test was used (Mann-Whitney test). Pearson's Chi square test or Fisher's Exact test were used for categorical variables. P value of less than 0.05 was considered to indicate statistical significance.

RESULTS

The socio-demographic characteristics of the studied students are displayed in Table 1; the mean age of the studied students was 21.02±1.24. 47.27% of their fathers and 33.33 of their mothers had attained university education or above.

The distribution of the studied students according to their BMI categories showed that 25% of studied students were overweight or obese (19.2 and 5.8%, respectively) and 75% were none obese as shown in Table 2.

Distribution of overweight or obese and none obese respondents according to their socio-demographic characteristics are presented in Table 3; 44.6% of the overweight or obese group reported that their mothers had completed university education or above versus 29.5% of the none obese group, however this difference was not significant (P<0.05). In addition, there was statistically significant difference between both groups regarding their family monthly income where the overweight and obese group had higher income than the none obese one (P<0.05).

Table 4 shows the medical history as reported by the studied students; 60.7% of the overweight or obese

Table 1: Respondents' socio-demographic characteristics

Variables	No.	(%)	Mean±SD
Age			21.02±1.24
Education of father			
Illiterate/can read and write	18	8.18	
Completed P/IS	46	20.91	
Completed secondary school	52	23.64	
University graduate/postgraduate	104	47.27	
Total	220	100.0	
Education of mother			
Illiterate can read and write	29	13.06	
Completed P/IS	62	27.93	
Completed secondary school	57	25.68	
University graduate/postgraduate	74	33.33	
Total	222	100.0	
Working status of mothers			
House wife	110	58.51	
Working	78	41.49	
Total	188	100.0	
Income			
Mean income±SD			8504.11±6621.81

P/IS: Primary/intermediate school

Table 2: Distribution of the studied students according to their BMI categories

BMI categories	No.	%
Underweight	39	17.4
Desirable weight	129	57.6
Over weight	43	19.2
Obesity I	9	4.1
Obesity II	1	0.4
Obesity III (morbid obesity)	3	1.3
Total	224	100.0

group versus 41.1% of none obese group had family history of obesity (P<0.05). Moreover, 56.4% of the overweight or obese group compared to 18.2% of the none obese group tried to lose weight (P<0.001).

The mean anthropometric measurements of the studied students are presented in Table 5; statistically highly significant difference was found between the studied students regarding their weight, BMI, waist and hip circumferences (P<0.001). Categories of WHR according to relative cardiovascular risk revealed that most of students of both groups were at low risk of developing cardiovascular diseases, although the overweight and obese group carried more risk (p<0.05). Results also showed no differences between both groups regarding their physical activity although; 34.3% of the none obese group were performing exercise $\geq$ 5 times/week compared to 13.0% of the overweight or obese group as shown in Table 6.

The association between some dietary habits and obesity among the studied students shows that 54.5% of the overweight or obese group versus 18.1% of non obese group reported that they always ate while board, depressed or upset (p<0.001). On the other hand, both groups were comparable regarding the other dietary habits as presented in Table 7.

Weekly consumption of selected food items among the studied students shows that, there was insignificant difference between both groups (Table 8). On the other hand, the frequency of consumption of nearly all selected obesogenic foods was higher among the non obese group compared with the overweight or obese group, however this result is not statistically significant as shown in Table 9.

DISCUSSION

Obesity is becoming a worldwide problem affecting all levels of society and is thus being described as a global epidemic. Economic development of Saudi Arabia during the last 3 decades has changed the nutritional and lifestyle habits; food has become more affordable to a larger number of people with the substantial decrease in the price relative to income and the concept of food has changed from a means of nourishment to a determinant of lifestyle and a source of pleasure, coupled with physical inactivity have likely contributed to the increase in the prevalence of overweight and obesity (Amin *et al*., 2008).

Based on BMI classification of weight status, the prevalence of overweight and obesity in the current study was 25% among the studied students, where overweight students represented 19.2% of the sample whereas, 5.8% were obese, this result agreed with Yahia *et al*. (2008) who found that 23% of female students were overweight and obese. Also, our result is consistent with Abdalla and Mohamed (2010) who found the prevalence rate of obesity among medical students as 26.2% (classified as 16.8% over weight and 9.4% obese). However our findings were much lower if compared with another study carried out in Jordan by Abbas *et al*. (2003) who revealed that the prevalence of overweight was 39%, while that of obesity was 37%, giving a total of 76%. Also, in contrast with the result of Iranian male college students study in 2006, where only 7.9% were above the normal body weight (Nojomi and Najamabadi, 2006). That rate decreased to 2.9% among Chinese college students (2005) with a percentage of obesity as low as 0.4 (Sakamaki *et al*., 2005). Despite the small sample sizes and the fact that self reported height and weight were used in some of the above mentioned studies, their findings still reflect differences in the severity of obesity problems among young adults across nations (Al-Rethaiaa *et al*., 2010).

Regarding the socio-demographic status, the overweight and obese students had significantly higher income than none obese. On the other hand no significant association was found regarding the level of mothers' education and working status, although higher percentage of the mothers of obese and overweight students were working and highly educated than the none obese group, in agreement with Amin *et al*. (2008). Obesity tends to aggregate in families as a result of interaction among environmental, genetic factors and life style (Davison and Birch, 2002). Even when the mother

Table 3: Distribution of obese and none obese respondents according to their socio-demographic characteristics

	None obese		Overweight and obese		
Variables	No.	(%)	No.	(%)	P-value
Age					
Mean age±SD	21.03±1.2		21.05±1.3		0.93
Education of fathers					
Illiterate/can read and write	14	8.5	4	7.3	0.75
Completed primary/intermediate school	32	19.4	14	25.4	
Completed secondary school	41	24.8	11	20.0	
University graduate/postgraduate	78	47.3	26	47.3	
Total	165	100.0	55	100.0	
Education of mothers					
Illiterate/can read and write	20	12.1	9	16.1	0.06
Completed primary/intermediate school	48	28.9	14	25.0	
Completed secondary school	49	29.5	8	14.3	
University graduate/postgraduate	49	29.5	25	44.6	
Total	166	100.0	56	100.0	
Working status of mothers					
House wife	88	60.7	22	51.2	0.27
Working	57	39.3	21	48.8	
Total	145	100.0	43	100.0	
Income					
Mean income±SD	7586.61±5910.11		10814.81±7795.64		0.03

Table 4: Distribution of respondents according their medical history

	None obese		Overweight and obese		
Variables	No	(%)	No	(%)	P-value
Irregular period					
Yes	45	27.8	14	25.5	0.74
No	117	72.2	41	74.5	
Total	162	100.0	55	100.0	
Currant use of hormones					
Yes	10	6.0	7	12.5	0.11
No	158	94.0	49	87.5	
Total	168	100.0	56	100.0	
Past history of chronic conditions					
Yes*	78	46.4	26	46.4	1.00
No	90	53.6	30	53.6	
Total	168	100.0	56	100.0	
Family history of obesity					
Yes	69	41.1	34	60.7	0.01
No	99	58.9	22	39.3	
Total	168	100.0	56	100.0	
Family history of chronic conditions					
Yes**	152	90.5	54	96.4	0.16
No	16	9.5	2	3.6	
Total	168	100.0	56	100.0	
Trial to lose weight					
Yes	30	18.2	31	56.4	<0.001
No	135	81.8	24	43.6	
Total	165	100.0	55	100.0	
Take medications to lose weight					
Yes	3	1.8	3	5.4	0.16
No	162	98.2	53	94.6	
Total	165	100.0	56	100.0	

*Including: (Diabetes, Heart diseases, High blood lipids, Kidney disease, Sleep Apnea, Snoring, Reflux, heartburn, Back pain, Shortness of breath, Asthma, Headaches, Arthritis, Cancer and Others).

**Including: (Diabetes, Heart disease, High blood pressure, Cancer, Arthritis, Osteoporosis).

has an active participation in the labor market, out of her home, she has an effective role in the selection and preparation of foods consumed by her family (Menezes *et al*., 2009). In our study a significant association

Table 5: Anthropometric measurements of the studied students

	None obese		Overweight and obese		
Anthropometric measures	Mean±SD		Mean±SD		P-value
Weight (kg)	51.66±8.08		73.49±13.98		<0.001
Height (m)	1.57±0.06		1.58±0.07		0.25
BMI	20.88±2.92		29.19±4.43		<0.001
Waist circumference (cm)	65.32±6.64		81.10±9.89		<0.001
Hip circumference (cm)	93.38±7.55		109.39±9.32		<0.001
WHR	0.70±0.06		0.74±0.06		0.33
WHR* categories	No.	(%)	No.	(%)	
Low risk	161	95.8	48	85.7	0.03
Moderate risk	3	1.8	3	5.4	
High risk	4	2.4	5	8.9	

* (0.80 or less) low risk (0.81 to 0.85) moderate risk and (>0.85) high risk

Table 6: Physical Activity among the respondents

	None obese		Overweight and obese		
Physical activity	No.	(%)	No.	(%)	P-value
Doing exercise					
Yes	70	41.7	22	40.0	0.80
No	98	58.3	33	60.0	
Total	168	100.0	55	100.0	
Type of exercise					
Walking	49	70.0	14	63.6	0.28
Aerobic	7	10.0	2	9.1	
Running	5	7.1	0	0.0	
Other	9	12.9	6	27.3	
Total	70	100.0	22	100.0	
Frequency/ week					
1-2 times	27	40.3	8	36.4	0.06
3- 4 times	17	25.4	11	50.0	
≥5 times	23	34.3	3	13.6	
Total	67	100.0	22	100.0	
Intensity of physical activity					
Level 1	94	58.4	27	66.1	0.59
Level 2	52	32.3	15	26.8	
Level 3	15	9.3	4	7.1	
Total	161	100.0	56	100.0	

between the prevalence of obesity and a family history of obesity was found, where 60.7% of the overweight and obese group have family history of obesity, this result goes in accordance with Menezes *et al.* (2009) and Musaiger *et al.* (2003).

The sedentary lifestyles, the rapid changes in socio-economic status and food habits in Arab Gulf countries, have led to a great change in health and nutritional status of people (Musaiger *et al.*, 2003). Our data showed no association between the practice of physical activity and overweight or obesity, although 66.1% of the obese group versus 58.4% of none obese group had sedentary or light activity life style. The literature is controversial regarding the association between physical activity patterns and obesity (Menezes *et al.*,2009). A case control linked to a cohort study carried out in a Southern city of Brazil showed no association between physical activity and overweight or obesity (Monteiro *et al.*, 2004). Similar results were described in other Brazilian case control studies (Neutzling *et al.*, 2003; Silveira *et al.*, 2006; Menezes *et al.*, 2009). However, the lacks of physical activity due to social and religious norms precludes many female students, especially obese and overweight ones, from engaging in public sports, thereby contributing to their higher weight status.

The practice of consuming meals in front of the television has become very popular among families in recent years (Musaiger and Gregory, 2000). This study indicates no association between consuming meals while watching television and obesity; this is contrary to reports that there exists a positive relationship between obesity and watching television (Robinson, 2001). This could be because, it was not the amount of food consumed during television viewing that was associated with the adolescent's BMI but, it was the fat content of the foods (Matheson *et al.*, 2004). This could explain the lack of the association as seen in this study. It should,

Table 7: Association between dietary habits and obesity among the studied students

	None obese		Overweight and obese		
Variables	No.	(%)	No.	(%)	P-value
Frequency of breakfast intake					
Daily	74	44.6	25	44.6	0.62
3-4 times/week	54	32.5	15	26.8	
1-2 times/week	24	14.5	12	21.4	
Rarely	14	8.4	4	7.2	
Total	166	100.0	56	100.0	
No. of meals/ day (frequency/last week)					
One meal	11	6.5	2	3.6	0.80
Two meals	79	47.0	26	46.4	
Three meals	70	41.7	26	46.4	
> 3 meals	8	4.8	2	3.6	
Total	168	100.0	56	100.0	
Eating at university (frequency/last week)					
None	0	0.0	1	1.8	0.14
Daily	68	42.0	22	39.3	
3-4 times/week	52	32.1	13	23.2	
≤2 times/week	42	25.9	20	35.7	
Total	162	100.0	56	100.0	
Eating out of home (frequency/ last week)					
None	35	20.8	11	19.6	0.44
1-2 times/week	82	48.8	32	57.1	
2-5 times/week	43	25.6	9	16.1	
>5 times/week	8	4.8	4	7.2	
Total	168	100.0	56	100.0	
Eating while watching TV					
Always	43	25.6	10	17.9	0.44
Sometimes	108	64.3	41	73.2	
Never	17	10.1	5	8.9	
Total	168	100.0	56	100.0	
Eating while bored, depressed and upset					
Always	30	18.1	30	54.5	0.00
Sometimes	55	33.1	12	21.8	
Never	81	48.8	13	23.7	
Total	166	100.0	55	100.0	
Frequency of snacks/day					
Once	83	50.3	25	46.3	0.58
Two	57	34.5	17	31.5	
Three	21	12.7	9	16.7	
> 3 meals	4	2.5	3	5.5	
Total	165	100.0	54	100.0	
Snacks on way home or university					
Always	39	23.8	10	18.2	0.79
Often	52	31.7	18	32.7	
Never	11	6.7	3	5.5	
Some times	62	37.8	24	43.6	
Total	164	100.0	55	100.0	
Snacks when studying					
Always	10	6.2	3	5.6	0.55
Often	14	8.6	8	14.8	
Never	94	58.0	27	50.0	
Some times	44	27.2	16	29.6	
Total	162	100.0	54	100.0	

be noted that since the type of food consumed during TV viewing was not determined, it is not possible to draw any concrete conclusion with regard to the energy content. Another observation in this study was association between eating when upset, depressed or bored and overweight and obesity; this was inconsistent with Bin Zaal *et al.* (2009). However, it has been reported that a stressed or depressed state in humans induces

Table 8: Weekly consumption of selected food items among the studied students

	None obese		Overweight and obese		
Food items	No	(%)	No	(%)	P-value
Meat					
≤Once	118	70.7	38	69.0	0.53
2-4 times	45	26.9	14	25.5	
≥5 times	4	2.4	3	5.5	
Total	167	100.0	55	100.0	
Chicken					
≤Once	31	18.6	8	14.5	0.39
2-4 times	99	59.3	30	54.6	
≥5 times	37	22.1	17	30.9	
Total	167	100.0	55	100.0	
Fish					
≤Once	128	81.5	43	84.3	0.89
2-4 times	26	16.6	7	13.7	
≥5 times	3	1.9	1	2.0	
Total	157	100.0	51	100.0	
Milk and other dairy products					
≤Once	35	21.0	8	14.9	0.50
2-4 times	62	37.1	24	44.4	
≥5 times	70	41.9	22	40.7	
Total	176	100.0	54	100.0	
Type of milk					
Skimmed	3	3.1	4	10.3	0.08
Low fat	24	25.3	14	35.9	
Whole fat	68	71.6	21	53.8	
Total	95	100.0	39	100.0	
Fruits					
≤Once	91	54.5	24	44.4	0.21
2-4 times	57	34.1	18	33.4	
≥ 5 times	19	11.4	12	22.2	
Total	167	100.0	54	100.0	
Fresh Vegetables					
≤Once	64	38.1	12	22.2	0.09
2-4 times	65	38.7	27	50.0	
≥5 times	39	23.2	15	27.8	
Total	168	100.0	54	100.0	
Cooked vegetables					
≤Once	67	39.9	18	34.0	0.74
2-4 times	64	38.1	22	41.5	
≥5 times	37	22.0	13	24.5	
Total	168	100.0	53	100.0	
Bread and other bakery products					
≤Once	14	8.4	2	3.7	0.47
2-4 times	46	27.5	14	25.9	
≥5 times	107	64.1	38	70.4	
Total	167	100.0	54	100.0	
Rice and other cereals					
≤Once	32	19.1	15	27.8	0.36
2-4 times	58	34.5	15	27.8	
≥5 times	78	46.4	24	44.4	
Total	168	100.0	54	100.0	

either increased comfort food intake and body weight gain or decreased intake and body weight loss (Dallman *et al*., 2003).

Although, increased snacks consumption is often accused for increased prevalence of obesity, yet, a clear cut relation between snacking and BMI is still unsettled (Al-Rethaiaa *et al*., 2010). On the other hand, the snacks consumption may contribute to a positive energy balance and increased body weight (De Graaf, 2006). Contrarily, results of the present study revealed no

Table 9: Frequency of the selected obesogenic food consumption in the last week as stated by the studied students

	None obese		Overweight and obese		
Food items	No.	(%)	No.	(%)	P-value
Carbonated soft drinks					
None/week	10	6.8	3	6.3	
1-2 times/week	76	51.4	31	64.5	0.20
3-6 times/week	35	23.6	11	22.9	
Once or more/day	27	18.2	3	6.3	
Total	148	100.0	48	100.0	
Sweets/candy					
None/week	5	3.0	1	1.9	
1-2 times/week	68	41.2	32	59.3	0.03
3-6 times/week	62	37.6	19	35.1	
Once or more/day	30	18.2	2	3.7	
Total	165	100.0	54	100.0	
Cakes/cookies/doughnut/biscuits					
None/week	3	1.9	1	2.0	
1-2 times/week	94	58.3	31	63.3	0.73
3-6 times/week	45	28.0	14	28.6	
Once or more/day	19	11.8	3	6.1	
Total	161	100.0	49	100.0	
Chewing gum					
None/week	8	5.4	1	2.0	
1-2 times/week	77	51.7	24	48.0	0.68
3-6 times/week	40	26.8	15	30.0	
Once or more/day	24	16.1	10	20.0	
Total	149	100.0	50	100.0	
Chocolate					
None/week	3	1.9	1	1.9	
1-2 times/week	60	37.5	23	42.6	0.89
3-6 times/week	64	40.0	21	38.9	
Once or more/day	33	20.6	9	16.6	
Total	160	100.0	54	100.0	
Potatoes chips/popcorn/packed foods					
None/week	1	0.6	1	2.0	
1-2 times/week	80	51.0	29	58.0	0.55
3-6 times/week	53	33.8	15	30.0	
Once or more/day	23	14.6	5	10.0	
Total	157	100.0	50	100.0	
Pizza and similar food products					
None/week	4	2.5	1	1.9	
1-2 times/week	71	43.8	30	57.7	0.52
3-6 times/week	69	42.6	17	32.7	
Once or more/day	18	11.1	4	7.7	
Total	162	100.0	52	100.0	

association between overweight and obesity and snacks eating rate. This is supported by several epidemiological studies, as describes by Al-Rethaiaa *et al.* (2010).

It is well documented that vegetables and fruits are low in energy density because of their high water and fiber content. Therefore, adding them to a diet reduces its overall energy intake, thus, helping in weight management (Rolls *et al*., 2004). However, the current data showed insignificant association between overweight and obesity on one hand and vegetables and fruits consumption on the other hand. Eating raw vegetables and fruits in the course of a meal is uncommon among Saudi population. In addition, the vegetables content in most of the traditional Saudi dishes is too small to have an impact on the overall energy density of the diet. Moreover, fruits are usually taken as a dessert at the end of meals, thus, losing their "satiety effect" that tends to lower the overall energy intake of the diet (De Graaf, 2006).

It should be stressed that the information on food consumption was obtained by using the food frequency questionnaire that is subjected to recall bias, instead of detailed food diaries to calculate precisely the food consumption in terms of calories and other numeric measures which leads to the presumption that what was reported by students was less reliable. Moreover,

the limited validity in self-report estimates besides the missing data should be taken into consideration when using these data to make decisions concerning public health recommendation.

Conclusions: Obesity is a problem among Umm Al-Qura university students. One quarter of the studied students were overweight or obese. Factors behind overweight and obesity among the studied students were high-income level, family history of obesity, eating while bored, depressed and upset.

Recommendations: Strategies and coordinated efforts are needed at all levels to reduce the tendency of overweight, obesity and to promote healthy eating habits in our youth.

Improving University students' awareness about overweight and obesity health problems is an essential step towards decreasing the prevalence of overweight and obesity among university students and in the community.

Further studies are required on larger sample size since the use of a sample of students from just one university may not be a representative of all university students in KSA besides, the power of some results was reduced because of small sizes of some subgroups.

REFERENCES

Abbas, A., S. Khoury, D. Massad and S. Karabsheh, 2003. Prevalence of overweight and obesity in adult Jordanians aged 25 years and over: Results of a national survey. J. Arab Board, 4: 90-97.

Abdalla, S. and E. Mohamed, 2010. Obesity Among Medical Students of The National Ribat University, Khartoum 2008. Sudan J. Pub. Heal., 5: 16-19.

Al-Rethaiaa, A., A. Fahmy and N. Al-Shwaiyat, 2010. Obesity and eating habits among college students in Saudi Arabia: A cross sectional study. Nut. J., 9: 6-8.

Al-Shehri, S., Z. Saleh, M. Salama and Y. Hassan, 2004. Prevalence of Hyperlipidemia Among Saudi School Children in Riyadh. Ann. Saudi Med., 24: 6-8.

Amin, T., A. Al-Sultan and A. Ali, 2008. Overweight and Obesity and their Association with Dietary Habits and Sociodemographic Characteristics Among Male Primary School Children in Al-Hassa, Kingdom of Saudi Arabia. Indian J. Comm. Med., 33: 172-81.

Bin Zaal, A., A. Musaiger and R. Souza, 2009. Dietary Habits Associated With Obesity Among Adolescents In Dubai, United Arab Emirates. Nutr. Hosp., 24: 437-444.

Canning, P., M. Courage and L. Frizzell, 2004. Prevalence of Overweight and Obesity in a Provincial Population of Canadian Preschool Children. Can. Med. Assoc. J., 171: 240-242.

CDC, 2000. Adults Body Mass Index (BMI) Calculator. [Online] Available at: HYPERLINK "http://www.cdc.gov/healthyweight/assessing/bmi/"http://www.cdc.gov/healthyweight/assessing/bmi/ [Accessed 13 january 2010].

Cynthia L. Ogden, Margaret D. Carroll, Lester R. Curtin, Margaret A. McDowell, Carolyn J. Tabak, Katherine M. Flegal, 2006. Prevalence of overweight and obesity in the United States, 1999-2004. JAMA, 295, pp: 1549-1555.

Dallman, M., N. Pecoraro, S. Akana, S. La Fleur, F. Gomez, H. Houshyar, M. Bell, S. Bhatnagar, K. Laugero and S. Manalo, 2003. Chronic Stress And Obesity: A new view of "comfort food". Proc. Natl. Acad. Sci., USA, 100: 11696-11701.

Davison, L. and K. Birch, 2002. Obesigenic Families: Parents' Physical Activity And Dietary Intake Patterns Predict Girls' Risk of Overweight. Int. J. Obes. Relat. Metab. Disord, 26: 86-93.

De Graaf, C., 2006. Effects Of Snacks On Energy Intake: An evolutionary perspective. Appetite, 47: 18-23.

FAO, 2001. Human energy requirements, Report of a Joint FAO/WHO/UNU Expert Consultation. [Online] Available at: HYPERLINK "http://www.fao.org/docrep/007/y5686..."http://www.fao.org/ docrep/007/y5686. [Accessed 12 November 2010].

Gee, M., K. Mahan and E. Escott-stump, 2008. Krause's Nutrition for health and fitness. In E. Escott-Stump and K. Mahan, eds. Food, Nutrition and Diet Therapy. 12th Edn., Canada: Elsevier, pp: 532-57.

Gibson, R., 2005. Nutritional assessment methods In Principle of Nutrition Assessment. 2nd Edn., New York, USA: Oxford University press.

Gopalakrishnan, S., P. Ganeshkumar and M. Prakash, 2012. Prevalence of Overweight/Obesity among the Medical Students, Malaysia. Med. J. Malaysia, 67: 442-442.

Lean, M. and A. Mullan, 2007. Obesity: Which Drug and When? Int. J. Clin. Pract, 61: 1555-1560.

Matheson, D., J. Killen, Y. Wang, A. Varady and T. Robinson, 2004. Children's Food Consumption during Television Viewing. Am. J. Clin. Nutr., 79: 1088-1094.

Menezes, I., M. Neutzling and J. Taddei, 2009. Risk Factors For Overweight And Obesity In Adolescents Of Brazilian University: A case-control study. Nutr. Hosp., 24: 17-24.

Monteiro, P., C. Victora and F. Barros, 2004. Social, Familial and Behavioral Risk Factors for Obesity in Adolescents. Rev. Panam. Salud Publica, 16: 250-258.

Musaiger, A. and W. Gregory, 2000. Profile of Body Composition of School Children (6-18Y) in Bahrain. Int. J. Obes. Relat. Metab. Disord, 24: 1093-1096.

Musaiger, A., O. Lloyd, S. Al-Neyadi and A. Bener, 2003. Lifestyle Factors Associated with Obesity Among Male University Students in the United Arab Emirates. Nutr. Food Sci., 33: 145-147.

Neutzling, M., J. Taddei and D. Gigante, 2003. Risk Factors of Obesity Among Brazilian Adolescents: A case-control study. Public Health Nutr., 6: 743-809.

Nojomi, M. and S. Najamabadi, 2006. Nojomi M, Najamabadi Obesity among university students, Tehran, Iran. Asia Pac. J. Clin. Nutr., 15: 516-520.

Rezaeian, M. and Z. Salem, 2007. Prevalence of obesity and abdominal obesity in a sample of urban adult population within South East of Iran. Pak. J. Med. Sci., 23: 193-1971.

Robinson, T., 2001. Television viewing and childhood obesity. Pediatr Clin. North Am., 48: 1017-1025.

Rolls, B., J. Ello-Martin and B. Tohill, 2004. What Can Intervention Studies Tell Us about the Relationship between Fruit and Vegetables Consumption and Weight Management? Nutr. Rev., 62: 1-17.

Sakamaki, R., K. Toyama, R. Amamoto, C.J. Liu and N. Shinfuku, 2005. Nutritional knowledge, food habits and health attitude of Chinese university students -a cross sectional study. Nutr. J., 4: 1-5.

Silveira, D., J. Taddei, M. Escrivão, F. Oliveira and F. Ancona-Lopez, 2006. Risk Factors for Overweight among Brazilian adolescents of low-income families: a case-control study. Public Health Nutr., 9: 1-8.

WHO, 2010. WHO Global Infobase. [Online] Available at: Hyperlink "https://apps.who.int/infobase/Comparisons.aspx"https://apps.who.int/infobase/Comparisons.aspx [Accessed 5 December 2011].

Yahia, N., A. Achkar, A. Abdallah and S. Rizk, 2008. Eating Habits and Obesity Among Lebanese University Students. Nutr. J., 7: 1475-2891.

Yalcin, B., E. Sahin and E. Yalcin, 2004. Prevalence and Epidemiological Risk Factors of Obesity in Turky. Middle East J. Family Med., 6: 541-507.