

*Full Length Research Paper*

# Prevalence and risk factors of obesity and overweight among Taif University Students, Taif, Saudi Arabia

Lotfi Fahmi Issa

Department of Community Medicine, College of Medicine, Taif University, Taif, Saudi Arabia.  
Department of Public Health and Community Medicine, Al-Azhar Faculty of Medicine, Cairo, Egypt.  
E-mail: [dr\\_lotfy\\_eassi@yahoo.com](mailto:dr_lotfy_eassi@yahoo.com)

Accepted 04 November 2014

**Obesity and overweight are considered the most rapidly growing form of malnutrition in Saudi Arabia. The aim of this study was to determine the prevalence and some risk factors of obesity and overweight among Taif university students. A cross-sectional approach was conducted and 1473 male students were selected. A self administered questionnaire included socio-demographic data, different forms of activities, sedentary behaviors, smoking, dietary habits and family history was used for data collection. Body mass index was calculated and categorized according to WHO classification. Prevalence of obesity and overweight were 16.1% and 28.5%, respectively. However, higher prevalence was observed in older students ( $p=0.00$ ). Higher prevalence was found among students with high family income/month ( $p=0.02$ ), less daily active ( $p=0.00$ ) and physically inactive students ( $p=0.03$ ). Moreover, prevalence was more among students consuming non-healthy diet ( $p=0.00$ ), sleeping less than 8 hours/day ( $p=0.00$ ) and with family history of obesity ( $p=0.00$ ). Prevalence was significant among students with highly educated fathers ( $p=0.01$ ) and low educated mothers ( $p=0.01$ ). In conclusion, high prevalence of obesity and overweight were recorded among University students. Further studies of large samples representing both sexes as well as health education program on obesity and overweight are highly recommended to the students and their families.**

**Key words:** Prevalence, obesity, overweight, students, University, Saudi Arabia.

## INTRODUCTION

Obesity and overweight are considered a global epidemic and the most rapidly growing form of malnutrition in the developed world as well as in developing countries experiencing an economic transition such as most countries of Eastern Mediterranean region such as Saudi Arabia (WHO, 1998; Mandat et al., 2008).

The World Health Organization (WHO) estimated that 43 million children are overweight and obese even in their preschool years and 35 million of these children are in developing countries (De Onis et al., 2010).

It is well documented that obesity is associated with several chronic illness. Therefore, the prevalence of obesity in a population can be considered a rough indicator for health status. In Saudi Arabia, obesity is becoming one of the most important public health problems (Madani et al., 2000). Obesity is major risk factors of many chronic diseases such as coronary heart disease, type 2 diabetes mellitus, hypertension and stroke and the accumulation of body fat is associated with genetic, hormonal, metabolic and behavioral risk

factors (Thompson et al., 1999; Campfield and Smith, 1999).

Obesity and overweight affect self-esteem which may have significant implications for long term happiness and success in life and has negative consequences on cognitive and social development of the persons. The numerous psychological, physical and economic consequences are well known (Hesketh et al., 2004; Must and Strauss, 1999).

A community based national epidemiological survey conducted by examining 17,232 Saudi persons in the age group of 30 -70 years of selected households over 5 years period between 1995 -2000 showed that obesity and overweight are increasing in the Kingdom of Saudi Arabia with overall obesity prevalence 35% (Al-Nozha et al., 2005). It was estimated that 26.6% and 10.6% of adolescents aged 13-18 years are overweight or obese, respectively in Saudi Arabia due to marked nutritional changes and rapid urbanization in recent decades (El Mouzan et al., 2010).

A recent study conducted in Saudi Arabia including 357 male college students aged 18-24 years found that the prevalence rate of overweight and obesity among college students were 21.8 and 15.7% respectively (Al-Rethaiaa et al., 2010).

In Kingdom of Saudi Arabia, recent studies revealed that, increasing consumption of animal products and refined foods in the diet at the expense of fruits and vegetables. These dietary changes were accused for increasing the prevalence of both overweight and obesity observed (Amin et al., 2008; Mahfouz et al., 2007; Al-Nuaim et al., 1997).

In the Arab countries, few studies are available regarding determinants of obesity and overweight particularly among university students. Identification and better understanding of the prevalence and risk factors of obesity and overweight among university students are the essential step to plan and implement prevention program for decreasing the prevalence of obesity and overweight among university students and their community. Therefore, this study was conducted to determine the prevalence and risk factors of obesity and overweight among Taif university students.

## MATERIALS AND METHODS

A cross-sectional study was carried out on the total sample of 1473 male university students chosen by systematic random sample from all students of different colleges attending Taif male university primary health care clinic for any reasons during the period of study (1st of November 2013 till the end of April 2014). Female not included in this study because not allowed to male investigator to access female students according to Saudi community traditions. Pilot study was done before beginning the work in order to test the questionnaire, detect any difficulties, and also to give an idea about the prevalence of the problem under the study among university students.

### Data Collections and Tools

The study work was 3 days per week till the end of study. All students included in the study were interviewed in persons and asked to fill the self administered structured questionnaire after initial training. The self administered structured questionnaire was developed, pretested, and validated in a pilot study. The questionnaire included the following: Socio-demographic data such as (age, residence, faculty, academic grade, marital status, father education and occupation, mother education and occupation, percapita family monthly income in Saudi Riyal, family size and crowding index). Family history such as (tendency to gain weight easily, parental obesity). Different forms of activities including 1- physical activities

assessed by asking subjects how many times per week they exercised enough to work up to a sweat. Students were classified as physically active if they exercised to a sweat three or more times per week and as physically inactive if they did not exercise to a sweat or exercise with a frequency less than three times per week (Sanchez et al., 2007; Zoeller, 2009). 2- Daily activities such as, parking the car at the end of the parking, descend from transportation away from home, housework activities, using stairs and using fewer labor – saving devices. Three levels of daily activities: less activity for those who performed no daily activities or only one, moderate activities for those who performed two daily activities and higher activities for those who performed three or more daily activities. Different sedentary behaviors (such as hours spent in watching television, playing video games, in front of computer, or using internet, Sleeping: regarding hours of sleep, time they go to bed every night, time they wake up each morning, and times they wake up feeling refreshed). Total media time recommended should be limited to no more than 2 hours per day (American Academy of Pediatrics, 1999).

Factors related to special habits: smoking status was categorized as smokers and non smokers. Factors related to dietary habits: every student was asked 12 question regarding their dietary habits, these questions included, information about taking daily breakfast, taking at least three meals every day, taking snakes between meals, eating white bread, drinking whole milk, taking refined sugar products, using margarine, butter, or increasing the intake of fat, preference of eating chicken over lean meat, preference of boiled meals over fried meals, preference of fatty meat over lean meat. The response to each question was either yes or no, and each student was given a score between zero and twelve according to their response to the twelve questions. They classified into healthy and non healthy diet groups ( Shakhathreh et al., 2005) as the following: a score of  $\geq 9$  was considered as healthy diet, and a score of less than 9 was considered as non healthy diet.

Anthropometric measurements: Each studied student was subjected to:

1- Height was measured to the nearest 0.5 cm without shoes.

2- Weight was measured to the nearest 0.1Kg without shoes and with light clothes. 3- Waist circumference was measured midway between the lower border of the ribs and the iliac crest on a horizontal plane. Men are at risk that has a waist circumference greater than 40 inches (102 cm). 4- Hip circumference was measured as the distance around the large extension of the buttocks (WHO, 1998).

The following indices were calculated: 1- Body mass index: was calculated as weight in kilogram divided by the square of the height ( $m^2$ ). Body mass index was classified, based on (WHO, 1998) into 4 categories: underweight ( $<18.5 \text{ Kg } m^2$ ) normal ( $BMI=18.5 - 24.9 \text{ Kg}$

**Table 1.** Distributions of study sample according to body mass index.

Variables	No.	%	Mean	St. deviation
Underweight	40	2.7	17.21	0.777
Normal	776	52.7	21.8	1.95
Overweight	420	28.5	27.16	1.44
Obese	237	16.1	34.93	5.18
Total	1473	100.0		

m<sup>2</sup>), overweight (BMI=25 – 29.9 Kg m<sup>2</sup>), and obese (BMI=30 Kg m<sup>2</sup>) or more. 2- Waist\hip ratio: mathematically, calculated as the waist circumference divided by hip circumference. Ideal waist to hip ratio for men is 0.90 or less, but is considered at risk if it 1.0 or higher.

### Ethical Consideration

Approval by the deanship of student affairs was taken before starting the work. Also, approval of administer of university primary health care unit was taken before starting the work to facilitate the work. During the research activities, each study subject was informed about the study objectives stressing on confidentiality of collected data and getting a verbal consent of the subject to share in the study.

### Statistical Analysis

Data entry and statistical analysis were performed using Statistical Package for the Social Science (SPSS) program for windows version 12. Frequency and range checks were performed. Descriptive statistics such as means, standard deviation were used for the quantitative variables. Percentage was used to determine the prevalence rates of obesity and overweight among Taif University students. Proportion and percentage were used for category variables. Chi square test examined the relationship between obesity and overweight and risk factors. The p values < 0.05 was be considered for statistical significance.

## RESULTS

A total study sample was 1473 students, all of them were males. The age of study samples ranged between 19 – 25 years old. The mean age of study sample was 21.3±1.6 years old.

The results of the studied students sample revealed that 40 (2.7%) underweight, 776 (52.7%) normal, 420 (28.5%) overweight and 237 (16.1%) obese as shown in Table (1). The prevalence rate of obesity and overweight by

age was found to be significant (p = 0.00). Obesity and overweight were more in the older students (63.3 and 55%, respectively) than in the younger students (36.7 and 45%, respectively) Table (2).

The prevalence of obesity and overweight was found to be higher among students who were living in urban area ((82.3 and 75.7%, respectively) than those who were living in rural area (17.7 and 24.3%, respectively). However, this variation was not statistically significant (p = 0.05) Table (2).

Regarding academic grades, prevalence of obesity and overweight was found to be higher among students of third and fourth grades (34.2 and 32.1%, respectively) than those in the first and second grades (25.3 and 16.4%, respectively). The difference was statistically significant (p = 0.01) Table (2).

Obesity and overweight were found to be more among single students (88.6 and 90.7%, respectively) than those who were married (11.4 and 9.3%, respectively). The prevalence variation based on marital status was of no significant (p = 0.06) Table (2).

Concerning fathers education, prevalence was found to be significant (p = 0.01). Students whose fathers had secondary grade and higher were more obese and overweight (43 and 30.3%, respectively) compared to students whose fathers had not read or write (12.7 and 15.7%, respectively) Table (2).

Father occupation was found to be significant (p = 0.01). The prevalence of obesity and overweight was higher among students whose fathers had occupation (59.5 and 64.3%, respectively) compared to students whose fathers had not occupation (40.5 and 35.7%, respectively) Table (2).

Concerning mothers education, prevalence was found to be significant (p = 0.01). Students whose mothers had not read or write were more obese and overweight (25.3 and 30%, respectively) compared to students whose mothers had university grade and higher (25.3 and 20%, respectively) Table (2).

The prevalence of obesity and overweight was higher among students whose mothers had not occupation (74.1 and 80.7%, respectively) compared to students whose mothers had occupation (25.9 and 19.3%, respectively). The variation was found to be insignificant (p = 0.06) Table (2).

**Table 2.** Socio-demographic factors associated with obesity and overweight among study sample.

Variables	Underweight		Normal		Overweight		Obese		P-Value
	No.	%	No.	%	No.	%	No.	%	
<b>Age (years)</b>									
19-<22 y (780)	16	40.0	488	62.9	189	45.0	87	36.7	0.00
22-25 y (693)	24	60.0	288	37.1	231	55.0	150	63.3	
<b>Residence</b>									
Urban (1131)	26	65.0	592	76.3	318	75.7	195	82.3	0.05
Rural (342)	14	35.0	184	23.7	102	24.3	42	17.7	
<b>Academic Grade</b>									
First (288)	6	15.0	168	20.6	69	16.4	45	19.0	0.01
Second (348)	9	22.5	189	24.7	90	21.4	60	25.3	
Third (375)	7	17.5	182	23.8	135	32.1	51	21.5	
Fourth (462)	18	45.0	237	30.9	126	30.1	81	34.2	
<b>Marital Status</b>									
Single (1352)	35	87.5	726	93.6	381	90.7	210	88.6	0.06
Married (121)	5	12.5	50	6.4	39	9.3	27	11.4	
<b>Father Education</b>									
No read or write (225)	6	15.0	123	15.9	66	15.7	30	12.7	0.01
Read, write and Elementary (384)	10	25.0	206	26.5	114	27.0	54	22.8	
Middle and secondary (372)	12	30.0	183	23.6	126	30.3	51	21.5	
University and higher (492)	12	30.0	264	34.0	114	27.0	102	43.0	
<b>Father Occupation</b>									
No (612)	21	52.5	345	44.5	150	35.7	96	40.5	0.01
Yes (861)	19	47.5	431	55.5	270	64.3	141	59.5	
<b>Mother Education</b>									
No read or write (357)	11	27.5	160	20.6	126	30.0	60	25.3	0.01
Read, write and Elementary (498)	17	42.5	271	34.9	147	35.0	63	26.6	
Middle and secondary (299)	7	17.5	175	22.6	63	15.0	54	22.8	
University and higher (319)	5	12.5	170	21.9	84	20.0	60	25.3	
<b>Mother Occupation</b>									
No (1209)	35	87.5	643	82.9	339	80.7	192	74.1	0.6
Yes (264)	5	12.5	133	17.1	81	19.3	45	25.9	
<b>No. of Family Members</b>									
<5 (151)	5	12.5	80	10.3	39	9.3	27	11.4	0.8
≥5 (1322)	35	87.5	696	89.7	381	90.7	210	88.6	
<b>Family Income\Month</b>									
Low: <5000 SR (288)	6	15.0	162	20.9	87	20.7	33	13.9	0.02
Middle: 5000-10000 SR (507)	19	47.5	248	32.0	159	37.9	81	34.1	
High: ≥10000 SR (678)	15	37.5	366	47.1	174	41.4	123	52.0	

SR= Saudi Riyals.

On the other side, students who had large number of family members  $\geq 5$  were found to be obese and overweight (88.6 and 90.7%, respectively) more than those who had small number of family members (11.4 and 9.3%, respectively). Prevalence based on number of family members was found to be of no significant ( $p = 0.8$ ) Table (2).

Pertaining family income\month, prevalence was significant ( $p = 0.02$ ). Obesity and overweight were found to be higher among students of high family income\month  $\geq 10000$  SR (52 and 41.4%, respectively) than those of low family income\month  $< 5000$  SR (13.9 and 20.7%, respectively) Table (2).

As shown in Table (3), the prevalence rate of obesity and overweight by smoking habit was found to be significant ( $p = 0.00$ ). Obesity and overweight were higher among

non smoker students (55.7 and 67.9%, respectively) compared to smokers (44.3 and 32.1%, respectively). Regarding physical activities, the prevalence of obesity and overweight was found to be higher among students who were physically inactive (79.7 and 69.3%, respectively) than those who were physically active (20.3 and 30.7%, respectively). The difference was statistically significant ( $p = 0.03$ ) Table (3).

Concerning dietary habits, prevalence was found to be highly significant ( $p = 0.00$ ). Obesity and overweight were higher among students who consumed non healthy diet (62 and 75%, respectively) compared to students who consumed healthy diet (38 and 25%, respectively) Table (3). Regarding sedentary behaviors, obesity and overweight were higher among students who spent  $> 2$  hours \ day in front of computer and internet, watching TV or playing video games (70.9 and 67.1%, respectively) than those who spent

**Table 3.** Other factors associated with obesity and overweight among study sample.

Variables	Underweight		Normal		Overweight		Obese		P-Value
	No.	%	No.	%	No.	%	No.	%	
<b>Smoking</b>									
Non Smokers (1044)	30	75.0	597	76.9	285	67.9	132	55.7	0.00
Smokers (429)	10	25.0	179	23.1	135	32.1	105	44.3	
<b>Physical Activities</b>									
Physically Inactive (1029)	25	62.5	524	67.5	291	69.3	189	79.7	0.03
Physically Active (444)	15	37.5	252	32.5	129	30.7	48	20.3	
<b>Dietary Habits</b>									
Healthy Diet (328)	5	12.5	128	16.5	105	25.0	90	38.0	0.00
Non – Healthy Diet (1145)	35	87.5	648	83.5	315	75.0	147	62.0	
<b>Sedentary Behaviors</b>									
Hours spent in front of computer and internet, watching TV or playing video games									
≤ 2hours\day (477)	15	37.5	255	32.9	138	32.9	69	29.1	0.6
> 2hours \day (996)	25	62.5	521	67.1	282	67.1	168	70.9	
Hours of sleep\day									
<8 hours (774)	16	40.0	383	49.4	222	52.9	153	64.5	0.00
≥8 hours (699)	24	60.0	393	50.6	198	47.1	84	35.5	
Time they go to bed every night									
Before 12 AM (321)	10	25.0	179	23.1	87	20.7	45	18.9	0.5
12 AM or after (1152)	30	75.0	597	76.9	333	79.3	192	81.1	
<b>Family History of Obesity</b>									
No (870)	31	77.5	608	78.4	129	30.7	102	43.0	0.00
Yes (Father and or Mother) (603)	9	22.5	168	21.6	291	69.3	135	57.0	

≤ 2 hours \ day (29.1 and 32.9%, respectively), but the difference was of no significant ( $p = 0.06$ ).

Obesity and overweight were found to be more among students who go to bed late every night at 12 am or after (81.1 and 79.3%, respectively) than those who go to bed early every night before 12 am (18.9 and 20.7%, respectively), but the variation was of no significant ( $p = 0.05$ ). The prevalence of obesity and overweight was found to be highly significant ( $p = 0.00$ ) and more among students who sleep < 8 hours \day (64.5 and 52.9%, respectively) compared to those who sleep ≥ 8 hours \day (35.5 and 47.1%, respectively). All the above results were shown in Table (3).

Pertaining family history of obesity, the prevalence was found to be highly significant ( $p = 0.00$ ). Obesity and overweight were found to be higher among students who had family history of obesity especially parents (57 and 69.3%, respectively) compared to those who had not family history of obesity (43 and 30.7%, respectively) Table (3).

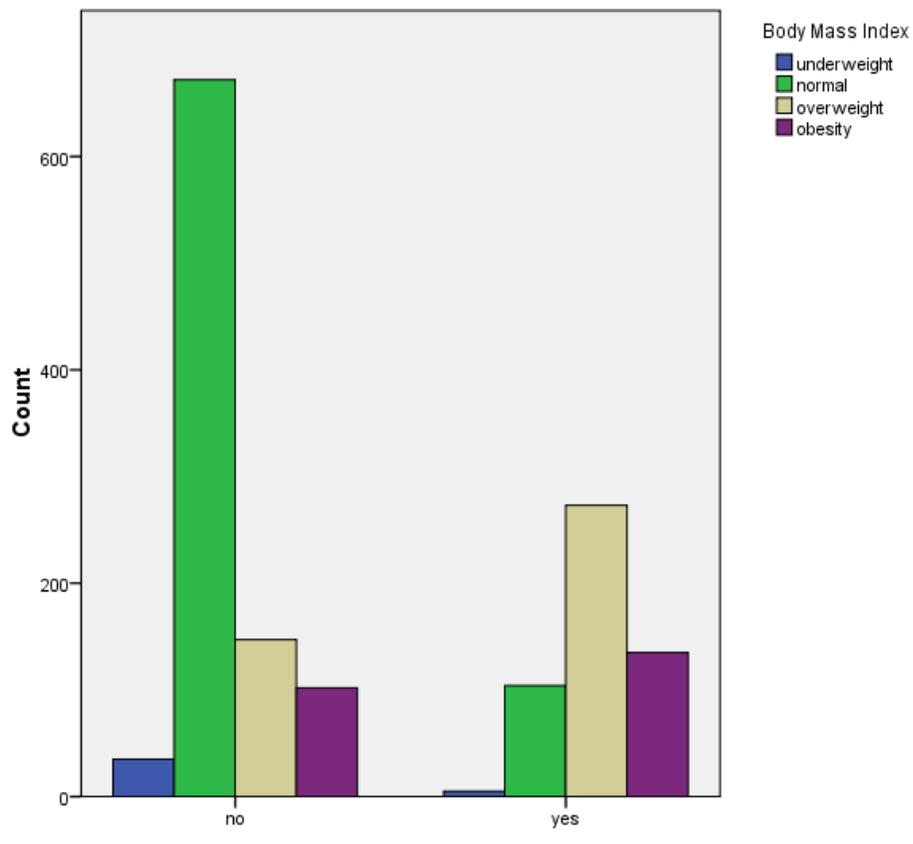
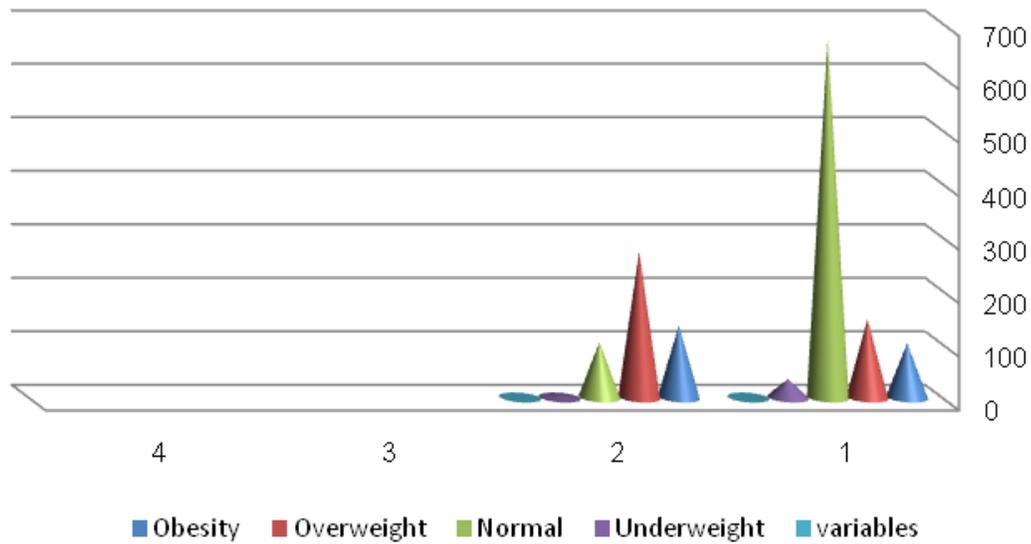
Daily activities were found to be significant ( $p < 0.00$ ). The prevalence of obesity and overweight was found to be more among students who were less daily active compared to high daily active students as shown in Figure (1).

Regarding family history of gaining weight easily, obesity and overweight were found to be higher among students who had family history of gaining weight easily compared to those who had not. The difference was statistically significant ( $p < 0.01$ ) Figure (2).

## DISCUSSION

Obesity has been noted as a major public health problem in many countries including Arab countries (Al-Isa, 1995; El Mugamer et al., 1995; Al-Mannai et al., 1996; Ajlouni et al., 1998; Beer-Bors et al., 2000). Although prior studies in Saudi Arabia reported high rates of overweight and obesity [Al-Shammari et al., 1994; Kordy and El-gamal,

**Figure 1.** Daily activities associated with obesity and overweight among study sample.



**Figure 2.** Family history of gaining weight easily associated with obesity and overweight among study sample.

1995; Al-Nuaim et al., 1996; Al-Nuaim et al., 1997), the determinants of obesity and overweight are still not well

understood among university students particularly with nutritional and lifestyle habits changes due to economic

development of Saudi Arabia during the last three decades (Magbool, 1993). Few studies were done to define risk factors, but more studies are needed to identify and better understand the risk factors related to the increasing levels of obesity and overweight and to develop appropriate prevention strategies.

The results showed that the overall prevalence of obesity and overweight among male university students were 16.1 and 28.5 %, respectively. These results were in agreement with studies done in Saudi Arabia where the prevalence of obesity and overweight was (19 and 30%, respectively) (Al-Malki et al., 2003) and (23.3 and 31%, respectively) (Al-Turkey, 2007). Also, these results are in agreement with many studies conducted in the Arab countries as in Kuwait, Lebanon and United Arab Emirate (Al-Isa, 1999a; Yahia et al., 2008; Musaiger et al., 2003). This agreement may be explained by the comparable eating habits and genetic constitution in Saudi Arabia with those in neighboring communities.

Our prevalence is higher than in study done in Iran and Chinese (Sakamaki et al., 2005; Nojomi and Najamabadi, 2006). The variance might be due to socio cultural, educational and geographical areas variations.

In this study the prevalence of obesity and overweight were more in older students. This might be due to decreased physical activities with increasing age. This finding corroborates the findings of other researchers reported from several studies in many countries (Al-Isa, 1999a; Al-Malki et al., 2003; Al-Tawil et al., 2007; Zindah et al., 2008).

Our study found that obesity and overweight were higher among students who were singles than married with insignificant statistical difference ( $p=0.06$ ). The higher prevalence in single students was because the age (19-25 years) may not be the age of marriage in population from which sample withdrawn, so most of the sample were singles, combined by single students may eat more outside the house and consume fast food more than married students. This result is inconsistent with other studies (Dehkordi et al., 2013).

It is likely that prevalence of obesity and overweight was more among students living in urban area (82.3 and 75.7%, respectively) than among students living in rural areas (17.7 and 24.3 %, respectively) but with insignificant association in our study ( $p>0.05$ ). The higher prevalence among students living in urban areas might be explained by modernization in urban areas while traditional lifestyles in rural areas. This was in agreement with findings by earlier researchers (Al-Nuaim et al., 1997). Other studies in Saudi Arabia have shown inconsistent results regarding the effect of place of residence on the bodyweight (Al-Shammari et al., 1994).

In this study we found that a significant association between obesity and overweight and parental educational and occupational levels except with mother occupation the association was insignificant. We showed that increased prevalence of obesity and overweight among

students whose fathers had secondary and high education level while increased among students whose mothers had low education level. Also, we found increased obesity and overweight among students whose fathers had occupation and among students whose mothers had not occupation. On the other hands, studies from Italy and Turkey found no significant association between overweight and obesity and parental educational and occupational levels, this may be due to relatively large sample size in our study rather than other studies.

In our study, obesity and overweight were more among students who have large family size (88.6 and 90.7%, respectively) than those who have small family size but the association was insignificant ( $p>0.05$ ). This may be explained by members of large family had lack of high quality food and depend more on starch and carbohydrates in their eating which are the source of high energy and fat depositions.

Rising income in developing nations may be a potential contributor to the high rates of obesity and overweight (Martorell et al., 2000). Among our participants higher rates of obesity and overweight were observed in students of high family monthly income. Data from other surveys in Saudi Arabia concur with this findings (Al-Nuaim et al., 1997). This may be attributed to higher income students may spend more money on buying more high calory foods especially with limited awareness in the population of the health risks associated with obesity and overweight. A study in the neighboring country of Bahrain did not find an association between income and obesity (Al-Mannai et al., 1996).

Our study revealed that obesity and overweight were more prevalent among non smoker's students than smokers. This may be due to inhibitory effect of cigarettes on the appetite however, smoking cessation usually leads to weight gain (Owen-Smith and Hannaford, 1999). Similar findings were found in other studies (Al-Nuaim et al., 1997; Kordy and El-Gamal, 1995), otherwise some studies in India showed that smokers constituted greater percentage of the obese group (Legato, 1997).

As we know physical activities play important roles in protection against obesity as well as its importance in the regulatory system controlling the storage, distribution and utilization of calories. This study revealed that physically inactive and less daily active students were more obese and overweight than among physically active and high daily active students with significant association ( $p<0.05$ ). This was in agreement with several studies (Al-Isa, 1999b; Lowery et al., 2000; Huang et al., 2003; Mataix et al., 2005; Kobayashi, 2007) that showed an inverse relationship between level of physical activities and overweight and obesity. Decreased physical activity may be due to dramatic lifestyle changes in the past three decades among Saudi population especially students. The following factors may lead to decreasing physical activities among students: Motorized transport became

available in large scale even most students have private cars. The technology made life easier so, they don't need to go outside during the day to exert physical activity. Moreover, poor role models of the parent in practicing an active lifestyle for their offspring due to modernization and new generation culture do not appreciate any type of work requiring physical activities. Furthermore, the transition from secondary school to the university life implies that students have to adapt to a new social, academic and psychological environment accompanied by decreased physical activity.

In this study prevalence of obesity and overweight among students consuming non healthy diet (62 and 75%, respectively) were more than students consuming healthy diet (38 and 25%, respectively) with significant association ( $p < 0.05$ ). Non healthy diet is characterized by skipping breakfast, irregular intake of three meals daily, frequent snacking, eating less variety food, increased intake of fatty food, frequent eating of fried food and increased intake of refined sugar products including soft drink. The results were in consistent with many other studies (Al-Isa, 1999b; Von Bothmer and Fridlund, 2005; Sakamaki et al., 2005; Kobayashi, 2007; Lowery et al., 2000; El-Qudah et al., 2008; Yahia et al., 2008). This may be explained by food become more available with large varieties as the price of food had decreased substantially relative to income and the concept of food had changed from a mean of nourishment to a marker of lifestyle and a source of pleasure. In addition, there are many social activities like wedding parties and religious occasions in which people gather and consume plenty of food like Kabsa (fatty meal consists of rice and meat). Also, students consume fast food meals with their friends and then must share their family with eating at home. Moreover, the mother or wife feels proud that all food was consumed by their family members as a sign of good cook.

This study showed that students who used to spend more than 2 hours in watching TV, computer, internet or playing video games were more found to be obese or overweight than students who do not or who spend 2 hours or less but the association was statistically insignificant in our study ( $p > 0.05$ ). Other international studies in contrast to our study confirmed a significant association between total media time spent and obesity (Rebecca et al., 2007; Carvalhal, 2006; Giammattei, 2003). This may be explained by increased calories consumption, reduce metabolic rates and eating habits are common while watching TV, or playing video games.

In our study students who sleep less than 8 hours per day or go to bed late every night at 12 am or after were more obese and overweight than students sleep 8 hours or more per day or go to bed early every night before 12 am with significant statistical association for hours of sleep but insignificant association with time they go to bed every night. These findings were in agreement with published meta analysis which showed that odds ratio for

short duration of sleep and obesity was 1.89 (Cappucio, 2008). This may be explained by longer TV watching with more junk food consumptions are common when students don't sleep early or for enough time.

Study results showed that prevalence of obesity and overweight (57 and 69.3% , respectively) among students with history of parental obesity or family history of easily weight gain were more than among students with no history of parental obesity or family history of easily weight gain with significant association ( $p < 0.05$ ). Results were in agreement with findings of other researchers (Al-Isa, 1999a; Musaiger et al., 2003). This may be explained by development of obesity may have a genetic role and obesity runs in families.

The results of the present study are limited by the followings: data collection was by self administered questionnaire and this may be subject to recall bias or missing data. Some of the selected variables were estimated subjectively as it was difficult to be estimated objectively as daily sleeping time in hours. The sample of students was taken from one university which may not be representative of all university students in Saudi Arabia. Study sample involved male students only, so the result cannot be generalized to all students or people in the same age. Waist and hip circumferences couldn't be measured as most students' refuse this measurement, so only one parameter of measurement was used (body mass index).

In conclusion, obesity and overweight increased among Taif University students and the problem was mostly due to dramatic lifestyle changes among students in Saudi Arabia. The most important risk factors of obesity and overweight among Taif university students were increasing age, high family monthly income, less daily activities, physical inactivities, consumption of non healthy diet, sedentary life behaviors and family history of obesity especially parents.

In the light of our results, we recommend that more studies are needed among large sample representing all university students males and females in Saudi Arabia for more investigations. Also, health education program should be done for university students and to their families. This program should increase their awareness about a healthy body size, appropriate eating habits and exercise behaviors, risk factors and obesity and overweight health problems. Thus, increasing awareness is the essential step for planning and future modifications of public health interventions for decreasing the prevalence of obesity and overweight among university students and their community.

## ACKNOWLEDGMENTS

I would like to express my thanks and appreciation to administrators of Taif University for granting the fund to do this work, administrators and staff members of male

university primary care unit for their help and support. Also, I would like to express my thanks and appreciation to all students who participate in this study and to students who help me in collecting data.

## REFERENCES

- Ajlouni K, Jaddou H, Batieha A (1998). Obesity in Jordan. *Int. J. Obes & Relat. Metab. Disorder.* 22:624–628.
- Al-Isa AN(1995). Prevalence of obesity among adult Kuwaitis: a cross-sectional study. *Int. J. Obes & Relat. Metab. Disorder.* 19:431–433.
- Al-Isa AN(1999a). Obesity among Kuwait university students: An explorative study. *J. R. Soc. Promt. Health.* 119: 223-227.
- Al-Isa AN (1999b). Dietary and socioeconomic factors associated with obesity among Kuwaiti college men. *Br. J. Nut.* 82: 369-374.
- Al-Malki JS, Al-Jaser MH, Warsy AS (2003). Overweight and obesity in Saudi females of childbearing age. *Int. J. Obes. Relat. Metab. Disorder.* 27:134-139.
- Al-Mannai A, Dickerson JW, Morgan JB, Khalfan H (1996). Obesity in Bahraini adults. *J. Roy. Soc. Hlth.* 116: 30 - 40.
- AL-Nozha M, AL-Mazrou Y, AL-Maatouq M, Arafa M, Khalil M, Khan N, Bamgboye AA, Al-Rubeaan EA, Al-Mazrou KA (2005). Obesity in Saudi Arabia. *Saudi Med. J.* 26 (5):824-829.
- Al-Nuaim A, Bamgboye E, Al-Rubeaan K, Al-Mazrou Y (1997). Overweight and obesity in Saudi Arabian population, role of socio demographic variables. *J. Community Hlth.* 22: 211-223.
- Al-Nuaim AR, Al-Rubeaan K, Al-Mazrou Y, Al-Attas O, Al-Daghari N, Khoja T (1996). High prevalence of overweight and obesity in Saudi Arabia. *Int. J. Obes. Relat. Metab. Disorder.* 20:547–552.
- Al-Rethaiaa AS, Fahmy AA, Al-Swaiyat NM (2010). Obesity and eating habits among college students in Saudi Arabia: a cross sectional study. *Nutr. J.* 9: 39.
- Al-Shammari SA, Khoja TA, Al-Maatouq MA, Al-Nuaim LA (1994). High prevalence of clinical obesity among Saudi females: a prospective, cross-sectional study in the Riyadh region. *J. Trop. Med. Hyg.* 97:183–188.
- Al-Tawil NG, Abdalla MM, Abdul-Ameer AJ (2007). Prevalence of and factors associated with overweight and obesity among a group of Iraqi women. *East Mediterr. Health J.* 13:420-429.
- Al-Turki YA (2007). Overweight and obesity among university students, Riyadh, Saudi Arabia. *Middle East J. Family Med.* Vol. 5: 1-4.
- American Academy of Pediatrics (1999). Media education. Committee of public education. *Pediatric.* 104: 341-343.
- Amin TT, Al-Sultan AI, Ali A (2008). Overweight and obesity and their relation to dietary habits and socio-demographic characteristics among male primary school children in Al-Hassa, Kingdom of Saudi Arabia: *Eur. J. Nutr.* 47: 310-318.
- Beer-Borst S, Morabia A, Hercberg S, Vitek O, Bernstein MS, Galan P, Galasso R, Giampaoli S, Houterman S, McCrum E, Panico S, Pannozzo F, Preziosi P, Ribas L, Serra-Majem L, Verschuren WM, Yarnell J, Northridge ME (2000). Obesity and other health determinants across Europe: the EURALIM project. *J. Epidem. Comm. Hlth.* 54: 424–430.
- Campfield LA, Smith FJ (1999). The pathogenesis of obesity, best practice and research clinical endocrinology and metabolism. 13: 13-30.
- Cappuccio FP (2008). Meta-analysis of short sleep duration and obesity in children and adults. *Sleep May.* 31(5): 619-626.
- Carvalho A (2006). Overweight and obesity related to activities in Portuguese children. *European J. of public health.* 17(1): 42-46.
- Dehkordi BM, Safaee A, Vahedi M, Pourhoseingholi A, Pourhoseingholi MA, Ashtari S, Zali MR (2013). Overweight and obesity and related factors in urban Iranian population aged between 20 to 84 years. *Ann. Med. Health Sci. Res.* Apr-Jun. 3(2):171-176.
- De Onis M, Blossner M, Borghi E (2010). Global prevalence and trends of overweight and obesity among preschool children: *Am. J. Clin. Nutr.* 92:1257-1264.
- El Mouzan MI, Foster PJ, Al Herbish AS, Al Salloum AA, Al Omer AA, Qurachi MM, Kecojevic T (2010). Prevalence of overweight and obesity in Saudi children and adolescents. *Ann. Saudi Med.* 30:203–208.
- El Mugamer IT, Ali Zayat AS, Hossain MM, Pugh RN (1995). Diabetes, obesity, and hypertension in urban, and rural people of bedouin origin in the United Arab Emirates. *J. Trop. Med. Hyg.* 98:407–415.
- El-Qudah JM, Al-Widyan O, Al-Boqai OK, Suleiman AA, Quasem JM (2008). Fat soluble vitamins (A, E and K) intake among a sample of Jordanian university students. *World Applied Sci. J.* 5: 252-257.
- Giammattei AM (2003). Television watching and soft drink consumption. *Arch Pediatr. Adolesc. Med.* 157(2): 882-886.
- Hesketh K, Wake M, Water E (2004). Body mass index and parent- reported self esteem in elementary school children: evidence for a causal relationship. *Int. J. Obes. Relat. Meta. Disord.* 28: 1233-1237.
- Huang TT, Harris KJ, Lee RE, Nazir N, Born W, Kaur H (2003). Assessing overweight, obesity, diet and physical activity in college students. *J. Am. Coll. Health.* 52: 83-86.
- Kobayashi F (2007). Assessing body type, diet, exercise and sedentary behaviors of American and Japanese college students. *Nut. Food Sci.* 37: 329-337.
- Kordy MN, El-gamal FM(1995). A study of pattern of body mass index (BMI) and prevalence of obesity in a Saudi population. *Asia-Pacific. J, Public. Health.* 8: 59–65.

- Legato MJ (1997). Gender-specific aspects of obesity. *Int. J. Fert. Women. Med.* 42:184–197.
- Lowery R, Galuska DA, Fulton JE, Wechsler H, Kann L, Collins JL (2000). Physical activity, food choice and weight management goals and practices among US college students. *Am. J. P. rev. Med.* 18: 18-27.
- Madanat HN, Troutman KP, Al-Madi B (2008). The nutrition transition in Jordan: the political, economic and food consumption contexts: *Promot. Educat.* 15: 6-10.
- Madani KA, Al-Amoudi NS, Kumosani TA (2000). The state of nutrition in Saudi Arabia. *Nutrition and Health.* 14:17-31.
- Magbool G (1993). Weight and height of Saudi children aged 6 to 16 years from the eastern province. *Ann. Saudi. Med.* 13(4):344–349.
- Mahfouz AA, Abdelmoneim I, Kham MY, Daffalla AA (2007). Obesity and related behaviors among adolescent school boys in Abha city: Southwestern Saudi Arabia. *J. Trop. Pediatr.* 54 (2):120-124.
- Martorell R, Khan LK, Hughes ML, Grummer-Strawn LM (2000). Obesity in women from developing countries. *Eur. J. Clin. Nutr.* 54: 247–52.
- Mataix J, Frias ML, Victoria EM, Juado ML, Aranda P, Liopis J (2005). Factors associated with obesity in an adults Mediterranean population: Influence on plasma lipid profile. *J. Am. Coll. Nutr.* 24: 456-465.
- Musaiger AO, Liyod OL, Bener AB, Al-Neyadi SM (2003). Lifestyle factors associated with obesity among male university students in the United Arab Emirates. *Nutr. Food Sci.* 33:145-147.
- Must A, Strauss RS (1999). Risks and consequences of childhood and adolescent obesity. *Int. J. Obes. Relat. Metab. Disord.* 23 (supply 2):S2-S11.
- Nojomi M, Najamabadi S (2006). Obesity among university students, Tehran, Iran. *Asi. Pac. J. Clin. Nutr.* 15 (4): 516-520.
- Owen-Smith V, Hannaford PC (1999). Stopping smoking and body weight in women living in the United Kingdom. *Br. J. Gen. Prac.* 49:989–990.
- Rebecca K, Swarnarekha B, Tinku T (2007). Television viewing and sleep are associated with overweight among urban and semi-urban south Indian children. *Nutri. J.* 6: 20-25.
- Sakamaki B, Amamoto R, Mochida Y, Shinfuku N, Toyama K (2005). A comparative study of food habits and body shape perception of university students in Japan and Korea. *Nutr. J.* 4: 31-36.
- Sanchez A, Norman F, Sallis J, Calafs J, Patrick K (2007). Pattern and correlate of physical activities and nutrition behaviors in adolescents: *Am. J. Prev. Med.* 32: 124-130.
- Shakhatrek MN, Suleimn AA, Maaitah RM (2005). Obesity among females of reproductive age in Ma'an, Jordan: Ma'an, Jordan: *Dirasat Med. Biol. Sci.* 32: 43-51.
- Thompson D, Edelsbberg J, Colditz GA, Bird AP, Oster G (1999). Lifetime health and economic consequences of obesity: *Arch Int. Med.* 159:2177-2183.
- Von-Bothmer MK, Fridlund B (2005). Gender difference in health habits and its motivation for a healthy lifestyle among Swedish university students. *Nurs. Health Sci.* 7:107-118.
- World Health Organization (1998). Obesity: preventing and managing the global epidemic. Report of WHO consultation, Geneva, June 3-5.
- Yahia N, Achkar A, Abdallah A, Rizk S (2008). Eating habits and obesity among Lebanese University students. *Nutr. J.* 7:32-32.
- Znidah M, Belbeisi A, Walke H, Mokdad AH (2008). Obesity and diabetes in Jordan: Findings from the behavioral risk factors surveillance system, 2004. *Prev. Chronic Dis.* 5:1-8.
- Zoeller F (2009). Physical activities, sedentary behaviors and overweight\obesity in youth: Evidence from cross sectional longitudinal and interventional studies. *Am. J. lifestyle Med.* 3:110-114.