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## Prevalence of and Factors Associated with Overweight and Obesity among Jordan University Students

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**Abstract:** To determine the prevalence of overweight and obesity among Jordan University students and to investigate some factors that might be associated with overweight and obesity. A cross-sectional survey was conducted at Jordan University, Amman, Jordan from March to September, 2005 using a multistage stratified sampling technique to recruit the participants. A total of 1219 students aged 17-28 years completed the study procedure with a response rate of 81.3%. A self-administered questionnaire was used for data collection. The questionnaire included questions on biological and non-biological factors influencing the development of overweight and obesity. Also, height and weight were self reported to calculate the Body Mass Index (BMI) and to categorize it into normal, overweight and obese according to WHO (1997) classification. The overall prevalence rates of overweight and obesity among university students were 28.5 and 10.2%, respectively. Biological factors significantly associated with overweight and obesity were increasing age, being female and parental obesity ( $p < 0.05$ ). Also, non-biological factors including, physical inactivity, non-healthy diet, lower family monthly income and being non-smoker were significantly associated with overweight and obesity ( $p < 0.05$ ). Obesity is a problem among Jordan University students. Factors behind overweight and obesity among Jordan University students were increasing age, being female, parental obesity, physical inactivity, non-healthy diet, lower family monthly income and being non-smoker.

**Key words:** Overweight, obesity, physical activity, diet, Jordan

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### INTRODUCTION

Obesity is 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 the Eastern Mediterranean Region such as Jordan (WHO, 1998; Chopra *et al.*, 2002; Popkin, 2004; Prentice, 2006; Hossain *et al.*, 2007; Madanat *et al.*, 2008). Numerous studies conducted worldwide demonstrated that obesity is associated with many chronic diseases including

Coronary Heart Disease (CHD), hypertension, type-2 diabetes, gallbladder disease, osteoarthritis, dyslipidemia and certain types of cancer (Must *et al.*, 1999; WHO, 2000; Visscher and Seidell, 2001; Manson *et al.*, 2004). Several studies conducted in Jordan demonstrated that the prevalence of overweight and obesity ranged between 57 to 73% and that obesity was strongly associated with cardio-metabolic risk factors such as CHD, hypertension, hyperlipidemia and diabetes mellitus (Jaddou *et al.*, 1996; Batiha *et al.*, 1997; Ajlouni *et al.*, 1998a; Abbas *et al.*, 2002; Shakhathreh *et al.*, 2005, 2008; Alboqai *et al.*, 2006;

Ahmad *et al.*, 2006; Zindah *et al.*, 2008). Chronic diseases are considered the leading cause of morbidity and mortality among adults worldwide, as well as, in Jordan (Alwan, 1997; Ajlouni *et al.*, 1998b; Baik *et al.*, 2000; Flegal *et al.*, 2005; Ministry of Health, 2006; Zindah *et al.*, 2008).

The economic cost of obesity and its associated co-morbidities is skyrocketing which is beyond the capacity of the best health care systems in the world (Viad, 2003; Katzmarzyk and Jenssen, 2004; Boutayeb and Boutayeb, 2005). In Jordan the economic cost of non-communicable diseases is estimated to be 1.2 Billion dollars yearly which is considered an overburden to Jordan's economy (Ministry of Health, 2006). Obesity is considered to be one of the most urgent public health problems and numerous studies have emphasized that obesity is a leading preventable cause of morbidity and mortality (Mataix *et al.*, 2005; Prentice, 2006).

Several international and regional studies indicated that factors causing obesity are multifactorial in origin. These factors may include biological and non-biological factors such as, heredity, age, sex, education, socioeconomic level, physical activity, eating habits and psychological factors (WHO, 1998; Chopra *et al.*, 2002; Ball *et al.*, 2003; Huot *et al.*, 2004; Mataix *et al.*, 2005; Al-Kandari, 2006; Fouad *et al.*, 2006; Al-Tawil *et al.*, 2007).

In the Arab countries, few studies are available regarding the determinants of obesity particularly among university students. These studies found that factors associated with obesity were age, sex, education, marital status, smoking, physical activity, parental obesity, dietary habits and socio-cultural factors (Al-Isa, 1999a; Al-Malki *et al.*, 2003; Musaiger *et al.*, 2003; Al Turki, 2007; El-Qudah *et al.*, 2008; Yahia *et al.*, 2008).

In Jordan, there is a lack of data about obesogenic factors which are important in defining and understanding the high risk factors which should be targeted for future modifications in public health interventions. Therefore, this study was conducted to determine the prevalence of overweight and obesity and their relationship with biological and non-biological factors among Jordan University students.

## **MATERIALS AND METHODS**

A cross-sectional survey on overweight and obesity was conducted on 1500 students attending Jordan University between March and September, 2005. Jordan University is a large sized and a public university consists of eleven faculties, located in Amman the capital of Jordan. A multistage stratified sampling technique was used to recruit the participants of the study which was

approved by the deanship of student affairs (Dawson and Trapp, 2004; Fink and Kosecoff, 1998). At the first stage of selection five faculties (medicine, dentistry, agriculture, science and humanities) were selected using a systematic random sampling technique. At the second stage of selection one class from first, second, third and fourth years in each faculty were randomly selected. Classes were visited by the research team to clarify the purposes of the study. A schedule for the next visit was given to fill the questionnaire. At the second visit an informed consent was obtained from each participant and a self administered questionnaire was filled by the students in the presence of a member of the research team. A total of 1219 students aged 17 to 28 years (791 females, 428 males) returned the questionnaires. A total of 281 students were excluded. Thus, the response rate for sample respondents was 81.3% (1219/1500). Statistical analyses were carried out on responses from 1219 participants.

A pre-tested questionnaire consisted of two sections. The first section of the questionnaire included information about biological factors related to obesity such as age, sex and parental obesity. Age was categorized as, 17-20 and 21-28 year. Parental obesity was categorized as neither parent having obesity and father and/or mother having obesity (Al-Isa, 1999a). The second section of the questionnaire included information about non-biological factors related to obesity such as physical activity, type of diet, family monthly income and smoking status. Physical activity was assessed by asking subjects how many times per week they exercised enough to work up 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 with a frequency less than three times per week (Patrick *et al.*, 2004; Sanchez *et al.*, 2007; Zoeller, 2009). Each student was asked 12 questions regarding their dietary habits, to classify them into healthy or non-healthy diet groups (Shakhathreh *et al.*, 2005). Dietary habits questions included information about taking daily breakfast, taking at least three meals every day, taking snacks 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. Response for each question was either yes or no. Each subject was given a score between zero and twelve according to his/her responses to the twelve questions. A score  $\geq 9$  was considered as healthy diet and a score of  $< 9$  was considered as non-healthy diet. Family monthly income, in Jordanian Dinar (JD), was categorized as  $< 500$  JD and  $\geq 500$  JD. Smoking status was categorized as non-smokers and smokers.

Body weight and height were self reported. Body Mass Index (BMI) was computed using the widely accepted method of weight (kg) divided by the square of height (m<sup>2</sup>). BMI was classified, based on (WHO, 1998) into three categories: normal (BMI = 18.5-24.9 kg m<sup>-2</sup>), overweight (BMI = 25-29.9 kg m<sup>-2</sup>) and obese (BMI = 30 kg m<sup>-2</sup>).

Data entry and statistical analysis were performed using the Statistical Package for the Social Science (SPSS) program, for windows (version 11.5, SPSS Inc., Chicago, Illinois). Frequency and range checks were performed initially to detect errors in the data entry. Detected errors were corrected by rechecking the original data forms. Descriptive statistics such as means, standard deviation were used to summarize the quantitative variables. Also percentages were used to determine the prevalence rate of overweight and obesity among Jordan University students. Proportions and percentages were used to summarize category variables. Chi-square test examined the relationship between overweight and obesity and biological and non-biological factors. The p-values ≤ 0.05 were considered for statistical significance.

**RESULTS**

The study sample included a total of 1219 students, of this number 35.1% (N = 428) were males and 64.9% (N = 791) were females. The female to male ratio was (1.8:1.0). The mean age for all subjects was 20.3±1.5 years (range = 17 to 28 years). Nearly 63% of the students were between the ages of 17-20 years. Approximately 45% of students had a family monthly income <500 JD. Smoking was prevalent among 22.1% of students. Overall, 31.2% of students were physically active compared with 68.8% of students who were physically inactive.

Table 1 shows the distribution of study sample according to BMI. The overall prevalence rates of normal, overweight and obesity were 61.3, 28.5 and 10.2%, respectively.

Table 2 shows biological factors associated with overweight and obesity. Age was significantly (p = 0.0001) associated with overweight and obesity. The prevalence rates of overweight and obesity among students increased with increasing age ranging between 47.4 and 42.7% in the age group 17-20 years to 52.6% and 57.3% in the age group 21-28 years, respectively. Gender was also significantly (p = 0.01) associated with overweight and obesity. Females were more likely to be overweight and obese compared with males. Parental obesity was significantly (p = 0.0001) associated with overweight and obesity. Prevalence rates of overweight and obesity among students whose father and/or mother

Table 1: Distribution of study sample according to Body Mass Index (BMI)

Body mass index (kg m <sup>-2</sup> )	No.	Percentage
Normal (BMI<25)	747	61.3
Overweight (BMI 25-29.9)	348	28.5
Obesity (BMI>30)	124	10.2
Total	1219	100.0

Table 2: Biological factors associated with overweight and obesity among Jordan University students

Factors	Normal		Overweight		Obesity		p-value <sup>a</sup>
	No.	%	No.	%	No.	%	
Age							0.0001
17-20 years (n = 767)	531	71.1	165	47.4	53	42.7	
21-28 years (n = 452)	216	28.9	183	52.6	71	57.3	
Sex							0.01
Male (n = 428)	290	38.8	100	28.7	38	30.6	
Female (n = 791)	457	61.2	248	71.3	86	69.4	
Parental obesity							0.0001
Neither (n = 426)	362	48.5	52	14.9	12	9.7	
Father and/or mother (n = 793)	385	51.5	269	85.1	112	90.3	

<sup>a</sup>p-value based on χ<sup>2</sup> test

Table 3: Non-biological factors associated with overweight and obesity among Jordan University students

Factor	Normal		Overweight		Obesity		p-value <sup>a</sup>
	No.	%	No.	%	No.	%	
Physical activity							0.0001
Physically active (n = 380)	287	38.4	80	23.0	13	10.5	
Physically inactive (n = 839)	460	61.6	268	77.0	111	89.5	
Type of diet							0.0001
Healthy (n = 279)	217	29.0	53	15.2	9	7.3	
Non healthy (n = 940)	530	71.0	295	84.8	115	92.7	
Family monthly income							0.0001
<500 JD <sup>b</sup> (n = 40)	281	37.6	185	53.2	74	59.7	
≥ 500 JD (n = 679)	466	62.4	163	46.8	50	40.3	
Smoking status							0.0001
Non-smokers (n = 949)	543	72.7	293	84.2	113	91.1	
Smokers (n = 270)	204	27.3	55	15.8	11	8.9	

<sup>a</sup>p-value based on χ<sup>2</sup> test; JD<sup>b</sup> = Jordanian dinar

were obese (85.1 and 90.3%, respectively) were higher compared to similar rates of those students whose neither parent was obese (14.9 and 9.7%, respectively).

Table 3 shows non-biological factors associated with overweight and obesity. Physical inactivity was significantly (p = 0.0001) associated with overweight and obesity. Prevalence rates of overweight and obesity were 23 and 10.5, respectively, among physically active students compared to 77 and 89.5%, respectively, among physically inactive students.

Diet was significantly (p = 0.0001) associated with overweight and obesity. Prevalence rates of overweight and obesity were 15.2 and 7.3%, respectively, among students on healthy diet compared to 84.8 and 92.7%, respectively, among students on non-healthy diet.

Family monthly income was significantly (p = 0.0001) associated with overweight and obesity. Prevalence rates of overweight and obesity were higher among low income (<500 JD) students compared to those among high income

students ( $\geq 500$  JD). Prevalence rates of overweight and obesity among low income students were 53.2 and 59.7%, respectively, compared to 46.8 and 40.3%, respectively, among high income students.

Smoking was significantly ( $p = 0.0001$ ) associated with overweight and obesity. Prevalence rates of overweight and obesity were 84.2 and 91.1%, respectively, among non-smoking students compared to 15.8 and 8.9%, respectively, among smoking students.

## DISCUSSION

Study results indicated that the overall prevalence rates of overweight and obesity among Jordan University students were 28.5 and 10.2%, respectively. These results are in agreement with several studies conducted among university students in the Arab countries such as: in Kuwait (32 and 8.9%, respectively) (Al-Isa, 1999a); in Saudi Arabia (30 and 19%, respectively) (Al-Malki *et al.*, 2003) and (31 and 23.3%, respectively) (Al-Turkey, 2007); in Lebanon (24 and 7.2%, respectively) (Yahia *et al.*, 2008) and in United Arab Emirates where 35.7% of university students were either overweight or obese (Musaiger *et al.*, 2003). This may be attributed to the comparable eating habits in Jordan with those in neighboring countries, or to the comparable genetic constitution of neighboring communities.

A national study conducted in Jordan reported that the prevalence rate of obesity among 18-34 years old was 19.1% (Zindah *et al.*, 2008). The difference between the two studies is that Jordan national study was a nationwide study whereas this study was at the level of university students. With regard to the prevalence rates of overweight and obesity found in this study as compared with findings from international studies among university students, our rates were higher (Lowry *et al.*, 2000; Bertias *et al.*, 2003; Alcacera *et al.*, 2008). The difference may be due to geographical variation which is an epidemiological feature of comparisons both within and between countries among university students or due to educational and socio-cultural variations which are known to affect the level of health consciousness.

Results of this study showed that overweight and obesity increases significantly ( $p = 0.0001$ ) with age which are in agreement with several studies conducted elsewhere (Al-Isa, 1999a; Al-Malki *et al.*, 2003; Shakhatareh *et al.*, 2005; Mataix *et al.*, 2005; Al-Kandari, 2006; Fouad *et al.*, 2006; Al-Tawil *et al.*, 2007; Zindah *et al.*, 2008). This may be attributed to decreased physical activity with increasing age. In addition to that, the age at which obesity began and its duration are significant both for prognosis and treatment.

Our study showed a significantly higher rate ( $p = 0.01$ ) of overweight and obesity among females than males. This is consistent with findings of several studies (Ajlouni *et al.*, 1998a, b; Abbas *et al.*, 2002; Mataix *et al.*, 2005; Fouad *et al.*, 2006; Zindah *et al.*, 2008) and inconsistent with the findings of several other studies (Al-Isa, 1999a; Lowry *et al.*, 2000; Bertias *et al.*, 2003; Musaiger *et al.*, 2003; Alcacera *et al.*, 2008; Yahia *et al.*, 2008). This inconsistency may be due to the fact that obesity among females is likely to be rooted in the social norms and gender roles in traditional Arab societies, where females are seen mainly as child bearers and rearers, confined to their homes, either due to societal traditions or their pressing household duties, which became less associated with energy expenditure due to mechanization, have probably little chance of recreational and non-recreational activities. Furthermore, Arab males like plums females, due to the general belief that plums females are more capable of reproductive capacity.

The prevalence rates of overweight and obesity among females in this study is lower than those in the Arabian Gulf countries (Al-Isa, 1999a; Al-Malki *et al.*, 2003; Al-Turki, 2007). This low prevalence might be attributed to a better education, being not married, modern dress of female university students; which clarifies their body shape as compared to the traditional gown; and being not confined to home.

Study results demonstrated that the prevalence of parental obesity among overweight and obese subjects was 85.1 and 90.3%, respectively. This study revealed that family history of obesity was significantly ( $p = 0.0001$ ) associated with overweight and obesity and is in agreement with findings of Al-Isa (1999a) and Musaiger *et al.* (2003). This finding indicates that obesity runs in families and may suggest, in a limited way, that there are genetic aspects for the development of obesity.

Several studies had shown an inverse relationship between level of physical activity and overweight and obesity (Al-Isa, 1999b; Lowry *et al.*, 2000; Huang *et al.*, 2003; Mataix *et al.*, 2005; Kobayashi, 2007). In this study the prevalence of overweight and obesity among physically inactive subjects was 3.3 and 8.5 times, respectively greater than physically active subjects. These results are in agreement with that of Al-Isa (1999b), Lowry *et al.* (2000), Huang *et al.* (2003), Mataix *et al.* (2005) and Kobayashi (2007). It is well known that physical activity plays a protective role against obesity, as well as its importance in the regulatory system controlling the storage, distribution and utilization of calories. Also, the role of physical activity leads to an elevation in daily energy expenditure and increases resting energy need, promotes fat oxidation, decrease

leptin level, increases leptin receptors sensitivity and increases muscle mass and decreases fat mass (Achten and Jeukendrup, 2004). Jordan has witnessed a dramatic lifestyle changes in the past three decades which is characterized by decreased physical activity. Electricity, tap water and television entered almost every house, motorized transport became available in large scale and agriculture became largely mechanized. Central heating also reduced the need to expend energy for thermoregulation and probably encouraged lethargy. House building design reduced energy expenditure. The technology could be blamed for making it easier to get through the day without exerting physical activity. Also, social and misunderstanding to religious norms may preclude some people from engaging in public sports. People may also find engaging in sports at home incongruent with their domestic responsibilities or status. Parents from previous generations were good role models in practicing an active lifestyle for their offspring, whereas nowadays, most parents are poor role models for their offspring due to modernization. Furthermore, these lifestyle changes were not accompanied by programs which encourage involvement in physical activities. Also, new generation culture does not appreciate any type of work requiring physical activity. The transition from high school to the university life is known to be a problematic stage in adult development (Adlaf *et al.*, 2001). This transition implies that students have to adapt to a new social, academic and psychological environment accompanied by decreased physical activity. For many students leisure time tasks are dominated by television viewing, playing cards, playing computer games, internet chatting and other inactive pastimes. Thus, Obesity may be a normal response to new lifestyle for Jordanians, which is associated with a decline in energy expenditure as people adopt increasingly a sedentary lifestyle.

There is a wide agreement that diet is a key factor for the prevention and risk reduction of most chronic diseases, particularly obesity (WHO, 1998). This study indicated that 77.1% of students were on non-healthy diet which 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, increased intake of refined sugar products including soft drinks. The prevalence rates of overweight and obesity among students at non-healthy diet were 5.6 and 12.7 times higher compared with prevalence rates of overweight and obesity among students at healthy diet, respectively. This study results are consistent with several other studies (Al-Isa, 1999b; Von Bothmer and Fridlund, 2005; Sakamaki *et al.*, 2005; Kobayashi, 2007; Lowry *et al.*, 2000; El-Qudah, 2008;

Yahia *et al.*, 2008 ). Jordanians use bread with every meal with as spoon for eating. Also, a higher proportion of students concentrate on fried food as their main dish and drink soft drinks, rich in refined sugars, during the day. Furthermore, a significant proportion of students prefer eating fatty meat over lean meat and they prefer eating chicken over lean meat. A higher proportion of Jordanians consume olive oil, bread, falafel, hommos and fava beans (foul) with sweetened tea at breakfast and supper daily. Most people prefer drinking whole milk and consuming milk products rich in fat such as yogurt balls and cheese. Fresh vegetables and fruits are taken on average twice a week. This indicates the quantitative significance of sweet-fat combination foods in promoting a passive over-consumption of energy.

Jordanians lifestyle changes regarding dietary patterns were characterized by availability and variety of food, particularly imported food during the whole year whereas previously there was a shortage in locally produced and imported food (Alwan and Kharabsheh, 2006). In addition to that, there are many social activities like wedding parties and religious occasions in which people gather and consume plenty of food. It is usually against Arab customs to refuse partaking of food offered. Also, students consume fast food meals with their friends and then must share their family with eating at home. Furthermore, the majority of students eat with their family in groups, particularly during the weekend holidays, which may encourage overeating. Also, family members and friends tend sometimes to compete with each other in the amount of food consumed. The mother or wife feels proud that all food was consumed by their family members as a sign of good cook. Overweight and obesity may be attributed to traditional food habits.

Various factors determine college student's selection of food. These factors include: shortage of time, convenience, cost, taste, health, physical and social environment and weight control. Eating habits tend to become worse during college and young adulthood due to the fact that students combined both cultural and college food habits.

The results of this study elucidate the most important factors contributing to overweight and obesity as sedentary lifestyle, dietary factors and parental obesity. These results provide a better understanding of how the problem of overweight and obesity develops, which provide health planners with the awareness of this increasing national problem. Our results should be used to develop messages to raise awareness and develop greater priorities of the dangers of obesity among Jordanians. These messages should be extensive, beamed through the mass media, especially television and should

project that obesity is a risk factor for a variety of health problems. Policy makers must address the problem of overweight and obesity and focus on prevention strategy. Results of this study provide a basis for intervention strategies.

The findings of this study are limited by the use of a sample of students from just one university which may not be a representative of all university students in Jordan. It is highly recommended that an investigation of the prevalence of factors associated with overweight and obesity among a larger sample representing all Jordanian university students, as well as at the national level, be conducted in the near future. Furthermore, the data presented are self-reported and may be subject to recall bias.

In conclusion, obesity is a problem among Jordan University students. Factors behind overweight and obesity among Jordan University students were increasing age, being female, parental obesity, physical inactivity, non-healthy diet, lower family monthly income and being non-smoker. Dietary and exercise counseling is required as a preventive strategy for university students.

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