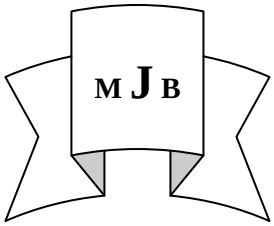
Prevalence of Overweight and Obesity among Students in University of Kerbala

Saad I. Al-Ghabban
Dept. of Community Medicine, College of Medicine, University of Kerbala, Holy Kerbala, Iraq. E-mail: saad_alghabban@yahoo.com



Abstract

Background: Overweight and obesity are major public health problems because of their impact on co-morbidity they are major risk factors for a number of chronic diseases. Recent data worldwide show an absolute increase in the prevalence of obesity in recent years

Objective: To study the prevalence and factors associated with overweight and obesityamong college students of University of Kerbala in Holy Kerbala, Iraq.

***Subjects and Methods*:** A cross-sectional study started from 1st March 2010 – 26th April 2010, a total of 463 students (219 male and 244 female) between 18 and 32 years of age (mean 21.28 ± 1.91 year) were selected randomly from the 11 colleges of the university. A questionnaire was distributed to each subject; Age, gender, dietary habits, sport activity, family history of obesity; number of households, monthly family income, were considered, weight, height, waist circumference; were measured, and BMI was calculated and used to assess weight status. The data was analyzed using SPSS version ١6.0, *P*-value greater than 0.05 was considered as statistically insignificant.

Results: The mean BMI was 23.58 ± 3.78 kg/m²; about two thirds (65.9%) of the students were of normal weight (60.7% of the male students and 70.5% of the female students); whereas the prevalence of overweight and that of obesity among them was 22.9% and 5.6% respectively. The prevalence of overweight was more common among male students compared to females (27.4% vs. 18.9% respectively), while the prevalence of underweight and obesity were not significantly different between them (5.6% vs. 5.3% respectively for both variables). Depending on their waist circumference, 4.6% of the males and 20.9% of the females were at higher risk of developing obesity comorbidities. There was a significantly higher mean BMI (t=4.905) and waist circumference (t= 3.825) within students with family history of obesity; (P<0.001 for both variables).Male students who reported that they used to practice regular sport activity had significantly lower body mass index and waist circumference.

***Conclusions*:** This study supports the fact that obesity is a multifactorial problem; it shows that male gender and family history of obesity are risk factors, while regular sport activity is a protective factor.

Key words: Prevalence; Overweight; Obesity; Students; Holy Kerbala; Cross-sectional study, Lifestyle factors.

Abbreviations: WHO, World Health Organization; BMI, body mass index; WC, waist circumference; SPSS, Statistical Package for Social Sciences.

الخلاصة

خلفية البحث:.زيادة الوزن والسمنةِ مشكلتان من مشاكلَ الصحة العامةِ الرئيسيةِ بسبب تأثيرِهما على الامراض المصاحبة،وهما من عوامل الخطرِ الرئيسيةِ لعدد مِنْ الأمراضِ المُزمنةِ. أظهرت البياناتُ الحديثة زيادةُ مُطلقةُ حول العالم في إنتشارِ السمنةِ في السَنَوات الأخيرة.

الهدف: دِراسَة معدل الإنتشارِ والعواملِ إلمرتبطاة بزيادة الوزنِ والسمنةِ بين طلبةِ كليات جامعةِ كربلاء في كربلاء المقدسةفي العراق.

اشخاص وطريقة الدراسة: ابتدأت هذه الدراسة المقطعية مِنْ ١ آذارِ ولغاية ٢٦ نيسان ٢٠١٠، تم دراسة مجموعه مؤلفة من 463 طالب و طالبة (٢١٩ و ٢٤٤ على التوالي) بعمر ١٨– ٣٢ سنةً (بمعدل٢١.٢٨ ±١.٩١ سَنَةً) إختيروا بشكل عشوائي مِنْ ١١ مِنْ كُلّيَاتِ الجامعةِ. شملت استمارة الاستبيان معلومات عن العُمر، الجنس، العادات الغذائية، ممارسة الرياضةِ بشكل منتظم، التأريخ

العائلي عِنْ السمنةِ؛ عدد افراد العائلةِ، الدخل العائلي الشهريِ، تم قياس الوزن، الطول، محيط الخصر؛ ودليل كتلةِ الجسمُ لتَقييم حالة الوزنِ. تم تحليل البيانات بإستعمال الرزمةِ الإحصائيةِ للعلومِ الإجتماعية (إس بي إس إس) النسخة ١٦. اعتبرت قيمة *P* اعلى مِنْ ٠.٠٥ غيرمعنوية احصائيا.

النتائج: كان معدل كتلة الجسم للطلبة ٢٣.٥٨ ±٣.٧٨ كغم/م ٢ وكان مايقرب من ثلثيهم (٦٥.٩%) مِنْ ذوي الوزنِ الطبيعي (٦٠.٧% من الطلابَ و٧٠.٥% من الطالبات)؛ بينما معدل إنتشار زيادة الوزنِ والسمنةِ بينهم كَان ٢٢.٩% و٥.٦% على التوالي. كان معدل إنتشار زيادة الوزنِ أكثر شيوعاً بين الطلابِ مقَارنَة إلى الطالبات (٢٧.٤% مقابل ١٨.٩% على التوالي)، بينما لم بكن معدل إنتشار قلة الوزنِ والسمنةِ مختلفَاً بينهم (٥.٦% مقابل ٥.٣% على التوالي لكلا المتغيّرين). إعتِمادا على محيط الخصر كان ٤.٦% من الذكورِ و٢٠.٩% من الإناث اكثر عرضة لخطرِ الاصابة بالامراض المصاحبة للسمنةِ. كان معدل دليلكتلةِالجسم ومحيط الخصر أعلى لدى الطلبة من ذوي التأريخِ العائلي ِللسمنةِ (P <0.001) لكلا المتغيّرين). .وكان الطلاب الذين ذَكروا بأنّهم كَانوا يمارسون نشاطًا رياضيا منتظمِاً ذوي دليل كتلةِ الجسم أوطأ.

الاستنتاجات: تَدْعمُ هذه الدراسةِ حقيقة ان السمنةِ مشكلة متعددة العاملية. واظهرتُ بأنّ الجنسِ الذكوريِ والتأريخِ العائليِ للسمنةِ من عواملَ الخطرِ، بينما ممارسة النشاط الرياضي المنتظمِ عاملُ وقائيُ.

Introduction

The global epidemic of overweight and obesity "globesity" is rapidly becoming a major public health problem in many parts of the world Overweight and obesity are major risk factors for a number of chronic diseases, including diabetes, cardiovascular diseases and cancer. Once considered a problem only in high income countries, they are now dramatically on the rise in low- and middle-income countries, particularly in urban settings [1].

According to the World Health Organization (WHO), overweight and obesity are defined as abnormal or excessive fat accumulation that presents a risk to health. A crude population measure of obesity is the body mass index (BMI), a person's weight (in kilograms) divided by the square of his or her height (in metres). A person with a BMI of 30 or more is generally considered obese. A person with a BMI equal to or more than 25 is considered overweight [1, 2]. The values of BMI are age-independent and are the same for both sexes; However, BMI may not correspond to the same degree of fatness in different populations due, in part, to different body proportions. The health risks associated with increasing BMI are continuous and the interpretation of BMI grading in relation to risk may differ for different populations. New data from USA and China suggest the lowest all-cause mortality in persons with BMI between 23 and 27 [3].

Waist circumference (WC) and waist/hips ratio (WHR) have also been proposed as useful indices of abdominal obesity and have been closely linked to comorbid illnesses such as diabetes, coronary heart disease and hypertension (4). As with BMI cut-off values have been set to identified increased risk, but for WC these need to be sex and population specific (Table 1); as the risk varies single global values cannot be used [4, 5].

Table 1 Sex-specific waist circumferences for 'increased risk' and 'substantially increased risk' of metabolic complications associated with obesity in Caucasians

Gender	Risk of obesity-associated metabolic complications*	
	Increased	Substantially increased
Men	≥ 94 cm	≥ 102 cm
Women	≥ 80 cm	≥ 88 cm

*Source: International Union of Nutritional Sciences, the Global Challenge of Obesity and the International Obesity Task Force [4]

In centuries past, from studies of art and literature, obesity appears to have been very uncommon. The huge majority of people were very poor, and, in the main, were physically active and muscular [6].

The latest projections of WHO indicate that globally in 2005: approximately 1.6 billion adults (age 15+) were overweight and at least 400 million adults were obese. [2]; WHO data indicates that the prevalence of overweight/ obesity (BMI ≥ 25 kg/m²) for adults in Iraq (2005) was 40.1% for males and 50.8% for females; The prevalence of obesity is 7.2 %.and 16.8 % for males and females respectively the mean BMI (kg/m²) is 24.1 for males and 25.2for females [7].

The increase of obesity prevalence observed in the 20th century continues until present, and it appears this trend will further continue in almost all countries in the world. Contemporary prevalence of adult obesity is very high in USA (33% in both genders), in oil rich Arabian countries (30% in males, 40% in females), and in European Union (up to 25% in both genders [3].Table 2: shows the prevalence of obesity and the estimated mean BMI among countries of Eastern Mediterranean Region (EMR) [8].

Table 2 The prevalence of overweight/obesity and the estimated mean BMI in EMR*

Country	Prevalence of BMI ≥25 kg/m² 2010 (%)		Prevalence of BMI ≥30 kg/m² 2010 (%)		Estimated Mean BMI – 2005 (kg/m²)	Estimated Mean BMI - 2005 (kg/m²)
	males	females	males	females	males	females
Jordan	57.5	65.4	19.6	37.9	26.1	27.9
Kuwait	69.5	80.4	29.6	55.2	27.5	31.0
Saudi-Arabia	63.1	65.9	23.0	36.4	26.6	27.6
Syria	50.4	59.6	12.4	24.6	24.9	26.1
Iran	48.5	60.2	10.0	29.5	29.4	26.5

*Source: WHO, Global InfoBase, international comparison [8]

The obesity epidemic is largely driven by the twin trends of changing dietary patterns and decreasing physical activity. Most countries in the Americas are experiencing a shift in dietary patterns toward increased consumption of energy-dense foods, rich in saturated fat, sugars, and salt. This pattern, coupled with the fact that 30 to 60% of the population does not meet minimum recommended levels of physical activity (e.g.,30 minutes walking per day) contribute in large part to the high rates of overweight and obesity in the Pan American Region [9]. Obese parents, low socioeconomic

status and limited intake of fruits and vegetables were among the obesity - risk factors [10].

Lifestyle and food habits have been reported to play an important role in the increasing prevalence of obesity in Western countries. Low physical activity was directly related to a higher prevalence of obesity [11]. Dietary habits of young adults are affected by the fast-food market. As a consequence, overweight and obesity are increasingly observed among the young [12]. Obesity in combination with unhealthy life style, such as smoking and physical inactivity, may increase the risk of chronic diseases. In this regard, nutritional knowledge may act as a deterrent against fast-food trend. Thus, universities may contribute significantly in reducing the prevalence of obesity among the young population through the promotion of healthy eating habits. Universities may provide an ideal forum for reaching out to a large number of young adults through nutrition education programs that may positively influence students' eating habits by advocating for the adoption of healthy food choices [12].
In the past few years, and because of financial abilities, Iraq has been experiencing a nutritional transition in food consumption and eating habits. As a consequence, the dietary habits of young adults have been affected; thus, overweight and obesity are expected to be increasingly being observed among the young.

The purpose of this study was to assess the prevalence of, and the factors that might be associated with overweight and obesity among college students of University of Kerbala including eating habits and physical activities. Assessing students' weight status and eating habits will help health educators to develop proper nutrition-related education programs that promote healthy food choices and good eating habits.

Subjects And Methods

Design and Setting

This cross-sectional, university based study was conducted in the University of Kerbala in Holy Kerbala governorate in Iraq during the second semester of the academic year 2009-2010, from 1st March 2010 – 26th April 2010; Approval of the study protocol and written consent was obtained from the authority of the university prior to data collection.

Questionnaire

The preliminary version of the questionnaire was finalized for application after being pretested in a pilot study on 57 fourth year medical students; after which minor modifications were made to the original questionnaire by eliminating confusing items and adding others. The final analysis did not include the results of the pilot survey.

The questionnaire included information about, age, gender, dietary habits, sport activity, family history of obesity; number of households, monthly family income. Weight, height and WC were to be measured for each student.

Sampling

The total number of university students at the time of the study was 7183 students, the sample size was obtained by accepting a 95% confidence interval of 4.5; accordingly, the calculated sample size was 445.The study included 513 students representing 6.2% of all university students. Applying the stratified random sampling technique, such percent of students were chosen out of each academic year in each of the 11 colleges of the university. 50 subjects were excluded from the study (after collection of data) because their gender was not reported in the questionnaire

sheet; therefore the net sample size included in the data analysis was 463 students representing 6.4% of all university students

Data collection

Data collection took place in two steps. The first step was to fill out the questionnaire and the second step was to perform the anthropometric measurements. The students were interviewed outside the classroom; clarifications and basic orientation on the objectives of the study were given beforehand and explanation of the rationale to take weight and length and WC to the students. The students were free to decide whether they would participate or not; they were assured of the confidentiality of their responses, briefed on the importance of giving an honest response, and informed verbal consent was taken from each student. Assistance was provided for respondents who requested clarification on any of the questions. To enhance honest disclosure of information, each participant had privacy in responding to the questionnaire.

Data collection and measurements were done by 57 trained fourth year medical students distributed as groups of both gender on the different colleges; all the academic years of each college were taken into consideration.

Weight was measured using a calibrated digital scale for all subjects (wearing light clothing) with an accepted error of 0.1 kg. Height was measured using flexible tape (taken to the nearest 0.5 cm) with the participant standing without shoes, heels together and head in the horizontal plane. The WC is measured (also taken to the nearest 0.5 cm) with a flexible tape placed on a horizontal plane at the level midway between lower rib margin and the iliac crest as seen from the anterior view.

Statistical analysis

Statistical analyses were performed using the Statistical Package for Social Sciences (SPSS) version ١٦.0 software. Results were expressed as means ± standard deviation (SD). Parametric variables were analyzed using student's-*test* and all statistical analysis was done at 95% confidence level. Statistical significance was accepted when $P< 0.05$.

To evaluate overweight and obesity, BMI was calculated from the height and weight data using the standard formula: BMI = weight (kg) / height (m).^{2} Weight status was classified according to "the International Classification of adult underweight, overweight and obesity according to BMI" into four categories (underweight (BMI ≤ 18.5), normal weight (BMI between 18.5 – 24.9), overweight (BMI between 25–29.9), and obese (BMI ≥ 30 [13]*;* and because of the absence of any cutoff criteria Of WC for Iraqis as indicators of risk of co morbidities, the standards adopted by the International Union of Nutritional Sciences "for Caucasians were used in this study to assess the risk; therefore; a WC of > 94 cm in males and > 80 cm in females were considered as indicators of increased risk [5]. The correlation coefficient was used to assess the correlation between WC and BMI.

Results

The characteristics of the study subjects together with their BMI and WC are presented in Table 3 that shows whether or not there was a significant difference between the mean values of BMI and WC according to each variable. The study included 463 students; the response rate was 100%; the mean age was 21.28 ± 1.91years (range 18-32); it was 21.72±1.90 (range 18-28) for males and; 20.88±1.83 (range 18-32) for

females. The mean family households was 6.85± 2.48 (range 2-18); the mean monthly family income was 1,041,705 ±950,392 ID (range 100000-12,500,000). The average weight and height of the participated students are shown in Table 4.

Table 3 Demographic and academic characteristics of the study subjects

Variable	N	Percent %	Mean BMI±SD(kg/m²)	*P*-value	Mean WC±SD(cm)	*P*-value
Gender						
male	219	47.3	23.89± 3.96		83.50±9.92	<0.001
female	244	52.7	23.31±3.59		79.32±11.15	
Age (years)						
18–20	179	38.7	23.25±3.72		78.91±9.67	<0.001
21 –23	237	51.1	23.70±3.60		82.42±10.69	
>23	47	10.2	24.30±4.69		84.70±13.35	
Residency						
urban	365	78.8	23.59±3.84		80.95±10.68	
rural	98	21.2	23.56±3.55		82.59±11.11	
Family history of obesity						
yes	154	33.3	24.78±4.17	<0.001	84.00±10.84	< 0.01
no	308	66.5	22.99±3.42		80.00±10.49	
no response	1	0.2				
Family income (ID)						
≤ 1000000	309	66.7	23.39±3.84		81.44±10.43	
> 1000000	125	27.0	23.77±3.42		80.72±11.100	
no response	29	6.3				
Households						
≥ 5	143	30.9	23.56±3.75		79.62±10.13	<0.05
6-10	285	61.5	23.60±3.82		82.16±11.00	
> 10	35	7.6	23.56±3.57		81.18±11.08	
Total	463	100	23.58±3.78		81.30±10.78	

Table 4 Average weight and height of the participants

Students	N	Weight (kg) (mean ± SD)	Height (m) (mean ± SD)
males	219	71.97±12.09	1.74±0.08
females	244	59.42 ± 9.17	1.60±0.06
Total	463	65.36 ± 12.35	1.66±0.10

The mean BMI was 23.58 ± 3.78 kg/m² with a range of16.78-38.67; there was no significant difference between males and females (*P*>0.05); the mean WC was 81.30± 10.78 cmwith a range of 52–120; it was significantly higher in males than that in females (*P*< 0.001). The median BMI was 23.03 kg/m² and the median WC was 80.00 cm.

Table 3 shows also that there was no significant difference in the mean BMI between different age groups; and the mean WC was

significantly lower in students within the age group 18-20 years ($P< 0.001$), There was no significant difference in the mean BMI and the mean WC within students from urban compared to rural areas and within students from families with different monthly income, There was no significant difference in the mean BMI between students from large and small families; the mean WC was significantly lower in students from families with < 5 households ($P<0.05$) and There was a significantly higher mean BMI and WC within students with family history of obesity ($P< 0.001$ and ($P< 0.01$ respectively)..

The majority of the students (65.9%) were of normal weight (60.7% and70.5% for male and female students respectively); 22.9% were overweight and 5.6% were obese depending on their BMI. The prevalence of overweight was more common among male students compared to females (27.4% vs. 18.9% respectively) while the prevalence of underweight and obesity was not significantly different between them (5.6% vs. 5.3% respectively for both variables); 4.6% of the males and 20.9% of the females were at risk of developing obesity comorbidities depending on their WC (Tables 5 and 6); There was a significant correlation between BMI and WC r=0.610 ($P<0.001$); it was significant both in males and females r=0.687 & 0.545 ($P<0.001$) as shown in Table 5.

Table 5 Prevalence of different BMI categories among students by gender

BMI categories	male		female		Total	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
underweight	13	5.9	13	5.3	26	5.6
normal	133	60.7	172	70.5	305	65.9
overweight	60	27.4	46	18.9	106	22.9
obese	13	5.9	13	5.3	26	5.6
Total	219	100.0	244	100.0	463	100.0

Table 6 Prevalence of increased risk of obesity comorbidities among studied subjects

Risk categories	Male		Female	
	Frequency	Percent	Frequency	Percent
normal	209	95.4	193	79.1
increased risk	10*	4.6	51**	20.9
Total	219	100.0	244	100.0

* WC > 102cm ** WC > 88cm

Table 7 Correlation between BMI and WC

	Male	Female	Total
Pearson Correlation	0.687*	0.545*	0.610*
Sig. (2-tailed)	0.001	0.001	0.001
N	219	244	463

*. Correlation is significant at the 0.01 level (2-tailed). r= 0.610; N = number of participants

Lifestyle habits of the students showed that although 60% reported taking fast foods, sugar and snacks frequently and although the majority (70%) reported consumption of vegetables and fruits frequently, there was no significant difference in the mean BMI and the mean WC within those students compared to the minority of them who didn't as shown in table 8 that shows, also, the absence of a significant difference in the mean BMI and the mean WC within students who reported taking fatty high-energy foods frequently or who reported that they used to have regular sport activity.

Table 8 Lifestyle characteristics of the study subjects

Variable	N	Percent %	Mean BMI ± SD (kg/m^2)	Mean WC± SD (cm)
Regular sport activity				
yes	246	53.1	23.29±3.64	80.79±9.56
no	217	46.9	23.92±3.91	81.88±12.01
Intake of fatty high-energy foods				
frequent	217	46.9	23.55±3.61	81.77±11.20
sometimes	246	53.1	23.62±3.92	80.89±10.40
Intake of fast foods, sugar and snacks				
frequent	278	60.0	23.58±3.59	81.77±10.16
sometimes	185	40.0	23.60±4.06	80.60 ±11.65
Consumption of vegetables and fruits				
frequent	325	70.2	23.61±3.72	81.62±10.37
sometimes	138	29.8	23.52±3.92	80.54±11.70
Total	463	100	23.58±3.78	81.30±10.78

Higher percent of males reported doing regular sport activity, intake of fatty high-energy foods and intake of fast foods, sugar and snacks, while higher percent of females reported consumption of vegetables and fruits; it was found that there was a significant difference in the mean BMI and the mean WC within male students who reported that they used to have regular sport activity (p= 0.038, 0.036 respectively) as shown in table 9, that shows, also, that there was no such gender effect ,on both, regarding the other lifestyle factors regarding the dietary habits.

Table 9 Lifestyle characteristics of students and their mean BMI and WC according to gender

Variable	Male				Female			
	N	%	Mean BMI ± SD (kg/.m²)	Mean WC± SD (cm)	N	%	Mean BMI ± SD (kg/ m²)	Mean WC± SD (cm)
Regular sport activity								
yes	148	67.6	23.50±3.70*	82.54±9.42*	98	40.2	22.98±3.53	78.13±9.20
no	71	32.4	24.72±4.36	85.50±10.68	146	59.8	23.53±3.62	80.11±12.25
Intake of fatty high-energy foods								
frequent	115	52.5	24.18±3.74	83.90±10.02	102	41.8	22.84±3.35	79.36±11.10
sometimes	104	47.5	23.58±4.19	83.06±9.83	142	58.2	23.64±3.73	79.30±10.55
frequent	142	64.8	23.95±3.90	83.82±10.00	136	55.7	23.19±3.19	79.61±9.90
sometimes	77	35.2	23.80±4.10	82.90±9.79	108	44.3	23.45±4.04	78.96±12.60
Consumption of vegetables and fruits								
frequent	144	65.8	23.77±3.65	83.76±9.75	181	74.2	23.48±3.78	79.92±10.55
sometimes	75	34.2	24.13±4.52	83.01±10.28	63	25.8	22.80±2.94	77.60±12.66
Total	219	100	23.89± 3.96	83.50±9.92	244	100	23.31±3.59	79.32±11.15

* $P<0.05$

Discussion

The purpose of this descriptive study was to determine the prevalence of overweight and obesity and related risk factors among Kerbala University students. Body mass index was used to assess weight status. Based on BMI classification of weight status, findings of this study indicate that the majority of students (65.9%) were of normal weight; normal weight was more prevalent among females (70.5%) as compared to males (60.7%). Compared to other studies, only 45.8% of the King Saud University students in Riyadh, Saudi Arabia had normal body weight [14].

The prevalence of overweight and that of obesity were 22.9% and 5.6% respectively; the prevalence of overweight was more common among male students compared to females (27.4 vs. 18.9 respectively); while the prevalence of underweight and obesity was not significantly different between them (5.6 vs. 5.3 respectively for both variables). The lower rate of overweight among female students is expected since females are more cautious about their weight status than males, due to society perceptions which encourage females to be slender; in spite of that there was no significant difference in the prevalence of underweight between both genders in this studied sample.

The prevalence of overweight is different from that concluded by a joint FAO/World Food Programme (WFP) mission visited Iraq In May 2000 to assess the country's food and nutrition situation who concluded that the prevalence of overweight among adult population in Kerbala was 27% [15], and that of Al-Hilaly et al., 2008 which showed that "obesity affects about 30% of adult population in Kerbala, and it was higher in women [16].

The prevalence of obesity concluded in this study is lower than that reported by the WHO for the Iraqi population in 2005, and that estimated for 2010

(8.3% and 19.1% for males and females respectively) [7, 17].

Al-Tawil *et al.*, 2007 concluded that 76% of non-pregnant women (18-30 years) in Baghdad aged ≤ 30 years of age were overweight and obese. The mean BMI (SD) was 28.7 (5.6) kg/m^2 and the median was 28.6 kg/m^2. The mean (SD) for WC was 86.5 (10.4) cm with a range of 56–118 cm; the median was also 86.5 cm [18].

Higher prevalence rate of overweight and obesity was reported in a study conducted among Kuwait University students at 32% and 8.9%, respectively [19], among the university students in Jordan which were 28.5 and 10.2% respectively [20], and among King Saud University students in university students, Riyadh, Saudi Arabia which were 31%, and 23.3% respectively [14].

Higher prevalence of obesity among male university students were reported in recent studies in Lebanon, Spain, and Greece [12, 21,22]; while female gender was one of the factors behind overweight and obesity among Jordan university students [20].

The average weight and height for the studied subjects were within the normal international standards; and the normal limits of the mean BMI and WC of the study subjects encountered in this study can be attributed to the young age of respondents, their educational level and to their presumably acceptable level of the socio-economic status as manifested by the mean monthly family income of 1,041,705 ± 950,392 ID.

WHO data indicates that the mean BMI (kg/m²) for adults in Iraq is 24.1 for males and 25.2 for females [17]. My results showed that it was higher in males than females, with a mean comparable to the WHO data for males but lower than that for females, and is lower than that of Al-Tawil et al., 2007 in their study among women in Baghdad, which was 28.7 (5.6) kg/m² [18]; this can be attributed to the younger age of the university students and their socio-economic status as mentioned before. There was no significant difference in the mean BMI between different age groups;

The mean WC was significantly higher in males, in spite of that only 4.6% of the males compared to 20.9% of the females were at risk of developing obesity comorbidities, depending on their WC, owing to the different criteria between both gender; and there was lower level in students within the age group 18-20 years which, generally, constitutes the early years in the university.

There was no significant difference in the mean BMI and WC within students from urban compared to rural areas and within students from families with different monthly income. These findings are different from that of Suleiman et.al. 2009 in their study among Jordan university students who concluded that lower family monthly income was one of the factors behind overweight and obesity [20], Al-Nuaim et.al. 1996 who concluded that overweight and obesity were more prevalent among high-income subjects who were residing in urban communities in Saudi Arabia [23], and Aranceta J. *et al.* 2001 in their study among Spanish population concluded that low income among women and being from rural areas contributed to the development of obesity [24]. Sobal J and Stunkard AJ in their review of 144 published studies of the relationship between socioeconomic status (SES) and obesity reveals a strong inverse relationship among women in developed societies. In developing societies, however, a strong direct relationship exists between SES and obesity among men, women, and children [25]; several lifestyle factors in addition to inheritance might

contribute to this variability in the results.

There was no significant difference in the mean BMI between students from large and small families; the mean WC was significantly lower in students from families with < 5 households ($P<0.05$). Further studies are needed to confirm these results.

There was a significant difference in the mean BMI and the mean WC within students with Family history of obesity; similar results were concluded by previous study of Suleiman et al. 2009 in their study among Jordan university students [20]; this indicates the importance of health education program against obesity directed towered members of such families

The average weight and height of the participated students were 65.36±12.35 kg and 1.66±0.10cm, respectively; it was 71.97±12.09 kg and 1.74±0.08 cm for males and; 59.42 ± 9.17 kg and 1.60±0.06 cm for females (Table 2).

The significant correlation between BMI and WC concluded in this study is similar to observations in previous studies elsewhere [26-28].

A part from the male students who reported that they used to have regular sport activity who had a significantly lower BMI and WC, The absence of any significant difference between students who reported healthier life style pattern in terms of daily sport activities and healthy eating habits compared to students who did not report such life style might be attributed to false reporting by students and indicate the need of a cohort study to assess such factors accurately.

Female students showed healthier eating habits compared to male students in terms less frequent intake of fatty high-energy foods and intake of fast foods, sugar and snacks; and male students tend to do regular sport activity more frequently. Assessing food intake of obese people is one of the controversial areas of study; under-reporting of food intake in overweight people is an assumption, thus resulting in underestimation of energy intake; still, the results of this study indicated that the healthier eating habits among female students might explain the lower prevalence of overweight and obesity among them, Suleiman et al. 2009 concluded that physical inactivity, unhealthy diet were factors behind overweight & obesity among Jordan university students [20].

It can be concluded from this study that:

1. This study supports that obesity is a multifactorial problem. It shows that male gender and family history of obesity are risk factors, while regular sport activity is protective factor. Therefore, Public Health Programs should consider these factors when planning strategies aimed at preventing or reducing the problem of obesity in our society.
2. There is a significant correlation between BMI and WC; therefore both of them can be used for the evaluation of weight status among adults.
3. The prevalence of overweight and that of obesity were lower than that in university students of neighborhood countries
4. Female students showed healthier eating habits compared to male students
5. Despite the low prevalence of overweight and obesity in the studied university students' sample, results indicate that university students would benefit from a nutrition and health promotion program to reduce the tendency of overweight and obesity among students, particularly males, and to improve students' eating habits.

Public Health Education Programs should consider gender, family history of obesity as risk factors and, regular sport activity factor as protective factor when planning strategies aimed at

preventing or reducing the problem of obesity in our society; Promotion of healthy life styles and provision of nutritional information to the public is the mile stone of any such program.

Nutrition and health promotion program should be encouraged to promote healthy body weight management, to improve students' knowledge about nutrition and healthy eating habits, and to reduce the tendency of overweight and obesity among students.

The basic principles of energy balance should be taught in primary schools, and education should be provided at all levels to change attitude and behaviour towards diet and physical activity

Obesity should be made a core part of all medical training, and medical practice must adapt to the current epidemic of obesity and nutrition related diseases,

The findings in this report are subject to at least the following two limitations.

1. 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 Iraq, therefore, samples from different universities may provide a more inclusive picture of university students taking into consideration religion and socio-economic status. However, baseline information about weight status and eating habits among a sample of university students was certainly obtained from the present study.
2. The data are all based on self-reports, possibly leading to under or over reporting of behaviour, therefore. Information bias cannot be excluded

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