



## **Alarming High Prevalence of Overweight and Obesity among Adults in Jerash University: A Cross-Sectional Study**

**Ahmad A. Obeidat<sup>1</sup>, Hani J. Hamad<sup>2\*</sup>, Bara'ah Mehdawi<sup>3</sup>, Maysam Al-Sayyad<sup>3</sup>, Seba Alaqqad<sup>3</sup>, Raghad Al-Ajloni<sup>3</sup>, Mustafa Shanaah<sup>3</sup>, Ashraf M. Al-Khamaiseh<sup>4</sup>**

1- Department of Clinical Nutrition, Faculty of Applied Medical Sciences, Taibah University, Yanbu, Saudi Arabia

2- Department of Food Science and Nutrition, Faculty of Agriculture, Jerash University, Jordan.

3- Department of Food Science and Nutrition, Faculty of Agriculture, Jerash University, Jordan.

4- Department of Nutrition and Food Science, University of Jordan.

Correspondence: [hanihamad14@yahoo.com](mailto:hanihamad14@yahoo.com); Email: [h.jamil@jpu.edu.jo](mailto:h.jamil@jpu.edu.jo)

### **ABSTRACT**

*Obesity is a major cause of death globally and is common among adults and children. This study was conducted to investigate the prevalence of obesity among the university population in Jordan, specifically, in Jerash University in the north of Jordan. Three hundred individuals were randomly selected from both genders, with 41% of them being women and 59% being men at different ages. Measurements of height and weight were taken and the body mass index (BMI) was calculated. Data were analyzed using the SPSS software. The participants were classified based on weight, where 45.7% of them were having normal weight, 34.7% were having overweight, 11.3% were obese, and 8.3% were underweight. Together, nearly 54.3% of the participants were having malnutrition with 46.0% and 8.3% overnutrition and undernutrition, respectively. The male participants were more obese and having overweight than the females. The finding that about half of the sample community are suffering from overweight and obesity raises a warning alarm for the universities and the Jordanian public health institutions and is due to prompt them to initiate good extension and education programs directed at the local community.*

**Keywords:** *Overweight, Obesity, Body mass index (BMI), Cross-Sectional Study, University, Jordan*

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### **INTRODUCTION**

Obesity is a health condition in which a surplus of body fat has accumulated in the body to the extent that the fat has adverse effects on health. It is one of the major causes of death globally and is quite widespread among adults and even children [1]. According to Zamsad et al. [2] and the resources cited therein, obesity has become a prominent pandemic health concern in recent years across the developing and developed countries. It is now regarded as the fifth leading cause of mortality worldwide. Prevalence of obesity is ever increasing since the 1980s throughout the world [2]. The essential cause of overweight and obesity is an imbalance between the calories consumed and those expended, i.e., an energy imbalance. Worldwide, there has been (i) increased intake of energy-dense foods with high fat content and (ii) decrease in the physical activity, mainly because of the (i) sedentary nature of many of the works of the present time, (ii) changing modes of transportation, and (iii) growing urbanization [3]. According to Nie et al. [4] and Zamsad et al. [2] and the references cited therein, obesity is a serious reason for health worry as it has been linked with a broad range of health complications such as insulin insensitivity, hypertension, cardiovascular diseases, diabetes mellitus, stroke, and various kinds of cancer.

The WHO has recently performed studies for estimation of the levels of the overweight and obesity problems at the global level. As an example, in one of these studies in 2016, it was found that more than 1.9 billion adults at the age of 18 years and older were overweight. Of these, more than 650 million adults were obese whereas 39.0% of the examined adults were overweight, comprising 40.0% women and 39.0% men. Overall, approximately 13.0% of the adults in the world were obese in 2016 (15.0% women and 11.0% men). Prevalence of obesity almost tripled worldwide during the period 1975 to 2016 [1]. The

WHO developed the Global Action Plan for the Prevention and Control of Non-communicable Diseases 2013-2020. This plan was targeted towards drawing state-level commitment to the United Nation's (UN) Political Declaration on Noncommunicable Diseases (NCDs), which was first announced and endorsed by Heads of States and Governments in September 2011 [1].

Propagation of obesity and other NCDs constitutes a reason for high concern among the public health institutions in the world. So far, a huge body of research exists on assessment of levels of prevalence of overweight and obesity and the associated risk factors worldwide. Researchers and health professionals go on evaluating the nutritional status of adults in different communities in different countries worldwide. Special attention has been paid to the university community. As an example, Nie *et al.* [4] utilized data from the China Health and Nutrition Survey and analyzed changes in adult obesity over two decades (1991-2011) in China. The analysis results uncovered an increase in the levels of obesity among all the population cohorts who showed evidence on becoming more obese with time (intra-cohort change). In another example, in 2019, Balgoon *et al.* [5] investigated the association of the risk of metabolic syndrome (MetS) with the body mass index (BMI) of young female science\_students. The study population was 174 female students in King Abdulaziz University in the Kingdom of Saudi Arabia (KSA) ranging in age from 18 to 25 years. The study found that a high risk of developing MetS was associated with the increase in the BMI as 41.4% of the overweight students and 44.8% of the obese students demonstrated three or more MetS risk factors. Accordingly, these researchers concluded that MetS is growing in prevalence among the young female university students in the KSA as a result of an unhealthy lifestyle and no, or low, physical activity, which result in an increased weight and a potential for development of chronic diseases.

A large-scale study was performed by Peltzer *et al.* [6] to assess the prevalence of overweight and obesity and the associated factors among a random sample of university students in 22 universities in 22 low-income, middle-income, and emerging-economy countries. The study population was 15,646 university students, comprising 8,913 females (56.8%) and 6,773 males (43.2%) ranging in age from 16 to 30 years. The BMI was used as the measure of the weight status of the sample members. The study found that the percentages of underweight, normal weight, overweight, and obese students were 10.8%, 64.4%, 18.9%, and 5.8%, respectively, among men and 17.6%, 62.1%, 14.1%, and 5.2%, respectively, among women. Overall, nearly 22.0% of the sample members were overweight or obese (24.7% men and 19.3% women). A cross-sectional study was conducted by Zamsad *et al.* [2] to assess the prevalence of overweight, obesity, and abdominal obesity among university students in Bangladesh. The levels of prevalence of overweight (14.9%) and obesity (11.9%) were significantly 1.29-fold higher in the males than in the females. This finding led these researchers to the conclusion that the levels of prevalence of overweight and obesity are significantly higher in the male than in the female university students in Bangladesh. A possible explanation of the reported differences between the male and female students can be that the girls were more concerned about their physical appearance and interested in having a slim body than the boys.

Locally, a cross-sectional study was performed by Hamad [7] to explore the prevalence of obesity among the university population in Jordan University of Science and Technology (JUST) in the north of Jordan. The survey included 370 university male students who were recruited from different majors and academic years. The study results uncovered that the majority (50.0%) of the sample students were overweight. In the mean time, almost 28.0% of the sample students had normal BMI, about 11.1% were underweight, and 11.0% were obese. In view of these findings, the researcher concluded that overweight and obesity are somewhat prevalent in the student community of JUST. This phenomenon can be a reflection of the university students' lifestyle and dietary habits. In another local example, Gharaibeh *et al.* [8] carried out an investigation aiming at exploring the prevalence of obesity among the university community of Jerash University in the north of Jordan and determining their food habits and physical activities. The study results indicated that 39.4% of the sample students were overweight and that 24.1% were obese. In other respects, the study found that overweight and obesity were less common among the females than the males (35.7% and 21.45 vs. 40.8% and 25.2%, respectively). In contrast, about 12.5% females were underweight compared to 5.4% males. These researchers maintain that the university community with its members belonging to different age groups to some extent reflects the whole country profile.

Review of the literature uncovers that there is abundance of studies that investigated overweight and obesity among university students. Fewer studies targeted the general population and yet fewer studies addressed the university faculty members, both in developing and developed countries. This highlights research, and, hence, knowledge, gap in this research field. In light of this, and bearing in mind the generally limited related evidence from Jordan, the researchers were interested in developing further insight into overweight and obesity among the university community as a whole. Thereupon, the main

objective of this study was to investigate the prevalence of obesity within the university community and the lay public in Jordan, taking Jerash (Private) University as an example, with particular emphasis on identifying differences, if any, between the male and female students in weight imbalances and determining association of weight imbalance with age.

## MATERIAL AND METHODS

In terms of the time horizon, this study is cross-sectional study. It followed the inductive research approach and the survey research strategy. The study population was the community and visitors of Jerash University in the north of Jordan. It included students, academic staff, and university visitors, with no restrictions on gender or age or job rank. The sample members were collected following the simple random sampling method. Participation in this study was voluntary. In the beginning, each individual was provided with a briefing about this study and its goal and was consulted about participating in it, stressing that participation is voluntary. Overall, the sample comprised 300 individuals of the students, visitors, and faculty members who participated in the Second Agricultural Scientific Conference, which was organized by the scientific committee of the Faculty of Agriculture at Jerash University. Information was collected from the sample members on gender, weight, height, and age. Then, the BMI ( $\text{kg}/\text{m}^2$ ) was calculated as the individual's weight divided by her/his squared height. The researchers adopted the International Classification of Adult Underweight, Overweight, and Obesity according to BMI of the WHO [9] to categorize the participants according to their BMI. According to this system, the individual is underweight if her/his BMI value is  $< 18.5$ ; has normal weight if the BMI value falls in the range 18.5-24.9; overweight if the BMI value lies within the range 25-29.9; and obese if the BMI value is  $> 30$ . Two calibrated stadiometers were used. The height and weight measurements were taken within  $\pm 1$  cm and  $\pm 0.1$  kg, respectively. Afterwards, the collected data were analyzed using the SPSS software.

## RESULT

Table 1 lists results of frequency distribution analysis (FDA) of the demographic and anthropometric data of the participants. As this table shows, the study sample consisted of 300 individuals, of them 177 were males (59.0%) and 123 were females (41.0%). The age group of the highest representation (55.7%) in the sample was the 21-30 age group whereas the age group with the lowest representation (4.7%) in the sample was the ' $\geq 51$  Years' age group (Table 1).

**Table 1: Demographic and anthropometric measures of the participants**

Variable	Group	N <sup>(1)</sup>	% <sup>(2)</sup>
<b>Gender</b>	Male	177	59.0
	Female	123	41.0
	Total	300	100%
<b>Age</b>	$\leq 20$ Years	54	18.0
	21 - 30 Years	167	55.7
	31 - 40 Years	30	10.0
	41 - 50 Years	35	11.7
	$\geq 51$ Years	14	4.6
	Total	300	100%
<b>Weight</b>	$\leq 45$ kg	13	4.3
	46 kg - 65 kg	122	40.7
	66 kg - 85 kg	114	38.0
	86 kg - 105 kg	43	14.3
	$\geq 106$ kg	8	2.7
	Total	300	100%
<b>Height</b>	$\leq 150$ cm	8	2.6
	151 cm - 160 cm	65	21.7
	161 cm - 170 cm	96	32.0
	171 cm - 180 cm	95	31.7
	$\geq 181$ cm	36	12.0
	Total	300	100%
(1) N = number of sample members falling within the listed category (frequency)			
(2) % = Percentage			

Nearly 18.0% of the sample members were 20 years old or younger. Combining this figure (54, 18.0%) with that of people in the age group of '21-30 Years', which is the age of most of the students (i.e.,  $\leq 30$  years), suggests that the majority of the sample members (73.7%) were young people. It is expected that most of the people in this age ( $\leq 30$  years) are students. In terms of weight, it is found that the highest number of the sample members (122; 40.7%) had weights ranging from 46 kg to 65 kg, followed by individuals having weights that range from 66 kg to 85 kg (114; 38.0%). Meantime, the smallest number of participants (8; 2.7%) was that of the people having a weight equal to, or higher than, 106 kg. The second lowest number of participants was that of people having weights that are equal to, or less than, 45 kg (13; 4.3%).

To complement the information derived from the subjects' weights, the researchers calculated the BMI for each sample member and its value was classified into either of the four aforementioned weight categories based on the BMI, namely, underweight, normal (or healthy) weight, overweight, and obese. The calculation, and corresponding classification, results are compiled by Table 2.

**Table 2: Distribution of participants according to BMI categories**

BMI <sup>(1)</sup>	Classification	N <sup>(2)</sup>	% <sup>(3)</sup>
< 18.5	Underweight	25	8.3
18.5-24.9	Normal (Healthy weight)	137	45.7
25-29.9	Overweight	104	34.7
$\geq 30$	Obese	34	11.3
	Total	300	100%
(1) BMI = Body Mass Index; (2) N = Number of sample members falling within the listed category (frequency) (3) % = Percentage			

The results (Table 2) bring to notice that the highest proportion of the sample members (137; 45.7%) had normal weights. Only 25 individuals, corresponding to 8.3% of the overall study sample, were underweight. The analysis results also uncover that slightly more than one third of the sample members (104; 34.7%) were overweight. Nearly one tenth of the participants in this study (34; 11.3%) were obese. Overall, slightly less than half of the sample members (46.0%) have higher weights than normal (overweight and obese people).

Table 3 presents distribution of the male and female sample members according to their weight classification based on the BMI. The percentage of normal weight male participants was 39.0% while 41.8% of the males were overweight and 13.6% were obese. Only 5.7% males were suffering from underweight. Together, nearly 61.0% of the male participants demonstrated malnutrition, with 55.4% exhibiting overnutrition and 5.7% showing signs of undernutrition. Additionally, the results (Table 3) spotlight that while there were more obese (13.6%) than underweight (5.7%) males, there were more underweight (12.2%) than obese (8.1%) females. Accordingly, the researchers can conclude that the main weight disorder which the women experience is underweight while that which men experience is overweight.

**Table 3: BMI Categories according to the gender**

BMI <sup>(1)</sup>	Gender				Overall	
	Males		Females			
	N <sup>(2)</sup>	% <sup>(3)</sup>	N	%	N	%
<b>Underweight (&lt; 18.5)</b>	10	5.7	15	12.2	25	8.33%
<b>Normal (18.5-24.9)</b>	69	39.0	68	55.3	137	45.66%
<b>Overweight (25-29.9)</b>	74	41.8	30	24.4	104	34.66%
<b>Obese (<math>\geq 30</math>)</b>	24	13.6	10	8.1	34	11.33%
<b>Total</b>	177	100%	123	100%	300	100%
(1) BMI = Body Mass Index (2) N = Number of sample members falling within the listed category (frequency) (3) % = Percentage within the indicated gender, not of the overall sample						

On the other hand, the percentage of normal weight female participants was 55.3%. About 24.4% of the sample females were overweight and 8.1% were obese. Only 12.2% females were underweight. All

together, about 44.7% of the female sample members showed indications of malnutrition. In the meantime, almost 32.5% exhibited overnutrition and 12.2% manifested undernutrition. In sum, the study results (Table 3) spotlight that weight disturbances were more common among the male than the female sample members. Bearing in mind that the study sample consisted of students, faculty members, and university visitors (general public), it may be assumed that these results can be representative, to a high degree, of the weight disturbances in the local community.

After analysis of distribution of the male and female participants within the weight categories, the researchers performed an analysis of the distribution of the four weight categories based on values of the BMI within the five studied age groups. The FDA outcomes (Table 4) show that the case of underweight is the least prevalent weight disturbance in the sample community and that it is only reported in the youngest age groups where 14 individuals in the age group '21-30 years' (8.4% of the members of this age group) were underweight and 11 of the individuals who are 20 years old or younger were underweight. This figure corresponds to 20.4% of members of this age group. As to people with normal weight, it is found (Table 4) that the highest number of normal-weight individuals (89; 53.3%) pertained to the sample members falling in age between 21 and 30 years. The results also point out that the second highest number of normal-weight individuals (26; 48.1%) pertained to the sample members who are 20 years old or younger.

**Table 4: BMI Categories according to the age groups**

BMI <sup>(1)</sup>	Age									
	≤ 20 Yrs <sup>(2)</sup>		21-30 Yrs		31-40 Yrs		41-50 Yrs		≥ 51 Yrs	
	N <sup>(3)</sup>	% <sup>(4)</sup>	N	%	N	%	N	%	N	%
<b>Underweight (&lt; 18.5)</b>	11	20.4	14	8.4	0	0.0	0	0.0	0	0.0
<b>Normal (18.5-24.9)</b>	26	48.1	89	53.3	10	33.3	8	22.9	4	28.6
<b>Overweight (25-29.9)</b>	12	22.2	50	29.9	16	53.3	20	57.1	6	42.9
<b>Obese (≥ 30)</b>	5	9.3	14	19.2	4	13.3	7	20.0	4	28.5
<b>Total</b>	54	100%	167	100%	30	100%	35	100%	14	100%

(1) BMI = Body Mass Index  
(2) Yrs = Years  
(3) N = Number of sample members falling within the listed category (frequency)  
(4) % = Percentage within the indicated age group, not of the overall sample

Interestingly, while normal weight was most common in the '21-30 Years' age group, so is overweight. Table 4 underlines that 50 individuals in this age group had overweight. This figure (50) is equivalent to 29.9% of the members of this age group. The lowest prevalence of overweight (6 cases; 42.9%) was observed in the old people, that is, people who are 51 years old or older. The number of obese individuals was the highest in the '21-30 Years' age group (14; 19.2%). The remaining age groups have much comparable representations in the rest weight categories, ranging from 4 (the '31-40 Years' and '≥ 51 Years' age groups) to 7 individuals (the '41-50 Years' age group).

Within the one age group, Table 4 discloses that normal-weight people were the highest in numbers in two age groups; the '21-30 Years' age group (89; 53.3%) and the '≤ 20 Years' age group (26; 48.1%). Meantime, overweight people were the highest in numbers in three age groups: the '41-50 Years' age group (20; 57.1%), the '31-40 Years' age group (16; 53.3%), and the '≥ 51 Years' age group (6; 42.9%). Moreover, the results (Table 4) spotlight that the highest number of people with weight disturbances are those ranging in age from 21 to 30 years.

Horizontal reading of Table 4 helps in tracking changes in the body weight class with age. It is seen that the underweight imbalance disappears after the age of 30 years. Indeed, the same applies to the rest body weight categories, where the numbers of individuals having normal weight, overweight, and obesity increase until the age of 30 years and drop afterwards (Table 4). In view of this finding, the researchers infer that the most critical age interval in the context of the risk of weight imbalance is the 21-30 years period. This, in addition to findings of the cited previous studies, lead the researchers to the conclusion that the weight imbalance function of time is non-linear. Rather, it seems close to a single-peak or, mostly, double-peak sine wave. This finding can be characteristic of the Jordanian community since some previous studies (e.g., [10] and [4]) reported the otherwise, that is, weight imbalances increase with age. However, this inference should be handled with caution owing to that representations of the various age groups in this study are not equal.

## DISCUSSION

The results of this study are consistent with results of other studies conducted in Jordan and elsewhere. For instance, Gharaibeh *et al.* [8] found that 63.5% of their sample JUST students were overweight and obese. Moreover, overweight and obesity were less common among females than the males (35.7% and 21.45% vs. 40.8% and 25.2%, respectively). To the contrary, nearly 12.5% of the sample females were underweight compared to 5.4% of the males. With reference to the age groups, overweight and obesity were more prevalent amongst males in the age group of 20-25 years than in the other age groups. Meanwhile, these two weight imbalances were less common among females than males higher in age than 30 years (7.1% and 26% vs. 36% and 22.5%).

In our study, the females were less obese and overweight than the males. This finding agrees with findings of Zamsad *et al.* [2] who concluded that overweight and obesity were significantly less prevalent among the sample female than the male university students of Bangladesh. They explained this finding by that the girls were more concerned about their physical appearance and about having a slim body than the boys. As well, there is high agreement between the results of the present study and that of Pengpid and Peltzer [10] who assessed prevalence of overweight and obesity and associated factors in a sample of 800 Indian university students. The sample was made up of 259 females (32.4%) and 541 males (67.6%) with ages ranging from  $\leq 17$  years to 22 years. At the whole sample level, the results of the current study are somewhat close to the results of Pengpid and Peltzer [10] as regards the percentages of underweight (8.33% vs. 11.7%), normal weight (45.66% vs. 50.9%), overweight (34.66% vs. 26.8%), and obese individuals (11.33% vs. 10.7%). Another similarity between the two studies relates to the proportions of female sample members who are underweight (12.2% vs. 13.4%), normal weight (55.3% vs. 56.3%), overweight (24.4% vs. 22.4%), and obese (8.1% vs. 12.0%). In addition, both studies share in common that there were more underweight and normal-weight female than male sample members and more overweight males than females.

Certain findings of the current study differ somehow from findings of previous studies. For example, Al-Ghabban [11] reported lower prevalence of overweight (22.9%) and obesity (5.6) among Iraqi students in University of Kerbala than what is reported in the present study (34.7% and 11.3%, respectively). Though, Al-Ghabban [11] too reported higher prevalence of overweight among the male (27.4%) than the female (18.9%) students. As well, higher percentages of male and female students in University of Kerbala (60.7% and 70.5%, respectively) had normal weights than the sample members of Jerash University (39.0% and 5.3%, respectively). In addition, the proportion of the female students in University of Kerbala having underweight was much lower than the females in the current study (5.3% vs. 12.2%). Nevertheless, the percentages of the males having underweight are similar in both studies (5.9% and 5.7%). However, the researchers in the present study underscore a critical issue in the study of Al-Ghabban [11], which is that his sample was made up of university students only whereas the sample of the present study included university students, faculty members, and visitors of the university. This means that the results which Al-Ghabban [11] obtained can only be generalized to Iraqi university students while the results of this study can be generalized to the broad country population. All in all, it may be concluded that the university students in University of Kerbala have more healthy diet and better lifestyle than members of the sample of the present study.

Ren *et al.* [12] reported lower percentages of underweight, overweight, and obese male and female university students in China than the present study. Their sample ( $N = 2,617$ ) was made up of 1,486 female and 1,131 male university students, ranging in age from 19 to 23 years. Lower percentages of overweight and obese male students (14.7% and 4.2%, respectively), and higher percentage of underweight male students (14.2%), were reported by Ren *et al.* [12] than the present study. With respect to the female students, higher percentage of underweight students was found in the Chinese university (7.5%) than in the sample of the current study (12.2%). The opposite was true for the overweight (4.4% vs. 24.4%) and obese (0.6% vs. 8.1%) female students. These researchers too found that weight imbalances increase with age in the age interval of 21-23 years, both amongst the male and female students. Besides the fact that the Chinese university sample comprised students only, the researchers in the present study think that the observed differences between sample of this study and the Chinese university sample are attributed to the widely different food regimes in both countries, where a high proportion of the daily intake of food in China is sea food.

For a sample of 150 male and female Turkish university students ranging in age from 19 years to 26 years, El Sayed *et al.* [13] reported that the percentages of underweight, normal-weight, overweight, and obese students were 8.7%, 75.3%, 14.0%, and 2.0%, respectively. However, these researchers did not provide information on distribution of the genders or age groups within each weight classification. The corresponding percentages in the current study are 8.33%, 45.66%, 34.66%, and 11.33%, respectively (Table 3). While the percentages of males and females are close in the sample of Jerash University and the

Turkish university, a higher percentage of normal-weight individuals and lower percentages of overweight and obese persons were reported in Turkey. This indicates that the sample Turkish university students follow a more healthy food regime than the members of the sample of the current study. The results of the study of El Sayed *et al.* [13] also reveal that the percentage of overweight individuals was lower in the sample of the present study (34.66%) than in Egypt (50.67%) and higher than in the KSA (20.67%). Meanwhile, the percentage of the obese subjects was higher in the present study (11.33%) than in Egypt (8.0%) and the KSA (10.67%). However, the percentage of subjects with normal weight was very much higher in the current study (45.66%) than in Egypt (22.0%) and the KSA (25.33%). Thereupon, noticeable differences are observed in the proportions of people having weight imbalances, even between the Arab countries themselves.

Gan *et al.* [14] investigated weight imbalances among 584 students (40.6% males and 59.4% females) of four Malaysian universities in Klang Valley. The sample students ranged in age from 18 years to 24 years. Overall, about 19.0% of the sample students were underweight while 67.46% students had normal weights and 12.84% were overweight and obese. In the context of gender differences, Gan *et al.* [14] reported that more females (22.19%) than males (14.35%) were underweight. The present study has a similar finding in that more females (12.2%) than males (5.7%) were underweight, but the proportion of underweight males and females is lower in the present study than in the Malaysian universities. However, while the present study found that more females (55.3%) had normal weights than males (39.0%), Gan *et al.* [14] reported the otherwise, where 71.73% and 64.55% of the male and female Malaysian university students, respectively, had normal weights. Interestingly, these researchers found that the female and male students who are obese or overweight were very close in proportions (12.10% and 13.92%, respectively). These differences between the two studies can be explained by the food regime in Malaysia where there are several small, rather than three, meals daily and sea food comprises a high percentage of the Malaysians' daily intake of food.

Obirikorang *et al.* [15] explored prevalence of weight disorders among university students in Kwame Nkrumah University of Science and Technology (KNUST), Kumasi, Ghana, using a sample of 300 students (121 females and 179 males (age  $\leq$  31 years)). Overall, about 12.0% of the sample students were underweight and almost 70.33% of the students had normal weight. Meantime, almost 16.0% of the sample students were overweight and only 1.67% were obese. Consequently, the percentage of people having normal weights is lower (45.66%) in the present study than in the sample of KNUST students (70.33%). The opposite was observed in the case of the underweight individuals (8.33% vs. 12.0%). Moreover, more overweight (34.66%) and obese (11.33%) people were found in Jerash University sample than in the sample of KNUST (16.0% and 1.67%, respectively). Regarding genders, the results of the current study far depart from those of Obirikorang *et al.* [15] which reported almost negligible obesity proportions among the female (1.33%) and male (0.33%) students of KNUST. As well, the results of the current study indicate higher percentages of overweight females (24.4%) and males (41.8%) in the sample of Jerash University than in the sample of KNUST (9.0% and 7.0%, respectively). An important issue to highlight here is that the researchers in the current study could not compare their results with the age-related results of the study of Obirikorang *et al.* [15] because the sample of the latter study was almost predominated by one age group; the 19-24 years age group (229 out of 300 students (76.33%)). The researchers in the present study think that the results reported by Obirikorang *et al.* [15] may be more indicative of malnutrition than of healthy diet.

It is worth highlighting that another similarity between the present study and all the cited previous studies is the higher prevalence of overweight than obesity. In the present study, and in all cited studies, it is found that there is higher prevalence of overweight than obesity at the overall sample scale, within gender, and within the age groups, irrespective of the interval defining each age group. Accordingly, overweight is a transition stage between normal weight and obesity. Directing the health and food awareness and education efforts towards this stage warrants pulling the individual away from the risk of obesity to the normal weight state.

Changes in the socio-economic status and lifestyles in the Arab region have led to reduced physical activity among people of almost all ages. The lifestyles have become more sedentary than before and the practice of exercises has diminished steeply among children, adolescents, and adults, especially in the high-, and middle-income countries, as well as in the urban areas in the low-income countries [3]. In this regard, Musaiger [3] reported some statistics regarding the nutritional status in the Arab region. Results of a WHO survey of seven Arab countries (Egypt, Iraq, Jordan, Kuwait, Saudi Arabia, Sudan, and Syria) brought to notice that low physical activity among the adults ranged from 32.9% in Syria to 86.0% in Sudan. The need for incorporating physical activity into the dietary guidelines has been stressed by the Food and Agriculture Organization and the WHO. It was suggested that adults should perform a minimum

of 30 min of physical activity in most of the days, while the children and adolescents should perform a minimum of 60 min of moderate physical activity in most of the days [3].

## CONCLUSIONS AND RECOMMENDATIONS

This study investigated prevalence of overweight and obesity among adults in Jordan. The study is unique as it is characterized from all cited studies in that its sample consisted of university students, faculty members, and people from the lay public. As such, the results of this study can be broadly generalized to the local population rather than to the university community alone.

The results of this study lead to several conclusions. However, since the various investigated groups (the age groups and the genders) have unequal representations in the study sample, the subsequent conclusions are based on the numbers of individuals rather than on percentages. First, weight disturbances are common in the sample of Jerajh University, and, accordingly, in the local community. Second, underweight, though high, is the least common weight disturbance. Third, in the present study, and all cited studies, it is found that there is higher prevalence of overweight than obesity at the overall sample scale, within gender, and the age groups, irrespective of the interval defining each age group.

Forth, the weight disturbances are more commom among the men than the women. However, while the main weight disorder which the women experience is underweight, the major weight disorder which men experience is overweight. Since most of the cited studies found that there were relatively more underweight females than males and more overweight and obese males than females, it can be concluded that differences in the weight imbalances between men and women are independent of culture or the dominant food regime. Rather, they are basically related to the women being more obsessed than men in having good body shape. In fact, the observed differences between the genders are likely to have physiological, and presumably, psychological (e.g., anxiety and stress), roots, which is an issue that merits in-depth scientific investigation.

Fifth, weight disturbances are age dependent; prevalence of overweight increases with age, especially after the age of 30 years. Sixth, Since all the weight disturbances taken into account by this study were the least common among the eldest sample members ( $\geq 51$  Years), it is concluded that weight disturbances drop sharply, and may even disappear, after the age of 51 years. In view of the age-related findings of the current study, the researchers infer that the most critical age interval in the context of the risk of weight imbalance is the 21-30 years interval. This, in addition to findings of the cited previous studies, lead the researchers to the conclusion that the weight imbalance function of age is non-linear. Rather, it seems close to a single-peak or, probably, double-peak sine function. This finding can be characteristic of the Jordanian community since some previous studies (e.g., Nie *et al.* [4] and Pengpid and Peltzer [10]) reported the otherwise, that is, weight imbalances increase with age. However, this inference should be handled with caution owing to that representations of the various age groups in this study are not equal. Seventh, owing to that the highest numbers of people with weight disturbances pertain to those ranging in age from 21 to 30 years, it can be concluded that this specific age group (21-30 years) is the age group most vulnerable to weight disturbances and that, consequently, is the population group most at risk of weight disturbances. A practical implication of this finding is that future research, as well as the health and nutrition awareness programs, should give this age group topmost priority consideration to help people at these ages overcome weight imbalances.

Eighth, the finding of the present study that 45.66% of the overall study sample have normal (healthy) weights means that more than half of the sample members (54.32%) of both genders and all studied age groups have weight imbalances. This finding leads to the conclusion that most of the sample members had unhealthy eating habits. A possibility also holds that these individuals had insufficient nutrient intake. This is a warning alarm for the sample members themselves and for the health authorities. Indeed, it is a call for action. Changes in lifestyle, eating behaviors, and physical activity, besides modifications to the dietary intake, seem to be badly needed. The public health authorities and universities should capture the signal and develop evidence-based public health awareness programs that address this issue and help the local community in establishing, and maintaining, a healthy lifestyle in order to prevent the future risk of obesity. The universities may even design a course in health, food, and nutrituion at the university level that can be elective, or better still, compulsory, as reasonable educational intervention.

In other respects, and in the light of the findings of this study, the researchers have few recommendations for prospective research. At the local scale, future research is recommended to perform similar studies that cover a minimum of three universities simultaneously, one each taken from the north, central, and south regions of the country, and which incorporate lifestyle characteristics and dietary habits in the investigation. In other respects, it was astonishing that the majority of the related published research was conducted in developing countries, particularly Africa. The researchers recommend future researchers to



conduct similar research in developed countries in order to allow for comparisons in prevalence of, and risk factors for, weight imbalances between developing and developed countries worldwide.

Both at the local and international scales, the researchers recommend use of samples with equal, or very nearly equal, representation of genders and the age groups so that intra-group comparisons will be more realistic and accurate. Whatever demographic characteristics are taken into account in the study, equal representations of all sub-groups of each demographic characteristic of interest is beneficial. The researchers also question the position of fast foods in the food and weight imbalance equation and think that dedicated research examining this issue should be carried out worldwide. Additionally, the researchers recommend researching into gender-specific eating practices and health risk factors.

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#### CONFLICT OF INTEREST

The authors spotlight that there are no conflicts of interest to declare.

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