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PREVALENCE OF OBESITY AMONG KUWAIT UNIVERSITY STUDENTS AND ITS RELATION TO GENDER, AGE, AND EXERCISE VARIABLES

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Abstract

The 2002 World Health Report (Reducing Risks, Promoting Healthy Life) announced that the regional disease burden of the Eastern Mediterranean Region accounted for 47% of the total number of non-communicable diseases. Kuwait is among the Eastern Mediterranean Region countries that have witnessed significant economic growth since the discovery of crude oil reserves. In parallel with the economic development of the country, the prevalence of overweight and obesity have increasingly grown over the past few decades. A total of N=427 students (315 females, 112 females) aged seventeen to thirty-nine, were randomly selected from the leading universities in Kuwait; and asked to take a survey. Those selected were a representative sample; made up of 73.8% females and 26.2% males. The results of the study showed that gender was the main factor associated with the Body mass index (BMI). On average, among the sample, the females were found to be in the overweight category (BMI ≈ 25.2), whereas the males nearly fell in the obese category (BMI ≈ 29.2). On the other hand, based on a logistic regression at 95% of confidence, the chances of being overweight or obese, among the considered students' population, were predicted at about 67% for females and 85% for males. As a conclusion, it is recommended, for this population, the consideration of the Kuwait National Program for Healthy Living; an initiative created to uphold the health and well-being of the residents in the country.

Keywords: *Body mass index, Kuwait, logistic regression model, obesity, odds ratio, overweight, predictions, prevalence, probability, university students.*

Introduction

The 2002 World Health Report (Reducing Risks, Promoting Healthy Life) announced that the regional disease burden of the Eastern Mediterranean Region accounted for 47% of the total number of non-communicable diseases. This number is predicted to increase to 60% by 2020 [*WHO, 2002*]. The main reason for these increasing numbers of non-communicable diseases is the development and socio-economic transitions of the Eastern Mediterranean Region countries. This has produced essential changes in the lifestyle, dietary behaviors, and physical activity of the population. Kuwait is among the Eastern Mediterranean Region countries that have witnessed significant economic growth since the discovery of crude oil reserves. Kuwait holds the world´s sixth largest actual reserves of oil, which accounts for 40% of GDP of the country [*Trading Economics, 2018*]. In parallel with the economic development of the country, the numbers non-communicable diseases have increasingly grown the past few decades. This has been the outcome of the latest sedentary work, the use of motorized vehicles for transportation, the implementation of western dietary patterns, and decreased physical activity. This "evolution process" of the Gulf countries is similar to the transformation processes that occurred in the West,

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but that took place during a much shorter time period [*Woodman A et al., 2017*].

The sedentary lifestyle, unhealthy diet, and abnormal working hours are also among the factors that have led to the non-communicable diseases. The result has been a severe increase in several quite dangerous medical conditions. Included in these diseases are obesity, hypercholesterolemia, diabetes mellitus, and cardiovascular diseases, where obesity is considered the primary factor for the development of these cited non-communicable diseases [*Jackson R et al., 2010*].

According to the Public Authority for Civil Information more than 40% of Kuwaiti nationals are under the age of 15 years old [*Behbehani K., 2014*]. Earlier estimates done by the WHO (2006), estimated that the Kuwaiti population over 60 years of age would increase to 8% by 2030 and 25% by 2050 [*World Health Organization, 2006*]. Additionally, the World Health Organization reported that more than 60% of adults worldwide and two-thirds of the European population did not perform sufficient physical activity [*Alsahli M.A., 2016*].

Kuwait spent approximately 16% of its health expenditure on the treatment of diabetes alone in 2010 and it is expected that this number could increase to 150% by 2030 [*International Diabetes Federation, 2012*]. The studies also reported that the prevalence of type two diabetes has spread significantly among the children and adolescents in the country, which has made this issue a critical national problem as well as an emergency public health problem [*International Diabetes Federation, 2012*].

The independent scientists and investigators explored and identified the core issues of different ages, socio-economic groups, and genders to determine the impact factors related to overweight and obesity among the population of Kuwait. In addition, research was done to further define the connection between morbid nutrition and the prevalence of obesity and the diseases linked to overweight and metabolic syndrome (MetS). Researchers have determined that more than one-half of Kuwaiti adults are affected by overweight and obesity issues [*Guariguata L et al., 2014*]. Between the years 1995 and 1997, the overweight problem among Kuwaiti men of all ages was 67.5% and obesity was 32.3%. Among the Kuwaiti women, the statistics were 72.9% and 40.6% respectively. These rates were higher than in any other country in which similar studies were conducted [*Al-Isa A 1999*; *1997*].

The overall percentage of the obese population increased from 28.4% to 43% between 1998 and 2009, with the negative dominance directed towards students [*Alsahli M, 2016*]. Nour Y and co-authors in their cross-sectional study indicated that pre-diabetes symptoms are predominant among young adults aged 18 - 36 years. They stated that 6.3%, mentioned obesity as the main affecting factor in these cases [*Nour Y et al., 2016*]. Simultaneously, Kuwait was found to be the third country with the highest worldwide prevalence of diabetes- 21.1 %, in 2017. The children, young adults, and university students are the most vulnerable group in Kuwait, especially when compared to other European countries. Al-Rashdan I and Al Nesef Y (2009) reported that 80.4% of Kuwaiti adults were identified as overweight, 47.5% were obese, and 36.2% were diagnosed with MetS. Another outcome of the scientist's research was their evaluation of the gender's obesity rates: Kuwaiti women were more overweight and obese (81.9% and 53%, respectively) in comparison with Kuwaiti men (78% and 39.2%, respectively) [*Al-Rashdan I, Al Nesef Y, 2009*].

The Evaluation of Obesity Rates among the Kuwaiti Students based on Gender

Different studies as well as surveys taken among the university students in developing countries of different Continents show a high prevalence of overweight and obesity. Some of the most significant are: Africa - Nigeria: 10%; Egypt: 25.3%–59.4%; South Africa: 10.8%–24%; Asia - Bangladesh: 20.8%; China: 2.9%–14.3%; Malaysia: 20%–30.1%; Thailand: 31%; Pakistan: 13%–52.6%, and India: 11%–37.5%; Latin America - Colombia: 12.4%–16.7%; Mexico: 31.6%; The Middle and Near East - Saudi females: 47.9%; Oman: 28.2%; Kuwait: 42%; Iran: 12.4%, and Turkey: 10%–47.4% [*Peltzer K et al., 2014*].

A select group of scientists and researchers performed the gender-differentiated studies during the last decades. Their goal was to determine the rates of overweight and obesity among the Kuwaiti males and females. They did this by using a comparison of factors and how these factors influenced their lifestyle depending on their gender. Al Majed and co-authors found that male students had a

higher prevalence of obesity, while female students had a higher incidence of overweight. However, the scientists did not mention the rates of the physical activity for both genders. Physical inactivity serves as a negative factor for the health of an individual, and it is a decisive factor for obesity, weight gain, coronary heart disease, and other mortal diseases [*Al Majed H et al., 2011*].

It is expected that adults, from the ages of 18-29 are more likely to form unhealthy habits and gain weight while attending a university. Furthermore, patterns that are established during young adulthood can carry on into old age and increase or decrease one's life-expectancy [*Woodman A. et al., 2017*]. The percentage of Kuwaiti men who are overweight and obese at the ages of 18 - 29 increased by 23.4% and 14.8% respectively, between 1980 and 1993. By 1997, it became clear that the prevalence rates for overweight and obese people among the same age group men increased to 44.3% and 17.2% respectively. Al-Isa reported that the 38.5% of Kuwaiti college men were overweight and 11% were obese, compared with the 8% and 1% in European countries in 1997 [*Al-Isa A, 1997*]. Family traditions and certain aspects of society have a significant influence on the formation of dietary patterns. Therefore, family occasions like weddings, parties, and religious events, where men gather and intake a lot of food, is more prevalent in the Arab customs than the European, thus leading to an increase in Arab dietary health issues.

Two decades later, Maha Al-Sejari performed a cross-sectional survey of 262 male university students in Kuwait. The survey questions were related to social and health factors; body mass index (BMI), blood tests and MetS; a cluster of cardiovascular disease risk factors. This information was taken from a group of participants in primary health care clinics. The results of the survey indicated that more than half of the participants were overweight and obese. Furthermore, it showed that 74.4% of the participants had never visited a nutritionist; 69.8% were not on a diet; 42.7% reported moderate to very low daily physical activity, and 53.4% of the students were nonsmokers [*Al-Sejari M., 2017*].

Interestingly, the study demonstrated that Kuwaiti students with a higher income had a higher mean level of blood glucose than did the lower-income students. This conclusion again confirmed the impact of living a western lifestyle. That lifestyle was closely associated with higher economic status. Other qualities uncovered were that students were often consuming fast foods containing high fat and high carbohydrates, frequently eating between meals, drinking carbonates, adopting a sedentary lifestyle, and most of the time relying on cars for transportation rather than walking [*Al-Sejari M, 2017*]. The weight gain and rise in obesity of men increases from 53% to 93% at the age of 20-24 and ages 60-65 in women. The percentage of overweight and obesity for the same ages becomes 51% and to 96% respectively, with obesity being more common than weight [*Ramadan J et al., 2010*]. Research shows that there is an association between weight gain and body dissatisfaction among women, more so than among men. The survey conducted by Matter A and co-authors revealed that the causes, which are associated with obesity among females in the Middle East might consist of a sedentary lifestyle, low rates of physical activity, energy intake exceeding expenditure, and multiple pregnancies [*Matter A et al., 1990*]. Customarily, Arabian Gulf women eat in a group or among family members at home. This tendency carries more of a risk of overeating, and higher consumption of food then would occur when dining alone or in public places.

According to the studies done by Abdulwahab Naser Al-Isa, the obesity levels among Kuwaiti women were 59.2% in 1980 and, by 1993 it had reached 72.9%. Abdulwahab Naser Al-Isa conducted a random survey of 585 Kuwaiti college women in 1997 to learn the causes associated with overweight and obesity [*Al-Isa A, 1998*]. His study focused on subjects whose weight and height were measured according to body mass index standards, which is the weight in kilograms divided by the height squared (W/H^2). The information on the possible causes was gathered through questionnaires, which asked the age, marital status, area of residence, number of siblings, (brothers, sisters, total) suffering from a chronic disease, obesity among parents, parents' education and occupation. Furthermore, it asked about the number of meals served to the family, frequency of eating between meals, family income, the number of servants, number of people living at home, exercising habits, last dental and physical checkup, highest educational degree

earned, countries preferred to visit, and socioeconomic status. The study concluded that 27.2% of the students were overweight (BMI >25 kg/m^2) and 7.2% were obese (BMI >30 kg/m^2). The Logistic regression analysis of significant causes showed that all of the studied women performed the same personal routines that contributed to the development of overweight and obesity. This was true except for several brothers who had been diagnosed with a chronic disease [*Al-Isa A, 1998*].

Another study reported by Abdulrahman O. Musaiger and Mariam Al-Mannai used a target group of female university students studying at the Women's College in Kuwait University in 2013. The number of respondents was 228 girls aged between 19 and 25 years. When compared to the study done by Al-Isa in 1997, the subjects ages were lower in comparison with the participants of that survey. In addition to the investigation of common body mass index concerns, this study focused on collecting information on the role of media in body shape issues. It also researched how parents, peers, and the girls themselves dealt with the body shape issues. Interestingly, this study reached a number of significant conclusions. The use of the internet and reading women's magazines had a considerable influence on nutrition habits among the girls. They were more likely to try to lose weight, and their focus on mass media had two-three times more of an influence on obese girls than non-obese girls. The study concluded that overall, 30% of non-obese respondents and 81% of obese girls were displeased with their weight. All of these facts, as well as the pressure from peers and parents, may be the cause of the disordered nutritional attitudes. The other essential fact that was uncovered, which caused the body shape dissatisfaction among the respondents was the preference of men for specific women body shapes. It was revealed that 81% of these girls (either obese or non-obese) believed that Kuwaiti men preferred slim women, and only 19% of Kuwaiti girl students thought that men like plump (overweight) girls [*Musaiger O, Al-Mannai M., 2013*]. Remarkably, that thought was common among Arab women in Qatar, where 43% believed that Arab men prefer plump women [*Musaiger O., Al-Mannai M, 2013*].

In addition to the information gathered on the body shape dissatisfaction among the Kuwaiti girl students, additional data was found in a more recent study reported by Dalal Alkazemi and co-authors (2018). This study was done to investigate the existence of disordered eating attitudes and weight perception among young women with a high body mass indexto further determine the standards that relate to underweight, healthy weight, overweight, and obese weight status [*Alkazemi D et al., 2018*]. The data was collected from 1,147 female undergraduate students; 89% who were Kuwaiti nationals. The records were obtained according to the eating habits of Kuwaiti University students (EAT-26) with the use of an anonymous, self-administered questionnaire to define the prevalence of symptomatology indicative of anorexia nervosa and bulimia nervosa. The Eating Attitudes Test (EAT-26), generated by David Garner, is a commonly used self-report questionnaire of 26-items which were used to self-report and measured the symptoms and concerns that are characteristic of eating disorders. Among all of the participants, the mean total EAT-26 score was 21.0±11.2; whereas the most common EAT-26 items for which participants answered "usually" or "always" were presented in descending order. The results were as follows: "thinking about burning up calories when exercising"- 47.4%; "preoccupied with a desire to be thinner" - 46.2%; "preoccupied with the thought of having fat on my body"- 40.8%; "take longer than others to eat my meals"- 36.8%; "terrified about being overweight"- 33.7%; "fear other people think that I am too thin"- 32.3%; and "felt that food controls my life" - 28.5%

The overall result of the test showed that 46.4% of the participants scored above the diagnostic cut-off on the EAT-26, and the mean EAT-26 score. This was in the range of an at-risk group for disordered eating which was significantly higher with a rating of 31.3 .8 % than that of the not-at-risk group with a score of 10.4 5.1%. The study reported that almost half of the respondents were at risk of disordered eating according to EAT-26. Furthermore, the mean total score of the complete model exceeded the "cut-off value for being at risk of disordered eating behaviors." Based on this study, the comparison was made to parallel the rate of disordered nutrition habits and behaviors among the Arabian Gulf Countries during the last decades. The outcome showed that, to date, the highest negative rate was among Kuwaiti women. In the study

by Al-Subaie A and co-authors (1996), they reported that 19.6% and 24.6% of Saudi and UAE female college students scored above 20 on the EAT-26, respectively. Unlike these high levels, Alkazemi D and co-authors observed that disordered eating attitudes were rare in Omani adults - 2% [*Alkazemi D et al., 2018*].

Material and Methods

A total of N=427 students (315 females, 112 females) aged seventeen to thirty-nine, were randomly selected from the leading university in the Kingdom of Kuwait; and asked to take a survey. Those selected were a representative sample; made up of 73.8% of females and 26.2% of males. The questions on the survey asked about socio-demographic characteristics, personal lifestyle, and socio-economic status. The lifestyle questions focused on the subject's level of physical activity as well as their carbohydrate and fat intake. Before administering the survey, the questionnaire was pretested by a randomly selected group of students and approved by the Institutional Review Board (IRB).

All subjects were asked to sign a written consent to participate in the research process. Each section of the data was analyzed with the use of the SPSS statistics software program. Before this analysis, the body mass index was determined for each student, as the ratio of their weight (in kilograms) to the square of their height (in meters). The results were then converted into the widely-known four body mass index categories (obese, overweight, normal weight, and underweight). The conversion was done using the international classification, specifically for adults, as prescribed by the World Health Organization. According to the standard of the WHO, any person with a body mass index below 18.5 is considered to be underweight. Those who have a body mass index that falls within the range of 18.5-24.99 are considered normal. Those subjects deemed to be overweight or pre-obese have a BMI within the range of 25-29.99. Any person who has a body mass index of 30 or more falls into the obese category. Several variables, including, and not limited to, gender, age, fat and sugar intakes, weekly amount of exercise, and the family size and income were examined to determine their significance and the possible effect on the body mass index .

Cross tabulations were carried out to calculate the prevalence rates of obesity, overweight, and underweight for each variable category as well as for the entire sample. The Chi-square test was used to determine the significance of the association between body mass index and other variables. A correlation with a p-value of 0.05 or less was considered to be statistically significant. In addition, confidence intervals were determined to estimate the prevalence of obesity/overweight and Normal weight/underweight tendencies trends for the entire population of university students in the Kingdom of Kuwait. Finally, a Binary logistic regression was deployed to compare the patterns and predict the highest and lowest probabilities of obesity/overweight and normal weight/underweight for this population.

RESULTS

Descriptive Characteristics of the Sample

As presented in table 1, the sample consisted of female students (73.8%) and male students (26.2%) who were randomly selected from the foremost universities in Kuwait. Most of the subjects were less than 30 years of age (96%) and 4% were 30 – 39 years old. The average height was 1.60 *m* for females and 1.76 *m* for males. It was found that in both groups the heights were very similar (very small SD). However, this was not the case when weight was considered. Table 1 shows an average of 65 *kg* for females and 91 *kg* for males with an SD of 18 and 25 respectively. On average, this placed the female students in the overweight category (BMI ≈ 25.22 kg/m^2) and male students in the nearly obese category (BMI ≈ 29.21 kg/m^2). When their families were considered; those who share the same household; most had six people living together, on average, although the size did vary significantly in some cases (SD ≈ 4). In the sample, two groups emerged; families with 3 – 6 people (49%) and those with 7 - 9 people living in the same residence (14%).

Prevalence of Obesity, Overweight, and Underweight

Figure 1 shows that, among N=427 participants, the prevalence of obesity, overweight, and underweight were respectively 23.5%, 26%, and 6.5%. As expected, and confirmed in table 2, gender was the main factor impacting the body mass index.

***Prevalence by Gender and Age*:**

As shown in figure 1, there were relatively more obese and overweight in males than in females (about 37% and 30% vs. 18.5% and 24.6% respectively). However, females were more likely to be underweight than males (about 9% vs. 0%), which was also the case among the age group "< 30", according to figures 2 A, B. These figures also show that, for both genders, whereas the obesity prevalence was almost the same in the two age groups, the overweight prevalence was much higher among the oldest group (67% vs. 28% for males and 46% vs.24% for females). The differences in body mass index, due to the age group, were statistically significant ($p < 0.05$) and those, gender-based, were statistically highly significant ($p < 1/10^5$).

Prevalence Based on Physical Activity and Sugar Intake:

According to table 2, a weekly exercise seemed to be beneficial to obese students as their proportions decreased through time of exercise (less than 1*h/w* and 1 to less than 2*h/w*) from 28% to 20%,

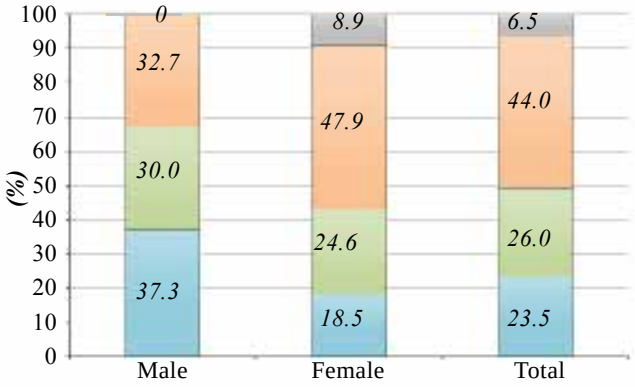

FIGURE 1. *Body Mass Index classification by gender.*
NOTES: *- obese, - overweight, - normal weight, - underweight*

but not for overweight whose prevalence increased from 18.5% to 31%. The prevalence of normal weight was close to 45% for all exercise-based groups. The differences in body mass index, due to the amount of weekly exercise, were statistically significant ($p < 0.05$). However, the sugar intake had almost no effect on the body mass index categories except for overweight students. There were indeed relatively more overweight among those who consume less sugar.

TABLE 1.

Socio-demographic characteristics of the sample

Factor	Categories	n (%)	Mean	SD*
Gender	Male	112 (26.2)	-	-
	Female	315 (73.8)		
Age (years)	< 30	410 (96.0)	24	2
	30 – 39	17 (4.0)		
Height (*m*)	Male		1.76	0.07
	Female		1.60	0.06
Weight (*kg*)	Male		91.06	25.34
	Female		65.17	18.39
BMI (kg/m^2)	Male		29.21	7.62
	Female		25.22	6.78
Family size	< 3	40 (11.9)	5	4
	3 – 6	208 (48.5)		
	7 – 9	61 (14.2)		
	≥ 10	28 (6.5)		
Family's Monthly Income (Kuwaiti Dinar)	500	19 (4.7)	1610	520
	500 – 999	36 (8.9)		
	1000 – 1499	106 (26.1)		
	1500	245 (60.3)		

Note: *BMI - Body Mass Index, SD - Standard Deviation

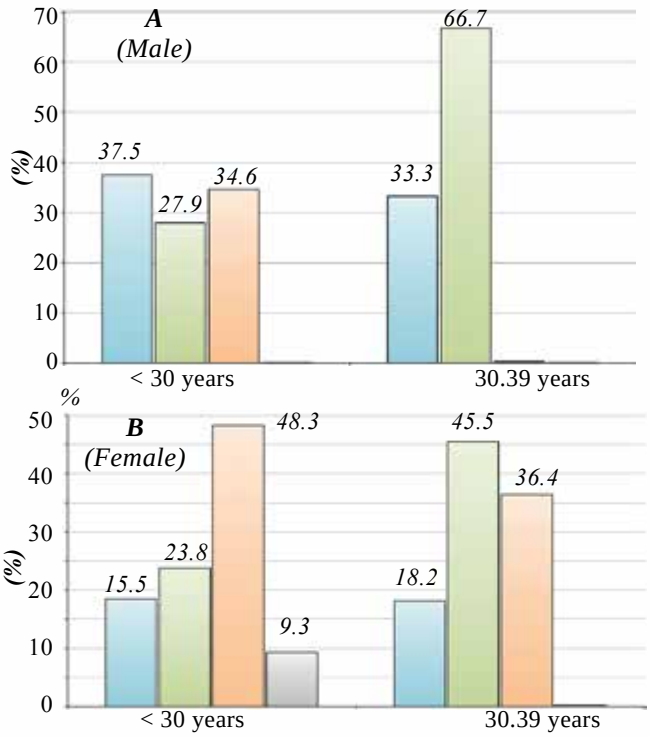

FIGURE 2. *Body mass index classification by age among males (A) and females (**B**)*
NOTES: *- obese, - overweight, - normal weight, - underweight*

Table 2.

Factors associated with the Body Mass Index of N=427 university students, Kuwait 2019

Factor	Obese n (%)	Overweight n (%)	Normal W. n (%)	Underweight n (%)	Total n (%)	Chi² Test & p-value
Gender						27.24 & < 5/10⁶
Male	41 (37.3)	33 (30)	36 (32.7)	0 (0)	110 (26)	
Female	58 (18.5)	77 (24.6)	150 (47.9)	28 (8.9)	313 (74)	
Age group						7.85 & 0.049
< 30	95 (23.3)	101 (24.8)	183 (45.0)	28 (6.9)	407 (96)	
30 – 39	4 (23.5)	9 (52.9)	4 (23.5)	0 (0)	17 (4)	
Physical Activity (hours/week)						14.25 & 0.015
< 1	50 (28.1)	33 (18.5)	81 (45.5)	14 (7.9)	178 (45.8)	
1 – < 2	19 (20.2)	29 (30.9)	40 (42.6)	6 (6.4)	94 (24.2)	
2 – < 3	15 (25.9)	16 (27.6)	24 (41.4)	3 (5.2)	58 (14.9)	
≥3	11 (12.9)	29 (34.1)	40 (47.1)	5 (5.9)	59 (15.2)	
Sugar Intake (~ cake portions/day)						8.99 & 0.174
< 2	58 (21.9)	78 (29.4)	115 (43.4)	14 (5.3)	265 (63.9)	
2 – < 4	29 (24.8)	23 (19.7)	56 (47.9)	9 (7.7)	117 (28.2)	
≥ 4	8 (24.2)	6 (18.2)	14 (42.4)	5 (15.2)	33 (8)	
Family Income (Kuwait Dinar Monthly)						11.71 & 0.23
< 500	2 (10.5)	8 (42.1)	9 (47.4)	0 (0)	19 (4.7)	
500 – 999	12 (33.3)	12 (33.3)	9 (25.0)	3 (8.3)	36 (8.9)	
1000 – 1499	24 (22.6)	28 (26.4)	47 (44.3)	7 (6.6)	106 (26.1)	
≥ 1500	53 (21.6)	57 (23.3)	117 (47.8)	18 (7.3)	245 (60.3)	

Regression Analysis and Predictions

As it can be seen in Table 2, gender variable was by far the factor that had statistically the most significant association with the body mass index status ($p < 1/105$). But other factors, namely age group and physical activity, were also shown to have a significant effect on the body mass index ($p < 0.05$). A binomial logistic regression of the body mass index status (normal weight clubbed with underweight and overweight clubbed with obese category) in terms of the top three influent factors was shown to be statistically highly significant ($p < 0.01$). Sugar intake and family income were not considered in the regression as their effect on the body mass index was statistically insignificant ($p > 0.05$). The odds ratios for overweight or obesity were predicted at 95% of confidence, as part of this regression analysis report, from which the main outputs were derived (Table 3).

Predictions of Overweight or Obesity

According to table 3, males have about 2.7 (≈1/0.369) times higher chance of being overweight or obese. Their odds for overweight or obesity are predicted by the logistic regression model:

$$\text{Odds} = e^{a+bx} = e^{1.72 - 0.997(0)} = e^{1.72} \approx 5.585$$

Thus, a male is about 5.6 times more likely to be overweight or obese than to be normal weight or underweight.

For a female, the same model with x=1 gives:

$$\text{Odds} = e^{1.72 - 0.997(1)} = e^{0.723} \approx 2.06$$

Thus, a female is twice more likely to be overweight or obese than to be normal weight or underweight.

When converting odds to probabilities, using the equation:

$$p = \frac{\text{Odds}}{1+\text{Odds}}$$

Table 3.

Predicted odds ratio for overweight or obesity among university students in Kuwait

Factors	B	SE	Wald	Df	p-value [a]	Odds Ratio	95% Confidence Interval
Gender							
Female	-0.997	0.233	18.302	1	0.000	0.369	0.23 – 0.583
Const.	1.72						
Age group							
≥ 30	1.252	0.580	4.638	1	0.03	3.499	1.122 – 10.91
Const.	-0.074						
Physical Activity [b]							
1 – < 2	0.178	0.255	0.484	1	0.487	1.194	0.724 – 1.970
2 – < 3	0.273	0.303	0.812	1	0.367	1.314	0.726 – 2.380
≥ 3	0.017	0.264	0.004	1	0.948	1.017	0.606 – 1.708
Const.	-0.135						

Notes: *(a) Significant at 95% level, (b) Reference group: < 1* h/week

it is found that, for males, p = 5.585 / (1+5.585) ≈ 0.85, which means that 85% of males are predicted to be overweight or obese, and for females, p = 2.06 / (1+2.06) = 0.67, giving females 67% chance of being overweight or obese.

On the other hand, table 3 indicates 3.5 times higher chance of being overweight or obese for students who are 30 years old or more, compared to those who are below 30 years of age. By a similar calculation as previously, they are found to have around 13/4 odds for overweight or obesity, and therefore, 76.5% chance of being overweight or obese (vs. 9/10 odds and 48% chance for the latter).

When it comes to predictions of overweight or obesity based on physical activity, it turns out, from (Table 3) that students who exercise the least (<1*h/week*) are slightly less likely to be overweight or obese. More precisely, by using the associated regression equation, they are found to have about 87/100 odds, and hence, 47% chance of being overweight or obese. Almost the same odds and chances can be predicted among students who exercise the most (≥ 3*h/week*). As for the two intermediate groups (1*h/w* – < 2*h/w* and 2*h/w* – < 3*h/w*), their odds are estimated at around 26/25 and 23/20, which give them about 51% and 53% chance of being overweight or obese.

Discussion

Limitations

Although the research accomplished its objectives, there were some prognosis limitations. Firstly, since this was a survey using self-reported data, the participants might have not responded honestly. This could be because they could not correctly recollect some of their personal data such as height and weight, or because they wanted to present themselves in a socially acceptable manner. Secondly, neither the distribution nor the effect of the family income was found to be relevant, certainly due to some participants who might have overestimated their family income. Finally, there was also a missing data in some cases. All of this was factored into the final results of the research.

Strengths

This study was based on primary data collected from a representative sample of students from the leading universities in Kuwait. It concluded that the obesity issue in this sub-population was less a critical factor when compared to the entire adult population in Kuwait; >37.3% vs. 30% for males and 18.5% vs. 24.6% for females. In addition, gender variable was found to be quite significant when associated with the body mass index status. The factors gender, age and physical activity, were used in logistic regressions (at 95% of confidence), to compare the trends and predict the odds for and probabilities of "overweight or obesity" among university students in Kuwait.

Conclusion

The results of this study show relatively concerning trends of overweight and obesity among university students in Kuwait. Based on these results, it is recommended for this population to consider the following information herewith for their health improvement and reducing the rates of overweight and obesity.

The Kuwait National Program for Healthy Living was an initiative created to uphold the health and well-being of the residents in the country. The primary objective of the Program was "to overcome barriers and empower the population of Kuwait" to implement correct behaviors related to a healthy lifestyle, which would lead each person to a prosperous, productive, and satisfying social life [*Behbehani K, 2014*].

The plan was generated according to the available data and information linking some lifestyle behaviors of the Kuwaiti people. Some of the most common chronic diseases in Kuwaitis are obesity, diabetes, hypertension, and coronary heart diseases. The external causes that were also measured were smoking, lack of workout, disordered eating behaviors, and excessive alcohol use. Finally, included in the study were any psychosocial causes, such as impaired cognitive capacity, aggression, and depression. Specific ethnic and racial minorities were studied and factors such as a lack of education, displeasure with a career were noted. Information regarding chronic occupational and social stressors was included in the study and was classified as societal risk factors [*Behbehani K, 2014*].

The first 5-year plan of the Kuwait National Program for Healthy Living (2013 - 2017) took into consideration all of the causes mentioned above that could have an impact on the health of the population. It also included any proposed policies that could be used to improve the health condition for all generations in the upcoming years. The plan developed the following health promotion structures: Healthy Living for the Elderly, Healthy Living in the Workplace, Promoting a Healthy Lifestyle through Religion, Healthy Living for Schools, Healthy Living in Malls, Healthy Living in Universities, Healthy Living in Cooperatives (Food Market), and Healthy Living in the Media [*Behbehani K., 2014*]. The information that was included was intended to create a functional and updated website of healthy living. Furthermore, it could be used to increase the number of participants in the Program, and train staff at schools about healthy lifestyles and such risk factors as obesity, diabetes, and other chronic conditions. The information could help to train healthcare staff; create policies related to healthy food and appropriate physical activity. Used data could help the media with training, workshops; to publish daily newspapers, newsletters, and magazines. It could introduce the elderly to healthy lifestyle needs as well as risk factors for children and adolescents. Finally, it could be used to monitor food labeling in supermarkets [*Behbehani K., 2014*].

These findings and recommendations offered by all of the institutions involved in this Program have one common goal; to improve the health of the people in Kuwait. The goal could be reached by teaching its people to consider their health and well-being as a collective obligated duty towards themselves within their surrounding environment. Subsequently, the most desirable outcome of the plan is the involvement of many stakeholders in encouraging the goals of the Program. The healthy lifestyle issues and their eventual solutions can have a massive impact on the upgrade and improvement of the structures of the plans to support and create an "ongoing and developing a healthy living environment in this part of the world".

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