Physical Activity and Dietary Behaviors as Factors Influencing Weight Gain among King Faisal University Male Students: A Pilot Study

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ABSTRACT

Obesity is a risk factor for many diseases. It has been associated to a higher risk of cardiovascular diseases, diabetes type II, difficulties in breathing, and osteoarthritis. Studies suggested that daily physical activity, dietary behaviors and genetic influences were the main factors determining weight gain. This study aimed to investigate the relationship between the daily physical activity, food consumptions, and weight gain among King Faisal University (KFU) students. 290 subjects were recruited from 4 colleges of the KFU by systematic random sample from 1120 students enrolled in the course "Health and Fitness" one of the university mandatory requirements. For each subjects, anthropometric characteristics were measured, daily physical activity was assessed using pedometer, and dietary behaviors were evaluated using a survey questionnaire developed for this study. The validity and reliability of this questionnaire were established before testing. Results noted that the prevalence of overweight and obesity among KFU students was 38.27% with 13.1% obese and 26.9% overweight. Data indicated also that subjects had greater susceptibility to be obese if they are engaged in a daily physical activity lesser than 5000 steps/day, consumed vegetables and fruits lesser than five times/week, and used sugar-sweetened drinks and French fries/potato chips more than five times/week. In conclusion this study noted that KFU students were less obese than other Saudi sub-groups. Nevertheless, a specific program may be proposed to implement the theoretical knowledge, including limiting the use of fast foods and sugar-sweetened drinks, and increasing vegetables consumption and the daily physical activity.

Key Words: Body composition, Dietary behaviors, KFU students, Overweight/obesity, Physical activity.

INTRODUCTION

Obesity is a serious public health problem in the world. It has been strongly linked to disorders such as hypertension, diabetes, fatty liver disease, abnormal blood fats, Gallbladder disease, coronary artery disease, stroke, osteoarthritis, sleep apnea, fertility problems, and many cancers (Sikorski *et al*., 2011; Doustmohamadian *et al*., 2017). In Saudi Arabia, a country characterized by a fast growing economy, a rapid urbanization, and several changes in nutritional habits in recent decades, it was estimated that, in 2000, 36.9% of the Saudi population were overweight and 35.6% were obese. In 2006, 52% of men, 66% of women, 18% of adolescents, and 15% of pre-schoolers were overweight or obese. In 2007, the prevalence of overweight and obesity was respectively 28.4, 23.6% in women, 30.7, and 14% in men (Al-Othaimeen *et al*., 2007; El-Mouzan *et al*., 2010; Al-Hazzaa *et al*., 2012; Al-Nakeeb *et al*., 2012). In 2010, the National Nutrition Survey for childhood obesity reported that 23.1% of children were overweight,

9.3% were obese and 2% were severely obese (El-Mouzan *et al*., 2010). Recently, quoting from World Health Organization statistics nearly 70 percent of the Saudi population aged over 16 years was overweight or obese (66 percent of men and 71 percent of women), classifying KSA in the 29th position among 194 studied countries (Ng *et al*., 2011).

According to relevant studies, obesity is associated to an excessive food consumption and a sedentary lifestyle (French *et al*., 2001; Al-Hazzaa *et al*., 2012; Al-Nakeeb *et al*., 2012). Several studies indicated also that many specific behavioural factors may improve weight gain among individuals, including the use of fast foods (Pereira *et al*., 2005; Sharkey *et al*., 2011), sugar-sweetened beverages (Beydoun *et al*., 2011), and reduction daily physical activity (Lam *et al*., 2012; Mahdavi *et al*., 2014; Shumei and Ying, 2016). Recently, many investigations have focused on the increase of fast food consumption to examine the weight gain and the body composition. As a conclusion, they

affirmed that these types of diets improve weight gain and disease risks (Seo *et al.*, 2011; Gondim *et al.*, 2015). Seo *et al.* (2011) noted in this way that regular consumption of fast food was generally associated to bad eating habits, poor nutrition knowledge, and irregular feeding of individuals (Choi, 2007).

In addition to dietary bad habits, lack of physical exercises worsens the riskiness of obesity. The urban living environments contributes to sedentary lifestyles, as individuals tend to use cars in all their commuting (school, work and leisure). Lumpkin (2013) noted that obese individuals instead of seeking opportunities for moving, spend their most waking hours inactive namely in watching television (2.7hours daily), surfing the internet (from 32 to 77 hours/ month), and using mobile devices (50 minutes/day). Fock and Khoo (2013) suggested also that physical training is not effective to generate a weight loss, it is important only for maintaining weight loss achieved through a dietary intervention. Nevertheless, relevant studies suggested that combined diet and physical exercise generates weight loss better than diet alone, highlighting also that an inclusion of more physical activity is often indicated to stimulate weight loss (Seo *et al.*, 2011; Davis *et al.*, 2016), increase energy expenditure, and improve insulin sensitivity as well as many cardiovascular factors (Maffiuletti *et al.*, 2008). The aim of this pilot study is to investigate the relationship between the daily physical activity, food consumptions, and weight gain among King Faisal University students.

MATERIALS AND METHODS
Problem approach:

This is a descriptive cross-sectional study which took place in King Faisal University located at Al-hasa, an oasis region sited in the east of Saudi Arabia. It was undertaken to determine the relationship between the level of the daily physical activity, food consumptions, and weight gain among KFU students. At the beginning of this research approach, subjects completed a questionnaire reporting their daily dietary intake, frequency of fast food intake, personal and behavioral factors related to the consumption of fast foods, and perceptions of using fast foods. Then, anthropometric characteristics were measured, and all subjects were familiarized with a wearable pedometer asked to wear it for one week.

Subjects:

A survey conducted between 1 January and the end of May 2015 on 299 male students recruited from 4 out of 17 colleges of King Faisal University (Education, Arts, Sciences, and Veterinary Medicine) by systematic random sample from 1120 students enrolled in the course "Health and Fitness" one of the mandatory requirements of the university. All subjects received a medical examination at the Medical Center. Among these participants, men with Body Mass Index (BMI) less than 18.5 $kg.m^{-2}$, reporting any metabolic or cardiovascular disorder or a history of heart attack, stroke, or cancer within six months prior to the start of the study were excluded (n=9). 290 students who met the eligibility criteria and agreed not to participate in any other similar studies, were assigned into three groups: Group of obese students (OS, n=64): formed by students with Body Mass Index upper to 30 $kg.m^{-2}$; Group of overweight students (OWS, n=108): formed by students with BMI between 25 and 29.9 $kg.m^{-2}$; and group of normal weight students (NWS, n=118), formed by students with BMI between 18.5 and 24.9 $kg.m^{-2}$. All participants completed a written consent for this study, and the trial protocol has been approved by the ethical committee of the Deanship of Scientific Research at King Faisal University and thus met the standards of the Helsinki Accords in its final version of 2013 [64th WMA General Assembly, Fortaleza, Brazil, October 2013].

Research protocol:
Anthropometric variables

Anthropometric variables included height, body weight, Girth measurements, and 04 skinfold thicknesses were conducted. Height

was measured barefooted to the nearest 0.1 cm using a stadiometer (Holtain, Crymich, UK). Body weight was determined with minimal clothing to the nearest 0.1kg using a digital scale (Seca, Germany). Girth measurements were obtained for the hip and waist using a Gulick anthropometric tape according to the Pollock and Garzarella method (1995), and skinfold thicknesses were measured on the right side of the body using a Harpenden skinfolds caliper (Harpenden skinfold, UK).

BMI was calculated according to the formula: BMI=body weight (kg). height $(m)^{-2}$, and was used to define normal weight ($18.5 < BMI < 24.9$ kg.m^{-2}), overweight ($25 < BMI < 29.9$ kg.m^{-2}) and obesity (BMI ≥ 30 kg.m^{-2}) (Cole *et al*., 2000). Body fat percentage was calculated by a prediction equation specific for adult male (Womersley and Durnin, 1977). Waist to hip ratio (WHR) and waist to height ratio (WHtR) were calculated, respectively, as the ratio of waist in cm / hip in cm, and waist in cm / height in cm, and were used to define abdominal obesity. Excess abdominal fat distribution is indicated by a WHR greater than 0.9, and a WHtR cut-off point of >0.50 is used to define persons "at risk" of cardiovascular diseases. (Al-Hazzaa *et al*., 2012) .

Habitual physical activity

Habitual physical activity was tracked using an Omron HJ-323U pedometer (PLCEUROPE LTD, England). Each participant was given one of these devices to carry it in his pocket or wears it clipped to his waistband. The Omron HJ-323U is a silent tri-axis accelerometer with ~3 inches long, and ~1.5 inches wide. It automatically measures motion patterns to determine the number of steps, distance, duration, aerobic steps, active calories burned, and pitch (steps per minute). For the present study we studied only the average day steps, the average weekday steps (from Saturday to Thursday), and the average weekend steps (Friday and Sunday). Each participant was asked to reset the pedometer every morning before leaving his bed, and to remove it only for sleeping or for bathing. He was also instructed to

record times when the device was not worn, download results via the built-in USB stick to a personal laptop, and store the daily data graphs online on the OmronFitness.com Dashboard.

Dietary behaviours

A written questionnaire regarding daily intake of food in general and fast food in particular was developed for this survey. It was developed specifically to this study, using previously published findings as well as questions about dietary information in general and fast food in particular, perceptions of nutrition facts of fast food and its influence on health, and nutrition and health considerations when selecting fast foods (Kim *et al*., 2004; Ji-young *et al*., 2008; Al-Hazzaa *et al*., 2012). The student survey included diverse items derived from previous studies and items written specifically for the study. It consisted of questions reporting to the type and regularity of meals, frequency of eating at fast food restaurants, fast food preferences, amount of fast food per meal, amount of intake per serving, methods for ordering, nutritional knowledge about fast food, purpose of using fast food restaurants, perceptions of fast food influence on health and nutrition, nutrition and health consideration when selecting fast foods, fast food nutrition information needs, fast food nutrition information accessibility, dietary information provider, and channels for nutrition information about fast foods.

Before administering the survey questionnaire, validity and reliability were established by a team of experts in life sciences, and using a pilot study carried out on 40 students not included in the sample (ten from each college). Some adjustments were made to the instrument in the light of the pretest to make the language less confused and more clearly comprehensible, and the questionnaire has a reliability of 0.82.

Statistical analyses:

All statistical analyses were conducted with SPSS 17.0. Results are presented as mean±SD. Simple statistics such as

frequencies and percentages were used, and 95 % confidence interval for the prevalence of overweight and obesity were calculated. Questionnaire reliability was estabilished using the Cronbach's alpha. Comparison of differences was performed using chi-square test and ANOVA. A Pearson correlation test was conducted to examine the relationships between the level of physical activity, the food consumptions and the body compositions. P<0.05 was designated as the level of significance.

RESULTS
Anthropometry and lifestyle
The data indicates that among the 290 students tested 179 subjects (0.6172, CI: 0.5601-0.6713) were normalweight, 73

subjects (0.2517, CI: 0.2052-0.3047) were overweight, and 38 subjects (0.131, CI: 0.097-0.1747) were obese. Anthropometric and lifestyle-related variables for each group are presented in Table 1. The ANOVA test noted significant differences in BW, BMI, WC, HC, WHR, WHtR, BF, and the weekly frequency of sugar-sweetened beverages between all groups. A significant difference was also noted in NWS vs. OS in vegetables (p<0.05) and fruits consumption (p<0.05), in OS vs. the other two groups in the frequency of eating French fries/potato chips (p<0.01for NWS and p<0.05 for OWS), and in NWS compared to OWS and OS in the weekly frequency of sweets consumption (P<0.05 for all). No significant differences were noted in the other parameters.

Table 1: anthropometric and lifestyle-related variables among King Faisal University students stratified by BMI categories.

	Normal weight students (n=179)	Over weight students (n=73)	Obese students (n=38)
Age (years)	21.3±1.3	21±2.4	21.8±2.7
Height (cm)	174.8±10.3	175.65±7.5	176.1±5.7
Body Weight (kg)	74.83±6.29 ♣	90.9±8.3 ††	119.85±16.9 ***
Body Mass Index (kg/m^2)	22.07±2.68♣	27.8±1.62 †	35.98±4.12 **
Waist Circumference (cm)	73.21±5.33♣	94.54±4.27 ††	112.32±8.7
Hip Circumference (cm)	93.14±7.65 ♣♣	106.5 ± 3.2 ††	122.9 ± 7.2 ***
Waist to hip Ratio	0.74±0.16 ♣	0.81±0.23 †	0.93±0.32 ***
waist to height ratio	0.42±0.04 ♣	0.51±0.07 ††	0.64±0.05 ***
Body Fat (%)	19.58±4.69 ♣	27.14±2.66 †	34.35±2.63 **
Average day steps (steps/day)	81402567±	71551123±†	4823959± **
Average weekday steps (steps/day)	78982574± ♣	62841573± β†	51901411± **
Average weekend steps (steps/day)	89192888±	82332100±††	4338943± **
Breakfast consumption (times/week)	3.82 ± 2.17	3.65 ± 2.7	3.89 ± 2.8
Vegetables Consumption (times/week)	8.98 ± 3.98	7.79 ± 4.6	4.88 ± 4.4 *
Fruits Consumption (times/week)	9.65 ± 4.1	9.37 ± 4.3	4.95 ± 3.3 *
Milk/dairy products intake (times/week)	8.03 ± 3.4	7.53 ± 4.4	7.98 ± 4.4
Sugar-sweetened drinks (times/week)	5.12 ± 3.3 ♣	7.87 ± 2.3 †	11.8 ± 4.3 **
French fries/potato chips (times/week)	4.36 ± 2.0 ‡‡	5.06 ± 3.1	6.66 ± 2.7†
Cake/donuts (times/week)	3.52 ± 2.2	3.84 ± 2.7	4.12 ± 3.7
Sweets (times/week)	5.08 ± 2.3‡	8.08 ± 3.3	9.68 ± 5.7†
Energy drinks (times/week)	1.98 ± 1.4	2.42 ± 2.8	2.58 ± 2.4

Values are presented as mean ± SD.
♣ p<0.05, ♣♣p<0.01: Normal vs Over weight
*p<0.05, **p<0.01 ***p<0.001: Normal vs Obese
†p<0.05, ††p<0.01, †††p<0.001: Over weight vs Obese
β <0.05different to the Average weekend steps.

Data regarding daily physical activity showed also a significant difference between OS and the other two groups in average day (OWS: $p<0.05$; NWS: $p<0.01$), average weekday (OWS: $p<0.05$; NWS: $p<0.01$) and average weekend day steps ($p<0.01$ for both). No significant differences were recorded between the overweight and the normal weight students in the average day and the average weekend day steps. To illustrate graphically the differences in daily physical activity, means and standard error bars for average day, average weekday and average weekend steps are presented in Figure 1.
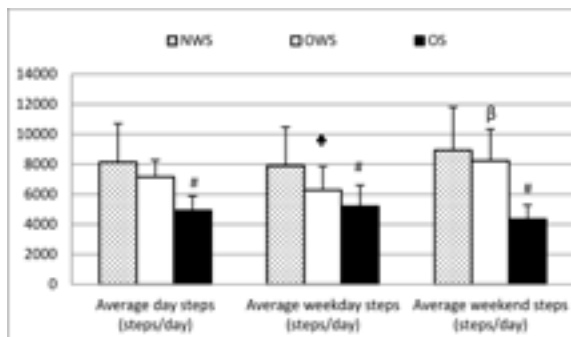

Figure 1: daily physical activity among King Faisal University students stratified by BMI categories. Values are presented as mean ± SD. # Differs significantly to the other two groups, ♣Differs significantly to the normal weight students group, β differs to the Average weekend steps.

Usage patterns of fast food restaurants

Results demonstrated that the majority of KFU students (65.178%) went to hamburger restaurants and 63.45% to chicken restaurants at least once a week (Table 2). Results for NWS, OWS and OS were respectively 62.01%, 71.23% and 68.42% for hamburger, and 54.75%, 75.34% and 81.58% for chicken. Significant differences were noted between groups in using chicken restaurants ($p<0.01$).

The purpose of using fast food restaurants noted also that most respondents used fast food restaurant as a place for social gatherings (50%) or eating (25.17%) or relaxing (12.76%). It was found also that 46.2% of respondents do not have regularly three meals a day although 73.8% of the respondents felt they had sufficient knowledge about nutrition. In the contrary, our results showed that King Faisal University students take into consideration the taste (51.03%), nutritional value (26.20%) and the improvement of health (33.45%) when choosing fast foods. The data demonstrated also that 69.3% of respondents agreed to that nutritional information must be available in fast foods restaurants, and they declared that this information do not always exist in these places. Even so, for this reason, 68.28% of KFU students used internet as a channel for nutrition information about fast food. Faculty members (23.45%), television (21.38%), parents (15.86%), dietitian (10.69%), and friends (10.34%) constitute also other important sources of information.

Table 2: usage patterns of fast food restaurants and its perceived influence on health and nutrition among King Faisal University students.

Respondents N (%)				
Items	Normal weight (n=179)	Overweight (n=73)	Obese (n=38)	Total
Frequency of hamburger restaurant use				
✓ Rarely	08	03	02	13
✓ 1/month	27	06	03	36
✓ 2/month	33	12	07	52
✓ 1/week	47	28	11	86
✓ ≥2/week	64	24	15	103
	$\chi^2= 10.363$		NS	

Table 2, cont.

Respondents N (%)				
Items	Normal weight (n=179)	Overweight (n=73)	Obese (n=38)	Total
Frequency of chicken restaurant use				
✓ Rarely	09	02	00	11
✓ 1/month	37	05	02	44
✓ 2/month	35	11	05	51
✓ 1/week	60	22	13	95
✓ ≥2/week	38	33	18	89
	χ^2= 26.67		p<0.01	
Purpose of using fast food restaurant				
✓ Hanging out with friends	85	33	27	145
✓ feeding	46	21	06	73
✓ spending free time	14	07	01	22
✓ relaxing	26	09	02	37
✓ others	08	03	02	13
	χ^2= 9.48		NS	
Regularity of meals				
✓ Regular	121	24	11	156
✓ Irregular	58	49	27	134
	χ^2= 36.01		p<0.001	
Fast foods considerations				
✓ nutritional values	49	16	11	76
✓ improvement of health	67	17	13	97
✓ pleasure	84	43	21	148
✓ others	13	12	17	42
	X^2= 26.932		p<0.001	
Availability of nutritional information in fast foods restaurants				
✓ agree	133	49	19	201
✓ disagree	14	16	12	42
✓ Neither agree nor disagree	32	08	07	47
	χ^2= 20.341		p<0.001	
Fast food preference				
✓ Like	48	41	06	115
✓ Neither like nor dislike	49	14	07	70
✓ Dislike	82	18	05	105
	χ^2=35.247		p<0.001	
Amount of fast food per meal				
✓ Inadequate	103	34	32	169
✓ Neither adequate nor adequate	47	17	04	68
✓ Adequate	29	22	02	53
	χ^2= 18.989		p<0.001	

Table 2, cont.

Respondents N (%)				
Items	Normal weight (n=179)	Overweight (n=73)	Obese (n=38)	Total
Amount of intake per serving				
✓ Sufficient for a meal	102	17	06	125
✓ Sufficient for a snack	56	29	11	96
✓ Just the value of a beverage	21	27	21	69
$\chi^2=54.672$ p<0.001				
Method for ordering				
✓ Set menu	97	43	22	162
✓ Item by item	82	30	16	128
$\chi^2= 0.541$ NS				
Dietary information provider				
✓ Self-provider	77	17	13	107
✓ Parents	27	12	07	46
✓ Friends	19	08	03	30
✓ Others	04	03	02	09
✓ faculty members	39	24	04	67
✓ Dietitian	13	09	09	31
$\chi^2= 21.207$ p<0.01				
Channels for nutrition information about fast food				
✓ Television	41	15	06	62
✓ Internet	117	52	29	198
✓ fast food restaurants	04	02	01	07
✓ magazine/newspaper	03	04	00	07
✓ leaflet from health workshops	10	00	01	11
✓ bulletin board in college cafeteria	04	00	01	05
$\chi^2=11.808$ NS				

DISCUSSION

In this work, we studied the relationship between several lifestyle factors and weight gone among KFU students, who were randomly selected from 04 different colleges (Education, Arts, Sciences and Veterinary Medicine). The main findings of this cross sectional study are that KFU students have higher odds of being overweight or obese. Data revealed that the prevalence of overweight and obese students was 38.27% with 13.1% obese and 26.9% overweight amongst the 290 participants. A similar study conducted at King Saud University by Al-Turki (2007) on a randomly sample of 701 male students aged 21.7 years, noted a prevalence of overweight/obesity of 54% with 31% overweight and 23.3% obese. In addition, a cross-sectional household survey conducted by Al-Nuaim (1997) on 13177 Saudi individuals aged 15 years and over, noted that overweight/obesity is more important in females than males. Values were 51% and 45%, respectively. Furthermore, a recent study carried out by Al-Nuaim et al. (2012) including 663 males aged 17.08±1.10

years from Al-hasa Governorate revealed a combined prevalence of overweight and obesity of 35.9% with 19.1% obese and 16.8% overweight individuals. A more recent study exploring the similarities and differences in overweight/obesity, dietary habits, and daily physical activity among 572 youth males from Central England (UK) and 580 youth males from Al-hasa reported a combined prevalence of overweight and obesity of 23.8% and 36.4%, respectively (Al-Nakeeb *et al.*, 2014). This study indicates also that youth from Al-hasa had a lower level of physical activity and follow bad dietary habits than youth from Central England. Additionally, quoting from World Health Organization statistics, Al-Abdulkarim (2014), vice president of Health Affairs in the Ministry of National Saudi Guard, said that nearly 60% of the population aged over 16 years was overweight or obese, placing the country in the 29th position among 194 countries worldwide. In the Gulf Co-operation Council States, Kuwait had the highest proportion of obese adults with 42.8 percent, followed by Saudi Arabia with 35.2%. In the UAE, 33.7% of the population suffering from serious problem of fatness, while in Qatar it was 33.1%, Bahrain 32.6%, and Oman 22.1% (Ng *et al.*, 2011).

All data cited above affirmed that King Faisal University students are less obese than all other Saudi sub-populations. Our data indicate also that these subjects had higher odds of being obese if they are engaged in a daily physical activity lesser than 5000 steps/day, consumed vegetables and fruits lesser than five times/week, and used sugar-sweetened drinks and French fries/potato chips more than five times/week.

The finding that body weight was negatively correlated to the level of daily physical activity ($r = -0.117, p < 0.05$) highlights the important role that physical activity plays in preventing obesity. This confirms also the growing evidence noting that physical inactivity is a mean factor leading to obesity among youth individuals (Sahoo *et al.*, 2015). Based on many available evidence, Tudor-

Locke *et al.* (2013) determine 05 indices to classify pedometer-determined physical activity in healthy adults: (i) sedentary (less than 5000 steps/day); (ii) low active (5000 - 7499 steps/day); (iii) somewhat active (7500-9999 steps/day); (iv) active (10 000 - 12499 steps/day); and highly active (≥12 500 steps/day). According to these indices, most of KFU students were sedentary or low active. The low levels of daily physical activity might be due to a number of environmental factors. Firstly, the harsh desert climate, which characterizes Al-Hasa region, is not favorable to sports practice and physical activity for a long period of the year. The lack of parks, sports grounds, and appropriate facilities for exercise in these locations also aggravates the situation. Moreover, a number of social norms, cultural attitudes and beliefs are less favorable to youth engagement in sportive activities that claim a particular clothing different than other communities (Al-Nuaim *et al.*, 2012).

It is surprising that this study reported no significant difference in the daily physical activity between normal and overweight group, overweight subjects were less active than normal weight-individuals only during the weekdays. These findings are in line with those of LeCheminant *et al.* (2009) suggesting that the relative energy expenditure ($kg^{-1}.min^{-1}$) and the movement economy ($kg^{-1}.min^{-1}.km^{-1}$) of walk and jog were similar in normal weight and overweight/obese individuals. Our data coincides also with statements of current public health guidelines' indicating that healthy adults typically take between 4000 and 18000 steps/day, and that 7000-8000steps/day is the minimal amounts of moderate-to-vigorous physical activity accumulated in the course of monitored free-living behavior (Tudor-Locke *et al.*, 2011). Aggregated reference values for steps/day indicate also that healthy adults should walk at least in average 10000 steps/day, exercise and sports training were considered as part of the habitual activity (McCormack *et al.*, 2003). Thus, it is essential that overweight and obese individuals be informed about the

characteristics of the most effective physical activity. Specialists in health care must provide also specific activity suggestions that might promote the long-term participation in physical activities. Nevertheless, Satija *et al.* (2013) affirmed that the promotion of health could not be established by physical exercise alone, dietary patterns of individuals play a crucial role in the weight gain and maintenance. Al-Hazzaa *et al.* (2012) noted that overweight and obesity status was significantly associated with less frequent sugar-sweetened drinks, and vegetable consumption. These suggestions were in line with our findings noting a significant association between vegetables consumption ($r= -0.152$, $p<0.01$), sugar-sweetened drinks ($r=0.118$, $p<0.05$), French fries/potato chips intake ($r=0.114$, $p<0.05$), and body weight. According to WHO's recommendations (2004), the promotion of health depends on increasing vegetable consumption, and reducing the intake of free sugars and fats. Moreover, a recent systematic review on weight gain and the role of vegetables intake showed a significant association between vegetables consumption, and the reduction of adiposity among overweight or obese adults (Ledoux *et al.*, 2011).

Relevant studies noted also that dietary behaviors, such as regularity of meals, fast food use, and the knowledge about fast food nutrition and its application, play an important role in creating an obesogenic environment (Ji-young *et al.*, 2008). In Saudi Arabia, the personal income and the dietary behaviors have been changed enormously over the past decades. The use of animal products, refined sugar, and western calorie-dense fast foods has increased while the intake of fruit and vegetables has decreased (Al-Hazzaa *et al.*, 2012). Our results noted that most overweight and obese KFU students do not have regularly three meals a day, and they used fast food restaurants at least once a week. The purpose of using fast foods included social gatherings, eating, and relaxing. This disagrees with the findings of several studies noting that taste and quick service were the main factors for

choosing fast food restaurants among youth (Al-Hazzaa *et al.*, 2012).

This is surprising because our data demonstrated that most respondents reported having above average knowledge about dietary behaviours and perceived nutrition values of fast foods. Results demonstrated also that most respondents were satisfied with the accessibility to fast food information. This implies that there is a gap between theoretical knowledge related to healthy nutritional behaviours and the implementation of such knowledge by KFU students in their daily food behaviour. These findings were consistent with those of French *et al.* (2001) and Al-Hazzaa *et al.* (2012) in which they noted that perceived benefits of healthy eating were not associated with the use of fast food restaurants. A nutrition education that reports the necessity to enforce the theoretical knowledge is so very necessary.

Data of the present study should be interpreted in light of some limits. The main limitation was the potential existence of bias along the measurement of daily physical activity and dietary habits. In fact, according to Karasu (2013) much of the collected data relies on a subject's recall, which can be sometimes inaccurate. Moreover, subjects can be embarrassed by their behaviours, especially about food consumption, which may be influenced by a poor memory or a lack of awareness regarding some specific food items and the consumed amounts. Another limitation deserves our attention is the accurate measurement of physical activity and energy expenditure. The pedometer determines only the number of steps/day, and cannot directly measures type, onset, duration, intensity, and capturing the fundamental nature of physical activity (Maffiuletti *et al.*, 2008; Benedetti *et al.*, 2009). Longitudinal studies investigating other variables influencing weight gain are needed to further our understanding of the etiology of obesity in KFU students. Comparisons of male and female KFU students with that of other Saudi universities would yield also valuable information about

weight loss and its maintenance.

In summary, this study revealed that the prevalence of overweight and obesity among KFU students was 38.27% with 13.1% obese and 26.9% overweight. Results demonstrated also that respondents had higher odds of being obese if they are engaged in a daily physical activity lesser than 5000 steps/day, consumed vegetables and fruits less than five times/week, and used sugar-sweetened drinks and French fries/potato chips more than five times/week. Compared to other studies conducted on Saudi sub-groups, our population presented the lowest score. This could be due to the importance of the dissipated courses related to health and fitness to all KFU students. Nevertheless, a specific program may be proposed to implement the theoretical knowledge, including limiting the use of fast foods and sugar-sweetened drinks, and increasing vegetables consumption, and daily physical activity greater than 7000 steps / day for all subjects.

CONFLICT OF INTERESTS

The author has no conflicts of interests that are directly relevant to the content of this paper.

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النشاط البدني والسلوكيات الغذائية كعوامل مساهمة في زيادة الوزن
لدى طلاب جامعة الملك فيصل : دراسة تجريبية

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الملخص

تزيد السمنة في احتمالية تعرض الشخص إلى العديد من الأمراض المزمنة كأمراض القلب والشرايين، والسكري من النوع الثاني، والفصال العظمي، وصعوبة التنفس أثناء النوم ، بالإضافة إلى عدة أنواع من السرطانات. ومن أهم الأسباب المؤدية إلى السمنة نجد مزيجا من السعرات الحرارية الزائدة عن الحاجة اليومية، مع النمط الحياتي السكوني والتأثيرات الجينية. تهدف هذه الدراسة إلى تحديد النشاط البدني والسلوكيات الغذائية اليومية لدى طلاب جامعة الملك فيصل وإبراز الدور الذي يؤديانه في تحصيل الوزن الزائد. شملت التجربة 290 طالبا ينتمون لأربع كليات في جامعة الملك فيصل عن طريق عينة عشوائية منتظمة من 1120 طالبًا مسجلين في مقرر «الصحة واللياقة» أحد المتطلبات الإجبارية للجامعة. تم قياس الخصائص الجسمية لكل فرد من العينة وكذلك النشاط البدني اليومي بواسطة عداد الخطى، كما تم تحديد السلوكيات الغذائية بواسطة استبانة تم التحقق من صدقها وثباتها سلفا. بينت النتائج أن مجموع الطلاب الذين يعانون من الوزن الزائد من بين الأشخاص الذين شملتهم التجربة يبلغ 38.27 % (13.1 % سمان و26.9 % ذوي وزن زائد)، وتشير البيانات إلى أن احتمال الإصابة بالسمنة يكون أعلى متى كان النشاط البدني اليومي أقل من 5000 خطوة/ يوم، وتناول الخضر والفواكه أقل من خمس مرات/ الأسبوع، واستهلاك المشروبات المحلاة بالسكر والبطاطس المحمرة أكثر من خمس مرات/ أسبوع. هذا ومقارنة بنتائج بعض البحوث المماثلة، تعد نسبة الأشخاص الذين يعانون من زيادة الوزن أو السمنة في جامعة الملك فيصل حدة من بين عدة مناطق بالمملكة العربية السعودية. ومع ذلك، يمكن اقتراح برنامج يعنى بالجانب التطبيقي للمعرفة النظرية التي يتلقاها الطالب، بما في ذلك الحد من استخدام الأطعمة السريعة والمشروبات المحلاة بالسكر وزيادة استهلاك الخضروات والنشاط البدني اليومي.

الكلمات المفتاحية: طلاب جامعة الملك فيصل، النشاط البدني اليومي، السلوكيات الغذائية، السمنة، التركيب الجسماني.