Gender differences in weight status, dietary habits, and health attitudes among college students in Kuwait: A cross-sectional study

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Abstract

Background: A better understanding of the factors involved in health and wellness among college students can aid in the design of interventions that can reduce the rate of weight gain during young adulthood. **Aim:** The aim of this study was to determine the gender differences in weight status, dietary habits, and health attitudes in a sample of college students at Kuwait University (KU). **Methods:** In this cross-sectional study, 615 students were recruited from KU between November 2013 and March 2014. Components of the study included a self-report questionnaire, assessment of body mass index, and calculation of Healthy Eating Score (HES) to assess eating habits and attitudes. Statistical analyses were performed to assess the gender differences among these domains. **Results:** The findings revealed that a greater proportion of men were overweight and obese compared to women (28.7% and 23.8% vs. 19.9% and 12.1%, respectively). Both genders show equally unhealthy dietary habits, marked by low mean HES scores. Gender-specific dietary patterns were noted, with more men reporting eating >6 oz (168 g) of animal protein per day as compared to women (48.4% vs. 28.9%, $p < 0.001$). A higher proportion of female students reported regular consumption of potato chips and fatty salty snacks (51.3% and 40.4%, respectively, $p = 0.12$) and that they ate sweets more than twice a day (52.5% and 39.9%, respectively, $p = 0.041$). **Conclusions:** Our findings highlight the need for evidence-based gender-specific strategies to reduce the number of overweight and obese college students and promote healthy dietary habits and eating attitudes among this population.

Keywords

College students, obesity, overweight, eating habits, healthy eating score

Introduction

The attitudes and behaviors towards eating while in college can profoundly influence adult lifestyle habits and influence future risk of obesity and related comorbidities such as diabetes and heart disease (Desai et al., 2008). College students face many challenges that may encourage unhealthy eating habits, which can lead to weight gain. They are frequently exposed to unhealthy foods, such as high-caloric snacks and fast foods, have a lower consumption of fruits and vegetables, and often skip meals (Driskell et al., 2006). Due to the nutritional transition that is affecting Kuwait and the Middle East region, unhealthy dietary habits are among the major risk factors for obesity and related chronic diseases (Hwalla et al., 2016; Ng et al., 2011). Diet quality and eating behaviors are undesirably influenced by changing environmental factors, which can lead to increasing rates of over-weightness and obesity, and to increased metabolic risk

factors among all age groups (Hwalla et al., 2016; Salameh et al., 2014).

Several studies performed in Kuwait indicated that over half of college students are either obese or overweight (Al-Isa, 1998, 1999a, 1999b; Musaiger et al., 2016). Studies that assessed the prevalence of obesity among college students reported variations in obesity prevalence rates between genders (Al-Isa, 1998, 1999a). However, studies have been contradictory in their findings in that both high and low obesity prevalence was noted among female versus male college students (Al-Isa, 1998, 1999a).

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Al-Issa et al. showed that male students were more obese and overweight than female students, even though male students significantly exceeded female students in the engagement of physical activity (Al-Isa et al., 2011). In addition to being less active, female students were found to be more stressed, with their food selections being more influenced by stress when compared to males (Ahmed et al., 2014). Stressed female college students in Kuwait were more likely to select unhealthy snacks that have high sugar and fat content and were more likely to drink greater amounts of beverages versus their male counterparts (Ahmed et al., 2014). Several recent investigations also showed that a high prevalence of disordered eating attitudes among male and female Kuwaiti college students was associated with a high prevalence of obesity (AlKazemi et al., 2018; Musaiger et al., 2016). Based on their distorted body-weight perceptions, most college women reported using dieting and food control behaviors to achieve their desired body image regardless of their weight status (AlKazemi et al., 2018). These observations are in line with several studies that have demonstrated gender differences in eating attitudes, dietary habits, and weight status in college students in many parts of Arabia and worldwide (Khalaf et al., 2015; Desai et al., 2008; Driskell et al., 2006; Salameh et al., 2014; Yahia et al., 2008).

Gender-specific attitudes and behaviors towards eating are often reflected by the food intake pattern. For example, compared to men, women generally tend to gravitate towards healthier food choices and are more concerned with maintaining healthy eating behaviors to stay in good physical shape (Beardsworth et al., 2002; Bellows et al., 2010; Malinauskas et al., 2006; Skoyen et al., 2013). Consumption of red meat and larger portions are often associated with masculinity, while vegetables, fruit, fish, and dairy products such as yogurt and cottage cheese are associated with femininity (Arganini et al., 2012; Vartanian, 2015). Compared to men, women engage in health-promoting behaviors and have healthier lifestyle patterns than men. Even if men are aware of "healthy eating guidelines," they often show skepticism and lack of interest towards nutrition education messages, and frequently perceive healthy eating as monotonous and unsatisfying (Arganini et al., 2012). Regarding eating habits in general, women are more aware of diet and the implications of the health–diet relationship, and embrace suggested dietary changes to a greater degree than men. Women also show higher dietary restraint and disinhibition levels than men (Leblanc et al., 2015). It is widely recognized that gender differences in dietary intake and dietary behavior exist; however, the differences are not well characterized in Kuwait.

Gender differences in biochemistry and physiology can result in a specific capacity to relate to and cope with environmental challenges (Arganini et al., 2012). However, gender roles, independent of biological sex, have been shown to affect health (Vafaei et al., 2014). Additionally, unlike biological sex, gender norms can be changed by educational approaches that promote healthy eating (Hosokawa et al., 2016). It is important to consider gender norms when addressing nutritional issues in research and in the formulation of suitable interventional and monitoring programs for college students (Gale-Ross et al., 2009). Better understanding of the factors involved in health and wellness among college students can aid in the design of interventions aimed at reducing the rate of weight gain during young adulthood (Desai et al., 2008). Such approaches could prevent the long-term health consequences of obesity, which include dyslipidemia, hypertension, sleeping problems, disordered eating attitudes, anxiety disorders, and depression.

To date, there is no comprehensive study that has assessed the dietary habits of college students in Kuwait; the issue of gender differences in terms of weight status, dietary habits, or health attitudes has also not been addressed among college students at Kuwait University (KU). The purpose of the present study was to assess the impact of gender differences on students' weight status, dietary habits, and health attitudes at KU. Information gained from this study will allow for the identification of health-related problems among these college students and allow for the tailoring of health education programs to address these problems.

Methods

Design and sample

This study was cross-sectional and included a convenience sample of students at KU. Data collection occurred between the end of November 2013 and the end of March 2014.

Data collection

Participants were recruited from 14 KU colleges. Recruitment was performed by research assistants and students. During recruitment, the purpose of the study and the questionnaire's content was explained in person. Students provided their verbal informed-consent before participating in the study. A newly developed questionnaire specific to this population was used to collect the research data. We modeled this questionnaire after many available online validated tools (Segal-Isaacson et al., 2004). Using this questionnaire, a pre-test was conducted with a small sample of students who were excluded from the final study sample. The questionnaire comprised three domains. The first domain included demographic data, such as gender, age group, college affiliation, nationality, total family income, and marital status. The second domain assessed health attitudes and included personalized questions related to weight, height, weight perceptions, readiness, and commitment to changes toward healthier lifestyle behaviors. The third domain assessed the students' dietary habits and aimed to identify daily dietary habits that could contribute

to better health. As it was not included in this investigation's objectives, key nutrients were not measured precisely from the questionnaire.

Measurements and definitions

Body mass index (BMI) was calculated using self-reported height and weight. Based on standard adult criteria, BMI was divided into four categories (underweight, normal weight, overweight, and obese) as described previously by Kuczmarski et al. (1997). Accordingly, underweight was classified as a BMI <18.5 kg/m^2, normal weight as a BMI of 18.5–24.9 kg/m^2, overweight as a BMI of 25–29.9 kg/m^2, and obesity as a BMI $\geq$30 kg/m^2.

The Healthy Eating Score (HES) developed in the present study was adopted from the previously validated Healthy Eating Index (HEI), which has been used as a scoring system to assess and monitor adherence to dietary guidelines (Al-Rethaiaa et al., 2010; Kennedy et al., 1995). The HEI provides an assessment for the intake of grains, vegetables, fruits, milk and dairy products, and meats, which receive a score of 0–10 per the number of servings consumed from each food group. Diet variety and intake of specific nutrients including total fat, saturated fat, cholesterol, and sodium are scored from 0 to 10 points. This tool has also been used to describe both the quality and variety of complex diets and can identify adult men and women who are at risk of diet-related chronic diseases (Guenther et al., 2014). For the present study, the HEI was modified to address the dietary issues of college students, and its nutrient-centered approach was replaced with food items that assessed the dietary habits of this population. Thus, to derive the HES scores, the components of fat, cholesterol, and sodium were replaced with corresponding food items that are a rich source of those dietary constituents (i.e. snack foods, processed meats, fried foods, animal fat, margarine, and butter). Diet quality was assessed by providing (a) greater credit for the consumption of whole grains rather than total grain consumption; (b) less credit for the consumption of higher-fat dairy foods; (c) more credit for the consumption of fish, poultry, beans, tofu, and nuts as opposed to red meat; and (d) less credit for the consumption of soda and drinks that replace healthier beverages. Higher scores were also assigned for healthy behaviors such as eating breakfast and taking multivitamins regularly. Previous studies that have used similar dietary habit-centered scoring approaches have found strong correlations between their scores and HEI (Schwingshackl and Hoffmann, 2015). Based on the above dietary habit components, an HES was calculated for each participant. Each answer scored the participants' dietary eating habits on a scale of +3 (best) to 0 (worst). As no regionally based dietary guidelines were available, scoring was based on the 2015 Dietary Guidelines for Americans provided by the Recommended Dietary Allowances of the US Department of Agriculture. The HES was calculated as the total score of all dietary habits, wherein diet quality increases with an increasing score. A pilot study that was performed to measure the HES reliability showed a Cronbach's coefficient α of 0.74, which supports the reliability of the HES total score as an indicator of overall diet quality. Completed questionnaires were reviewed and coded for statistical analysis.

Statistical analysis

Statistical analyses were performed using the Statistical Package for Social Sciences software, version 24 (IBM SPSS, Chicago, IL, USA). Parametric variables were analyzed using Student's t-tests and analysis of variance (ANOVA) to examine the differences in the anthropometric characteristics of students. Results were expressed as means $\pm$ standard deviations (SD). Chi-square analyses were conducted for non-parametric variables to examine the differences in sociodemographic characteristics, eating habits, health attitudes, and behaviors. Results were expressed as total number (n) and proportions (%). All reported p-values were two-sided tests and were compared to a significance level of 5%; differences were considered statistically significant at $p < 0.05$.

Results

The socio-demographic characteristics of the study participants are presented in Table 1, and the anthropometrics in Table 2. A total of 615 students (31.4% male and 68.6% female), with a mean age of 21.57 $\pm$ 1.99 years, participated in this study. Male students were slightly older than female students (21.90 $\pm$ 2.09 vs. 21.42 $\pm$ 1.92, $p = 0.008$).

Weight status based on BMI categories

The mean reported weight and height of the study participants were 67.52 $\pm$ 17.55 kg and 163.98 $\pm$ 10.28 cm, respectively (Table 2). The mean BMI was 25.02 $\pm$ 5.52, which is indicative of the overweight category, per the definition of the US Centers for Disease Control. The prevalence for overweight students and obese students was 22.7% and 15.7%, respectively. The majority of the students (56.7%) were normal weight (44.8% for male students and 62.2% for female students), as indicated in Table 2. Based on BMI classification, the prevalence of overweight and obesity was more common among male students compared to female students (28.7% and 23.8% vs. 19.9% and 12.1%, respectively). In contrast, 5.8% female students were underweight as compared to 2.8% male students.

Exercise, smoking status, and supplement use

Descriptive data on exercise behavior (Table 3) showed that a greater proportion of male students engage in exercise compared to female students (75.5% vs. 47.1%, $p < 0.001$). Regarding duration of exercise and frequency,

Table 1. Socio-demographic characteristics of KU students.

Characteristic	n	%
Sex		
Male	193	31.4
Female	422	68.6
Total family income in Kuwaiti dinars (per month)		
<1000	126	20.6
1001–2500	285	46.6
2501–4000	129	21.1
>4001	71	11.7
Nationality		
Kuwaiti	514	83.8
Non-Kuwaiti	99	16.2
Marital status		
Married	81	13.2
Single	534	86.8
KU college		
Law	52	8.5
Arts	75	12.2
Science[a]	31	5.0
Medicine[a]	88	14.3
Engineering and Petroleum	57	9.3
Education	86	14
Sharia and Islamic Studies	20	3.3
Business Administration	46	7.5
Pharmacy[a]	16	2.6
Dentistry[a]	18	2.9
Social Sciences	51	8.3
Life Sciences[a]	33	5.4
Architecture	30	4.9
Computer Science and Engineering	12	2.0

[a]Mean difference between groups significant at p < .05.

61.6% female students who exercised engaged in a <30-min session of exercise, and 73% female students exercised less than three times per week. In contrast, 35.7% male students engaged in a <30-min session, and 51.7% male students exercised less than three times per week. Male students felt a greater satisfaction level about their physical activity level, as 74.1% male students reported being able to get enough physical activity that they felt was appropriate for their health, whereas only 52.1% female students reported the same ($p < 0.01$). Regarding supplement use, 32.3% of all students reported using supplements, with no difference in use between genders; however, differences were noted in terms of the type of supplements used by each gender. Male students used sports-related performance-enhancing and muscle-bulking supplements, whereas female students used weight-loss aids, multivitamin tablets, iron, folic acid, omega-3 fatty acids, vitamin D, calcium, and hair- and nail-strengthening supplements. More male students reported being smokers as compared to female students (32.4% vs. 1.0%, $p < 0.001$).

Dietary habits and attitudes

The dietary habits for an average week are summarized in Table 4. More than one-third of students (35%) reported

often skipping breakfast, and 16% students reported eating four or more meals from sit-down or take-out restaurants.

In addition, 50% of the students reported that they do not eat as nutritiously as they feel is appropriate for their health (Table 5). In terms of food-group intake, the consumption of less than two servings a day of wholegrain or high-fiber products, whole fruits, vegetables, and milk or dairy products was reported as 24.3%, 26.6%, 24.7%, and 30.4%, respectively. No difference in the servings of these food groups was noted between genders. However, more male students reported eating >6 oz (or 168 g) of meat, chicken, turkey, or fish per day compared to female students (48.4% vs. 28.88%, $p < 0.001$). In addition, more male students reported drinking 330 ml or more of sugary drinks (32.4% vs. 24%, $p = 0.019$). A higher proportion of female students reported eating potato chips and fatty salty snacks (51.3% vs. 40.4%, $p = 0.12$) and eating sweets, such as cakes, chocolates, and candies, more than twice a day (52.5% vs. 39.9%, $p = 0.041$). An equal proportion of both genders reported consuming processed meats (male students = 29.8%, female students = 25%) and fried foods (male students = 54.3%, female students = 50.0%). More than half of all study participants reported that they usually added sugar to their tea or coffee (male students = 58.5%, female students = 59.3%), and more than one-third of all study participants reported adding salt to their food at the table (male students = 35.6%, female students = 37.7%). More female students usually felt good enough to shop or cook compared to male students (32.6% vs. 29.3%, $p = 0.001$). Most students (95.7%) agreed that good nutrition and regular physical activity can contribute to better productivity.

The maximum possible HES that a student could earn was 54 points. The mean score for all participants was 30.99 ± 5.72, with no difference between males and females (31.02 ± 5.31 vs. 30.97 ± 5.90, $p > 0.05$). Similarly, no differences were observed among participants when categorized by their weight status, nationality, or college type (data not shown).

Discussion

To our knowledge, this is the first study to examine gender differences in weight status, dietary habits, and health attitudes among college students at KU. This study revealed that more than one-third of the students were above the average body weight, 22.7% students were overweight, and 15.7% students were obese. In the current study, the overweight and obese participants were underrepresented in our population compared to other studies. On the national level, Ng et al. (2011) showed that 58.6% women and 43.4% men were obese, among the adult population aged ≥20 years. Allafi et al. (2014) reported that, among female adolescents aged 15–18 years, the prevalence rates of overweight and obesity were 20.8% and 20.6%, respectively. Almajed et al. (2011) examined a sample of 169 female college students aged 18–24 years

Table 2. Age, weights, heights, and calculated BMI of KU students.

Characteristic	Males (n = 193)	Females (n = 422)	Total (N = 615)	p-value
	Mean ± SD			
Age (years)	21.90 ± 2.09[a]	21.42 ± 1.92[a]	21.57 ± 1.99	0 .008
Weight (kg)	81.07 ± 19.42[a]	61.35 ± 12.48[a]	67.52 ± 17.55	<0.001
Height (cm)	174.33 ± 7.13[a]	159.25 ± 7.57[a]	163.98 ± 10.21	<0.001
BMI, weight (kg)/height (m^2)	26.71 ± 6.13[a]	24.25 ± 5.04[a]	25.02 ± 5.52	<0.001
BMI category	n (%)			p
Underweight	5 (2.8)[a]	23 (5.8)[a]	28 (4.8)	<0.001
Normal weight	81 (44.8)[a]	247 (62.2)[a]	328 (56.7)	
Overweight	52 (28.7)[a]	79 (19.9)[a]	131 (22.7)	
Obese	43 (23.8)[a]	48 (12.1)[a]	91 (15.7)	

[a]Mean difference across columns significant at $p < 0.05$.
SD: Standard deviation: BMI: body mass index.

Table 3. Physical activity, smoking status, and supplement use of KU students.

Health-related habits domains		Males (n = 193)	Females (n = 422)	Total (N = 615)	p-value
Exercise	Yes	142 (75.5)[a]	197 (47.1)[a]	339 (55.9)	<0.001
	No	46 (24.5)	221 (52.9)	267 (44.1)	
Duration of exercise	<30 min	51 (35.7)[a]	122 (61.6)[a]	173 (50.3)	<0.001
	30–60 min	48 (33.6)	68 (34.3)	116 (34.0)	
	>60 min	44 (30.8)[a]	8 (4.0)[a]	52 (15.2)	
Frequency of exercise	<3 times per week	74 (51.7)[a]	146 (73.7)[a]	220 (64.5)	<0.001
	>3 times per week	69 (48.3)[a]	52 (26.3)[a]	121 (35.5)	
Take supplements	Yes	55 (29.3)	141 (33.7)	196 (32.3)	NS
	No	133 (70.7)	277 (66.3)	410 (67.7)	
Smoke or use tobacco products	Yes	61 (32.4)[a]	4 (1.0)[a]	65 (10.7)	<0.001
	No	127 (67.6)	416 (99.0)	543 (89.3)	

[a]Mean difference across columns significant at $p < 0.05$.
NS: not significant.

from the College of Basic Education in Kuwait from the beginning of March 2009 to mid-January 2010 and found that the prevalence rate of overweight and obesity was 33.5% and 15.9%, respectively. Earlier studies (surveys before the year 2000) among university students in Kuwait showed that the prevalence rate of overweight and obesity combined was 48% (Peltzer et al., 2014). Al-Isa et al. (2013) showed a lower prevalence of overweight and obesity among 304 female college students from KU, and that the rate of overweight and obesity combined was 23.03%. However, in this latter study, the date of data collection and colleges where recruitment occurred were not specified. Despite inherent limitations, our study provides recent data and is the first study to include multiple recruitment sites extending the 14 colleges at KU. However, the prevalence rates among college students are much lower than the nationally reported levels (Karageorgi et al., 2013). Male students were heavier than female students, in contrast to what was seen in older adults in a nationally representative Kuwaiti sample (Ng et al., 2011). However,

our observations agree with other studies that indicated a higher prevalence of overweight and obesity, based on either actual or self-report measurements, in male college students as compared to female college students (Al-Isa et al., 2011; Desai et al., 2008; Feskanich et al., 2004; Salameh et al., 2014; Segal-Isaacson et al., 2004).

Regarding weight status derived from calculated BMI, a comprehensive review on the accuracy of self-reported weight and height concluded that both sexes tend to over-report their height and under-report their weight, and, as a result, BMI is often underestimated. Connor Gorber et al. (2007) and Binkley et al. (2009) showed that among college students in the US, female students had significantly higher actual BMI scores compared to their self-reported BMI scores. Further analysis showed that the miscategorization of weight status in both genders depended on the students' physical-self-concept scores. From the existing literature, the general conclusion is that overweight and obese statuses assigned from BMI measures are generally underestimated when calculated from

Table 4. Habitual dietary assessment of KU students.

In an average week, how often do you...?	Category comparison	Males (n = 193) n (%)	Females (n = 422) n (%)	Total (N = 615) n (%)	p-value
Skip breakfast	Usually/often	66 (35.1)	147 (35.0)	213 (35.0)	NS
	Rarely/never	37 (19.7)	98 (23.3)	135 (22.2)	
Eat four or more meals from sit-down or take-out restaurants	Usually/often	39 (20.7)	58 (13.8)	97 (16.0)	NS
	Rarely/never	51 (27.1)	115 (27.4)	166 (27.3)	
Eat less than two servings of wholegrain products or high-fiber starches a day	Usually/often	47 (25)	101 (24.0)	148 (24.3)	NS
	Rarely/never	33 (17.6)	93 (22.1)	126 (20.7)	
Eat less than two servings of whole fruit a day	Usually/often	44 (23.4)	118 (28.1)	162 (26.6)	NS
	Rarely/never	48 (25.5)	98 (23.3)	146 (24.0)	
Eat less than two servings of vegetables a day	Usually/often	36 (19.1)	114 (27.1)	150 (24.7)	NS
	Rarely/never	48 (25.5)	84 (20)	132 (21.7)	
Eat or drink less than two servings of milk, yogurt, or cheese a day	Usually/often	52 (27.7)	133 (31.7)	185 (30.4)	NS
	Rarely/never	45 (23.9)	101 (24.0)	146 (24.0)	
Eat >6 oz or 168 g of meat, chicken, turkey, or fish per day	Usually/often	91 (48.4)	121 (28.8)	212 (34.9)	<0.001
	Rarely/never	24 (12.8)	87 (20.7)	111 (18.3)	
Eat two servings or more of oily fish, like salmon, tuna, or sardines	Usually/often	26 (3.8)	53 (12.6)	79 (13.0)	NS
	Rarely/never	60 (31.9)	149 (35.5)	209 (34.4)	
Use regularly processed meats, like bologna, salami, hot dog, roast beef, turkey, and cold cuts	Usually/often	56 (29.8)	105 (25.0)	161 (26.5)	NS
	Rarely/never	33 (17.6)	100 (23.8)	133 (21.9)	
Eat fried foods, such as fried chicken, fried fish, French fries	Usually/often	102 (54.3)	210 (50.0)	312 (51.3)	NS
	Rarely/never	20 (10.6)	50 (11.9)	70 (11.5)	
Snack on regular potato chips, nacho chips, corn chips, crackers, regular popcorn, or nuts	Usually/often	76 (40.4)	215 (51.3)	291 (47.9)	0.012
	Rarely/never	34 (18.1)	44 (10.5)	78 (12.9)	
Add butter, margarine, or oil to bread, potatoes, rice, or vegetables at the table	Usually/often	42 (22.3)	101 (24.0)	143 (23.5)	NS
	Rarely/never	61 (32.4)	105 (25.0)	166 (27.3)	
Have sweets, like cakes, cookies, pastries, donuts, muffins, chocolate, or candies, >2 times per day	Usually/often	75 (39.9)	220 (52.5)	295 (48.6)	0.041
	Rarely/never	33 (17.6)	59 (14.1)	92 (15.2)	
Drink ≥330 ml of non-diet soda, fruit drink/punch, Tang, Vimto, or Kool-Aid per day	Usually/often	61 (32.4)	101 (24.0)	162 (26.6)	0.019
	Rarely/never	50 (26.6)	124 (29.5)	174 (28.6)	
Usually take sugar in your tea or coffee	Usually/often	110 (58.5)	249 (59.3)	359 (59)	NS
	Rarely/never	26 (13.8)	54 (12.9)	80 (13.2)	
Add/sprinkle salt on your food at the table	Usually/often	67 (35.6)	158 (37.7)	225 (37.1)	NS
	Rarely/never	44 (23.4)	87 (20.8)	131 (21.6)	
You or a member of your family shops and cooks rather than eating sit-down or take-out restaurant food	Usually/often	63 (33.5)	161 (38.3)	224 (36.8)	NS
	Rarely/never	26 (13.8)	52 (12.4)	78 (12.8)	
Often feel good enough to shop or cook	Usually/often	55 (29.3)	17 (32.6)	192 (31.6)	0.001
	Rarely/never	43 (22.9)	64 (15.2)	107 (17.6)	
Healthy Eating Index	mean ± SD	31.02 ± 5.31	30.97 ± 5.90	30.99 ± 5.72	NS

SD: standard deviation; NS: not significant.

self-reported versus measured data. Nonetheless, in most reports, there is a high correlation (0.96) between measured and self-reported BMI, and self-reported BMI is miscategorized in an estimated 20% of adults (Preston et al., 2015). Similarly, in the pilot study we found highly significant correlations between measured weights and heights and self-reported weights and heights (spearman rank $r = 0.94$ and 0.90, respectively). Thus, the self-reported data on weights and heights can be reliable estimates for most of the population. One caveat to our findings is that we did not measure body composition, and BMI alone does not distinguish between excess fat/muscle

Table 5. Self-evaluation for dietary and health-related behaviors of KU students.

Health attitudes domains		Males (n = 193)	Females (n = 422)	Total (N = 615)	p-value
		n (%)			*p-value*
You can get in as much physical activity as you feel appropriate for your better health	Yes	140 (74.1)[a]	219 (52.1)[a]	363 (59.0)	<0.01
	No	28 (14.8)	104 (24.8)	134 (21.8)	
	Don't know	21 (11.1)	97 (23.1)	118 (19.2)	
You eat as nutritiously as you think necessary for your better health	Yes	73 (38.6)	165 (39.4)	242 (39.4)	NS
	No	97 (51.3)	211 (50.4)	310 (50.5)	
	Don't know	19 (10.1)	43 (10.3)	62 (10.1)	
You have given serious thought to making a personal lifestyle change related to better health	Yes, in the past year	108 (57.4)	234 (55.8)	345 (56.3)	NS
	Yes, a year or more ago	51 (27.1)	113 (27.0)	166 (27.1)	
	No, not in recent memory	29 (15.4)	72 (17.2)	102 (16.6)	
You are satisfied with your current state of health	Yes	62 (32.8)	102 (24.4)	164 (27.0)	NS
	Somewhat	93 (49.2)	229 (54.8)	322 (53.0)	
	No	33 (17.5)	77 (18.4)	110 (18.1)	
	I don't think about it	1 (0.5)	10 (2.4)	11 (1.8)	
You think good nutrition and regular physical activity can contribute to better productivity at work	Yes	176 (93.1)[a]	406 (96.9)[a]	582 (95.7)	0.045
	No	9 (4.8)	6 (1.4)	15 (2.5)	
	Don't know	4 (2.1)	7 (1.7)	11 (1.8)	
You are willing to make changes in your eating habits	Very willing	81 (42.6)	163 (38.8)	244 (40.1)	NS
	Somewhat willing	89 (47.1)	225 (53.6)	314 (51.6)	
	Not at all	19 (10.1)	32 (7.6)	51 (8.4)	

[a]Mean difference across columns significant at *p* < 0.05.
NS: not significant.

mass (Zanovec et al., 2009). Therefore, some participants may have had more muscle mass and were thus categorized as overweight/obese when, in fact, they were not.

Studies have suggested that female college students are more conscious of body image and place higher importance on appearance when compared to college males, and, thus, they may engage in more dieting practices to maintain lower body weight (Salameh et al., 2014). Indeed, our data revealed a higher use of weight loss supplements among female students. In terms of body weight status, the female college student population in this present study differs significantly from the study population used by Ng et al. (2011), which included a larger proportion of stay-at-home mothers and showed a greater prevalence of women who were overweight and obese. It appears that body weight status in women increases with age, marriage, and children in the family (Feskanich et al., 2004).

Based on the findings in the present study, both male and female students at KU appear to generally have poor eating behaviors, which are reflected by the relatively high prevalence of overweight and obesity in this population. The HES data also showed that poor dietary habits appear to be equally common between both genders. More than one-third of the students in both genders skipped breakfast. Many students fell below two servings a day of fruits, vegetables, and whole grains, which is indicative of a low-fiber diet. A high proportion of both genders reported the frequent consumption of processed meats and

fried foods during the week, which is indicative of a poor-quality diet. These eating behaviors likely reflect students' lifestyles, which can include eating outside of their home environment or not being able to prepare their own meals due to time restraints. Gender differences, however, were noted in dietary habits, as more male students reported that they consumed a high amount of animal protein, soda, and sugary beverages as compared to female students. These dietary behaviors could be related to male students engaging in greater physical activity compared to female students, as noted previously (Guo et al., 2004), and appears to be evidenced by more male students using body-bulking and muscle-building supplements. Female students, in contrast, reported consuming salty snacks, such as chips and full-fat popcorn, and sugary snacks, such as cakes and sweets, more than twice a day, as also observed in earlier studies (Ouellette et al., 2012). The HES scores did not vary with students' weight status, nationality, or college type, which is likely due to the homogeneity of the dietary habits of this population. Furthermore, like the HEI, the HES is not based on dietary guidelines that target overweight and obese persons specifically; thus, a relationship with being overweight or obese cannot be established (Mikolajczyk et al., 2009). Additionally, bias may exist in using a self-reporting questionnaire to assess dietary habits, in that students may not accurately report their habitual nutritional behaviors.

Based on this survey, this population appeared to understand the importance of proper eating habits for overall health. Despite reporting unhealthy dietary habits and admitting that they were not eating as nutritiously as they could, students appeared to understand the benefits of healthy eating and regular exercise in improving work productivity. The capacity to relate their dietary habits to positive health gains beyond simple weight management was evident in both genders. It was not clear, however, whether healthy eating motivation was associated with a healthy lifestyle, as seen in other college student populations (Naughton et al., 2015). Previous studies at KU have reported a relatively low level of nutritional knowledge among students of both genders (Al-Isa and Alfaddagh, 2014). Thus, it appears that the adoption of healthy food choices through the offering of evidenced-based nutrition education programs at the university may positively influence students' eating habits. Although nutritional knowledge about healthy food choices could be a predisposing factor for improving dietary habits, such an approach may not be sufficient to motivate healthy eating habits, and studies to date have not yet clarified how nutritional knowledge can best be translated into changing behaviors (Kaufer-Horwitz et al., 2015). Previous attempts to increase nutritional knowledge and awareness among college students have shown that, often, overeating may stem from self-control issues, which occur despite a full knowledge of the negative health consequences (Kaufer-Horwitz et al., 2015). Further, many studies, including ours, failed to show any associations between nutritional knowledge and weight status, which supports the belief that their relationship is independent (Al-Isa and Alfaddagh, 2014; El-Sabban and Badr, 2011). Multi-disciplinary approaches to relieve stress-related behaviors could include the provision of psychological counseling services and workshops related to mindfulness that have shown utility for stress-related activities such as overeating and meal skipping (Bahl et al., 2013; Daubenmier et al., 2011).

It is evident that the overweight status among college students in KU is a nutrition-related problem that is associated with the prevalence of poor dietary habits in this young adult population. Taken together, the poor dietary behaviors seen in the present study, along with the previously reported low level of nutritional knowledge, indicate that there is a clear need to implement evidenced-based health and nutrition promotional programs for college students. In addition to promotional programs for improved dietary habits to promote healthy body weight, it is likely that interventions will be needed to promote self-awareness with body image issues as well as approaches to counteract stress-related eating behaviors.

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Ethical approval

The College of Life Sciences research committee ruled that no formal ethics approval was required in this case.

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