

Impact of nutritional knowledge on dietary behaviors of students in Kuwait University

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Summary. Increasing nutritional knowledge is an important component of broader societal efforts to address the high prevalence of nutrition-related diseases. In Kuwait, university students are a critical target group since many of their lifestyle behaviors are shaped during college and may continue throughout their life. The aim of this study was to explore the effects of nutritional knowledge on the dietary behavior of 700 undergraduate students of Kuwait University. Nutritional knowledge and dietary behavior of Kuwait University undergraduate students were evaluated using paper-based questionnaires to assess lifestyle and nutrition behavioral changes. Students who experienced better dietary habits had better nutritional knowledge. However, the strength of the association was considered weak ($r=0.229$). The findings suggest that nutritional knowledge can slightly assist in adopting healthier eating habits, which may reduce nutrition-related diseases. Therefore, nutrition education programs and nutritional activities in classes should be recommended among students to promote healthy lifestyles. (www.actabiomedica.it)

Key words: Nutritional Knowledge, students, dietary behaviors, Kuwait University

Introduction

Kuwait is categorized in the top 7% of countries with the highest prevalence rates of adult obesity and in the top 3% of countries with the highest diabetes prevalence rates (1). Overweight or obesity has been detected in approximately 80% of Kuwaiti adults, which in turn resulted in the development nutrition-related non-communicable diseases such as diabetes (15%), metabolic syndrome (24%), hypertension (26%) and dyslipidaemia (33%) (2).

College is a crucial life period as various lifestyle behaviors are shaped and may continue throughout life (3). Researchers have observed that dietary habits worsen during college age, leading to an increased risk of chronic diseases as they grow older (4).

A vast amount of research has emphasized that Knowledge-Attitudes-Behavior model is based on the assumption that exposure to new information is posi-

tively related to increased nutritional knowledge, healthy food purchasing behaviors and improved diet quality, which in turn, improves the dietary behaviors and may reduce the prevalence of diet-related diseases (5).

The impact of nutritional knowledge on dietary behavior has inconsistent conclusions in academic literature. Several studies have proposed that the levels of nutritional knowledge have limited impact on food choices and suggest that cultural, educational, and economic factors as well as food availability, nutrient content, physical/chemical properties of food, have more important influence on dietary behavior (6). Another study indicated that nutritional knowledge does not influence consumers' use of food labels (7). In contrast, a UK general population postal survey carried out in the year of 2000 concluded that individuals with greater nutritional knowledge were 25 times more likely to have their recommended intake of fruits, vegetables and fats than those with less knowledge (8).

No studies were done in the gulf region-specifically Kuwait- to explore the effect of nutritional knowledge and education on health and nutrition behaviors. Therefore, the main purpose of this study is to explore the effects of nutritional knowledge on the dietary behavior of undergraduate students in Kuwait University.

Material and methods

Sampling

The study was approved by the Research Administration from Kuwait University and a written informed consent from each of the participants was obtained. Kuwait University undergraduate students of both sexes attending different colleges of all majors (n=6) with a mean age of ≈ 21 years were recruited for this study [no. of subjects 700 individuals (87% females and 13% males), equal to 1.9% of the entire population (37,000 students)]. The population of Kuwait University is equal to 0.93% of Kuwait population (4 million) (9) and (Kuwait Central Statistical Bureau). Students were informed of the study and some of them were recruited to participate through a series of announcements that were made before or at the end of usual lecture times. Students were selected from classrooms in agreement with professors, cafeterias, lounges, campus squares, and lobbies. Participation was voluntary and anonymous. All students were surveyed over four months, from February to the end of October 2017. Students represented both theoretical (non-science) and practical (science) colleges. From a total of seven hundred questionnaires, six hundred and ninety were returned; males (n=87) and females (n=603). The response rate was 98.6%, since 1.4% of the students either filled out the questionnaire incorrectly or left more than half of the questionnaire incomplete; therefore, they were excluded from the sample.

Eligibility Criteria

Undergraduate Kuwaiti and non-Kuwaiti students of both sexes aged 17 years and older with children or not, were included in the study. Graduate and

pregnant students, as well as college personnel were excluded from the study.

Data Collection

A dietary questionnaire established earlier was used in this study (10). A written consent from Giovanna Turconi was obtained to use the questionnaire in our study. All questions of the questionnaire were translated into Arabic in order to make it easier for students to respond. Some questions, especially in Section 3 (eating habits) of the questionnaire were localized to meet Kuwaiti culture and remove ambiguity of untraditional cuisines, while some of them were omitted, as they are culturally and religiously unacceptable. These questions were about drinking wine and beer at meals, and eating alcohol-containing foods. The questionnaire included nine main sections.

Section 1- Socio-demographics, contained information on personal data and socio-demographics and were collected by means of ten questions. The socio-demographic section covered questions about age, gender, nationality (Kuwaiti and non-Kuwaiti), residential area, social status, year and college of study. Anthropometric measurements including students' weight and height were also collected. These measurements were self-reported by the students. The BMI cut-off points used were based on the National Institute of Health guidelines, which classified students' weight status into four categories: underweight (BMI ≤ 18.5), normal weight (BMI between 18.5-24.9), overweight (BMI between 25-29.9), and obese (BMI ≥ 30) (USDDH, NHLBI, 2003). Data about family monthly income was collected and divided into three categories low ($< 1,000$ KD), medium (1,000-3,000 KD), and high ($> 3,000$ KD).

Section 2- Food frequency questionnaire, contained 19 questions and has been validated for use in the Kuwaiti population. The aim of this section was to discover students' daily average, frequency of consumption of typical food and beverages such as bread, rice, cereal products, fruits and vegetables, milk, tea, coffee and weekly consumption of other foods such as meat and meat products, fish, eggs, cheese, legumes, etc. Visual aids about the quantities of food items were included in the questionnaire in order to help students predict their portion sizes.

Section 3 - Eating habits questionnaire, consisted of 13 questions. This section was designated to explore the food habits of college students, particularly students with regard to breakfast contents, the number of meals per day, daily fruit and vegetable intake, as well as the consumption of both soft and energy beverages. Seven questions under this section had the following response categories: always, often, sometimes, never; whereas the other six had four categorical responses to assess eating habits. A 0 to 3 score range was assigned to each answer, with the highest score given to the healthiest response and the minimum score to the least healthy response. The total score of this section was 13.

Section 4 - Nutritional knowledge: contained 10 questions; each question had four answers out of which one is correct. Correct answers were given 1 score, whereas, the incorrect answers were given 0 score. The purpose of this section was to assess the student's nutritional knowledge from different aspects. The total score of this section was 10.

The total score of each section was divided into tertiles, with the lowest tertile assigned to the worst assessment category (0%-33.3%) and the highest to the best assessment category (66.6%-100%). Before distributing the questionnaire, we explained the aim of the research to the students and asked for permission to participate in this study. In order to decrease the probability of bias, the dietitian or the observer who supervised the questionnaire was well instructed on the process and was guided to give a standardized explanations in case any of the students' had questions;

without providing any answers to the questionnaire items. The questionnaire was self-administered which enabled the gathering of a relatively larger set of data from different locations simultaneously in a cost effective manner as compared to personal interviews.

Data Analysis

Data of all questionnaire items were entered manually and were analyzed using a Statistical Package for Social Sciences (SPSS), version 22. The scores obtained in each section were expressed as mean \pm standard deviation. The percentage distribution of students in each tertile score was also calculated by using SPSS. Student-t test was calculated to investigate differences in scores obtained by males and females students. A Pearson-Product Moment correlation coefficient was calculated for the relationship between eating habits and nutritional knowledge. A p-value of 0.05 or less was considered statistically significant.

Results

Demographic Characteristics

Characteristics of the sample are presented in Table 1. Most of the respondents were women (87.4%). The age of students ranged from 18 to 37 years with statistically significant gender differences. Males mean age was 21.7 ± 3.1 years while 20.7 ± 2.5 years for females. In addition, BMI mean value was 27.1 ± 10

Table 1. Sample Characteristics

Variables	Males (n=87)	Females (n=603)
Age (years)	21.7 \pm 3.1	20.7 \pm 2.5
Weight (Kg)	82.9 \pm 32.1	61.5 \pm 14
Height (m)	1.7 \pm 0.07	1.6 \pm 0.06
BMI (kg/m ²)	27.1 \pm 10	24.2 \pm 5.2
Underweight (kg/m ²)	18.2 \pm 0.3 (2.3%) ^a	17.4 \pm 0.8 (5.8%) ^a
Underweight (kg/m ²)	21.3 \pm 0.5 (54%) ^a	23.2 \pm 0.4 (60.2%) ^a
Overweight (kg/m ²)	27.04 \pm 1.4 (23%) ^a	27 \pm 1.4 (23.4%) ^a
Obese (kg/m ²)	40.6 \pm 15.2 (20.7%) ^a	35.1 \pm 6.3 (10.6%) ^a

^apercentages of subjects

kg/m² for males and 24.2 ± 5.2 kg/m² for females, with statistically significant differences between both genders ($p=0.000$). According to the guidelines of the National Institute of Health cut-off points' reference standard for BMI (11), 2.3% of males and 5.8% of females were underweight, 23% of males and 23.4% of females were overweight, and 20.7% of males and 10.6% of females were obese. The age distribution for obese students was slightly higher for both males and females as compared to the age distribution for normal weight males and females. Table 2 reports the demographic characteristics of college students who participated in this study. The majority of students were Kuwaitis (80.7%), while non-Kuwaitis represented 19.3% of the sample. Most of the students were seniors (45.4%), while juniors, sophomores, and freshman represented 22.2%, 21.1% and 11.3% of the sample, respectively. More than half of the students (54.3%) studied at practical colleges (e.g., engineering, pharmacy, science, etc.), while 26.1% studied at theoretical colleges (e.g., arts, commerce, law, etc.) and 19.6% were not specialized. Geographically, Kuwait consists of six governorates, where some of them are defined as urban and others as semi-urban. In our study, more than one half (64.6%) of the sample live in urban areas. Only 6.2% of our sample had children and 17.7% belonged to families with high monthly income (+3,000KD).

Food Frequency

Table 3 presents students' responses to food frequency intake of favorable food types. Results indicate that most students reported daily consumption of milk and about 42% of them specified drinking one to two glasses of milk per day. Students consumed rice, pasta, bread, and potatoes regularly, as 33.7% of the students reported intake of one to two portions daily. Less than half of the sample (35.3%) reported daily intake of fruits and vegetables and about 11.9% reported eating three to four portions daily. More than one-third of the students (36.4%) reported fish intake one to two portions per day and 34.5% of them reported eggs one to two portions per day. About one-quarter of the students (22.6%) reported intake of ready-to-eat meat (such as mortadella and sausages) at least once every 15 days. More than one-third of the sample (38.9%,

Table 2. Demographics of the sample (n=690)

Variable	Frequency (N=690)	Percent %
Gender		
Male	87	12.6
Female	603	87.4
Nationality		
Kuwaiti	557	80.7
Non-Kuwaiti	133	19.3
Year in College		
Freshmen	78	11.3
Sophomore	146	21.1
Junior	153	22.2
Senior	313	45.4
Area of Residency		
Urban	446	64.6
Semi-urban	244	35.4
College of Major		
Practical colleges	375	54.3
Theoretical colleges	180	26.1
Not-specialized	135	19.6
Social-Status		
Single	593	86
Married	92	13.3
Divorced	5	0.7
Having Children		
Yes	44	6.4
No	646	93.6
Income		
Low	3	0.4
Medium	565	81.9
High	122	17.7

37.3%, 35.3%, respectively) consumed legumes, fried potatoes, and fast food at least one to two times per day.

Eating Habits and Nutritional Knowledge

Table 4 shows the scores obtained by males and females in eating habits and nutritional knowledge sections. The total score for the eating habits section is

Table 3. Percentage distribution of subjects' food frequency

	1-2/day	3-4/day	>4/day	1-2 /week	3-4 /week	>4 /week	1/10-15days	Never
- Do you drink milk/milk and coffee/cappuccino or do you eat yogurt every day?	42	7.7	2.1	16.1	16.2	2.7	5.4	7.8
2-Do you eat pasta/rice/bread/potatoes every day?	33.7	12.7	3.7	15.6	25.4	6.0	2.7	0.4
3- Do you eat fruit and vegetable every day?	35.3	11.9	2.8	21.5	17.5	5.4	3.3	2.4
Times of food intake								
Variable	1-2/day	3-4/day	1/week	2/week	1/10-15days	Never		
4- How often do you eat meat in 1 week?	29	31.9	22	4.8	6.2	6.1		
5- How often do you eat fish in 1 week?	36.4	4.4	0.7	0.6	32.8	25.1		
6- How often do you eat eggs in 1 week?	34.5	23.9	10.4	1.6	19.4	10.2		
7- How often do you eat cheese in 1 week?	21.6	37	24.7	6.1	6.7	3.9		
8- How often do you eat mortadella and sausages (ready to eat meat) in week?	17.1	5.1	2.3	1.3	22.6	51.6		
9- How often do you eat legumes in 1 week?	38.9	19	6	1.2	21.2	13.7		
10- How often do you eat sweets and cakes in 1 week?	24.2	29.8	26.6	10.9	6.5	2		
11- How often do you eat fried potatoes in 1 week?	37.3	25.7	9.3	2.6	19.1	6		
12- How often do you eat in a fast food in 1 week?	35.3	17.4	7	1.7	27.7	10.9		
13- How often do you eat pizza in 1 week?	25.5	4.6	1.3	0.6	50.1	17.9		

thirteen that was divided into tertiles, where the lowest one referred to "inadequate eating habits", the medium one referred to "partially satisfactory eating habits" and the highest one referred to "satisfactory eating habits". The mean score for male and female students were 7 and 11, without any statistical significant difference between them ($p=0.165$).

The total score for the nutritional knowledge section is ten that was divided into tertiles, where the lowest one referred to "insufficient nutritional knowledge", the medium one referred to "good nutritional knowledge" and the highest one referred to "quite

good nutritional knowledge". The mean score for male and female students were 4.8 and 5.8 with a statistically significant difference between males and females ($p=0.000$).

A Pearson-Product Moment correlation coefficient was calculated for the relationship between eating habits and nutritional knowledge. A positive relationship was found ($r=0.229$, $p<0.05$), indicating a significant linear relationship between the two variables. Therefore, students who practice better dietary habits have a better nutritional knowledge. However, the strength of the association is considered weak.

Table 4. Scores obtained from the various questionnaire sections by males and females

Questionnaire sections	Scores	Males n=87	Females n=603	p-value ^d
Eating Habits, total score=13	1 st tertile ^a	2 (65%)	7 (35%)	0.165
	2 nd tertile ^b	7 (55%)	11 (45%)	
	3 rd tertile ^c	10 (45%)	12 (55%)	
Nutritional knowledge, total score=10	1 st tertile ^a	2 (61%)	3 (39%)	0.000
	2 nd tertile ^b	4.8 (37%)	5.8 (63%)	
	3 rd tertile ^c	9 (20%)	10 (80%)	

^ainadequate; ^bmedium; ^csatisfactory; ^dsignificantly different at <0.05

Discussion

After doing a search for studies that assessed the impact of nutritional knowledge on dietary behavior among university students in Kuwait, we did not find any relevant studies. Therefore, our study is deemed to be the first to examine the association between nutritional knowledge and dietary behavior in Kuwait.

Our study involved a convenience sample of 700 college students attending different colleges at Kuwait University. Available evidence suggests that the transition period from adolescence to young-adulthood is crucial as various lifestyle behaviors are formed and may continue throughout their life (12). Majority of our sample were females, which reflected somehow the overall ratio (2:1) of women to men at the university. Moreover, males were not as enthusiastic as females to participate in the study and few of them were in-compliant in completing the questionnaire.

According to the BMI of students, the high prevalence of overweight was almost the same in both sexes, while the prevalence of obesity was two times higher in males than females. These results are consistent with the finding of Al-Isa et al. who revealed that the prevalence of obesity among Kuwaiti college students is higher in males than females (13). However, most of the college students were in the normal range of values according to guidelines of the National Institute of Health (11). Traditional Kuwaiti cuisines, which are rich in fat and carbohydrate, may play a role in the high prevalence of overweight and obesity. Moreover, the early nutrition transitions that occurred in Kuwait,

altered dietary habits and lifestyle dramatically. The high prevalence of overweight and obese subjects is alarming since overweight and obese young age students are more susceptible to stay obese in future, due to the fact that obesity at a younger age is a predisposing factor for adulthood obesity (14). Furthermore, many chronic diseases and health conditions such as hypertension, dyslipidemia, atherosclerosis, metabolic syndrome and type 2 diabetes may be caused by obesity (15). The lower prevalence of obesity among females compared to males can be explained by the fact that women have greater social pressure to be physically fit during college age period since the sociocultural environment in colleges encourages 'thinness' in women and endorses 'thinness' as a beauty measure. They tend to believe that having a thinner body will attract peers' attention (16, 17). The prevalence of underweight was low, but it was higher among female students.

Data on food frequency revealed that daily milk/yogurt was consumed by 92.2% of the students. Out of those who consumed milk/yogurt daily, 42% of the students consumed one to two glasses of milk per day. However, only 2.8% of the students met the recommendation of consuming at least five servings of fruits and vegetables per day (18). Our data revealed high students' consumption with regards to meat and fast food which may cause excessive body fat, weight gain and obesity (19).

Data on eating habits revealed that the mean score for male and female students were 7 and 11, without any statistical significant difference between them (p=0.165). On the other hand, data on nutrition-

al knowledge revealed that the mean score for male and female students were 4.8 and 5.8 with a statistically significant difference between males and females ($p=0.000$). The higher nutritional knowledge scores among females compared to males can be explained by the fact that females tend to be more anxious with their looks at an earlier age than males. That concern would, in turn, motivate females to search for more knowledge about nutrition (16).

In our study, a significant positive “weak” relationship was found between nutritional knowledge and eating habits ($r=0.229$). Therefore, students who have better nutritional knowledge, practice better dietary habits. Our results are in parallel with Spronk et al. results, which indicated a significant but weak positive association between higher nutritional knowledge and better dietary intake in the adult population in almost three-quarters of the included studies (19). Moreover, a meta-analysis published by Racey et al., reported a significant weak and positive correlation between nutritional knowledge and dietary behavior (20). Another systematic review included studies that reported a weak and positive correlation ($r=0.44$) between nutritional knowledge and dietary intake (21). Our finding could be explained by the effect of the numerous environmental and individual factors that affect dietary behaviors, such as taste, availability, food cost or security, cultural or religious beliefs and perceptions about food and health (22, 23). It is of high importance that future studies direct their focus into distinguishing the most substantial aspect of nutritional knowledge having the most significant correlation with dietary intake, which will not be only helpful for public health policy decision making, but would extend even to clinical counseling.

Conclusion

There is a positive correlation between nutritional knowledge and dietary behavior of our sample. Therefore, it is highly recommended that colleges emphasize on creating nutrition education programs and organizing nutritional activities in classes to promote healthy diets among students.

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Conflict of interest: Each author declares that he or she has no commercial associations (e.g. consultancies, stock ownership, equity interest, patent/licensing arrangement etc.) that might pose a conflict of interest in connection with the submitted article

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