Nutritional knowledge among Kuwaiti college students

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ABSTRACT

Objectives: To assess the level of nutritional knowledge (NK) among male Kuwaiti college students and to correlate NK scores with different nutritional domains. Methods: A random sample of 378 students was asked to answer a questionnaire regarding socio-demographic and health-related factors and answer questions assessing their NK on different domains. Height and weight were measured. Results: NK was low. NK on sodium and carbohydrates was the highest, where those of protein and cholesterol were the lowest. Only older age, healthy dental status, and high academic achievement in high school were associated with high NK. NK scores of different nutritional domains were weekly correlated with each other. While the NK on cholesterol correlated with NK on all other domains. NK on calories/food intake correlated with less than half of the domains. Conclusion: NK was found to be low and interrelated. NK education should aim to improve NK especially in those groups with the lowest scores.

KEYWORDS

Nutritional Knowledge; Determinant; Correlation; College Students; Kuwait

1. INTRODUCTION

Similar to other countries in the region, Kuwait is a country that underwent a process of fiscal and epidemiological transition. The pattern of disease has changed as a result of change in lifestyle and nutrition. With this transition, food intake has substantially increased and obesity became very common in the younger population [1,2]. Several studies have shown that the choice of food is related to the individual's level of nutritional knowledge (NK) [3-5]. This has led programs aiming at obesity prevention to develop and implement more nutritional education activities. Knowing the level and determinants of NK would help guide these activities to aspects which are deficient and require improvement.

Since most of chronic diseases start early in life, through a gradual process extending for decades, measuring NK in young adults is important to start disease prevention earlier. Moreover, understanding the determinants of having a high level of NK in the young adult population would help identify those that would benefit most of nutritional education activities. The correlations between NK on nutritional domains may be influenced by the dietary habits of an individual or the frequency of addressing these nutritional domains in educational opportunities. These correlations have not been properly discussed in the literature.

This study aims at exploring the level and determinants of NK among college students. Moreover, it attempts to measure NK on specific nutritional domains and report the levels of correlation between each.

2. SUBJECTS AND METHODS

2.1. Subjects

Our sample comprised 378 Kuwaiti male students in different years of study in Kuwait University. Students from all colleges were included except those from to health-related colleges (*i.e.* Colleges of Medicine, Dentistry, pharmacy, and Allied Health Sciences) since their field of study may put them in advantage in terms of NK.

A total of 211 students from scientific colleges and 167 students from non-scientific colleges were included. The response rate was 86%.

2.2. Procedure

Classes were randomly selected from different colleges, and students were asked to answer a written questionnaire. The questionnaire included two sections. The first assessed different socio-demographic and health-related characteristics. This included questions on dental status (perceived of dental status, number of teeth extracted other than wisdom teeth, last dental checkup), presence of medical conditions, dietary habits (number of meal per day, snacking), practice of exercise, number of relatives with obesity, parents level of education and occupation, college grades, residence status, family income, consanguinity between parents, high school subjects and grades, highest desirable degree, and choice of travel destinations. The second section included 39 "true/false" type of questions on NK, adopted from a previous study [6]. The questions assessed NK on different nutritional domains, including vitamins/minerals, fibers, fat, weight loss diet, protein, cholesterol, sodium, carbohydrates, and calories/food intake. A few modifications were made including omitting a question that accessed knowledge on alcoholic beverages and omitting the word "pork" from another question. These modifications were necessary, since Kuwait has an Islamic population in which consumption of alcohol and pork meat is prohibited. After completing the questionnaire, both the height and weight of participants were measured. This study was approved by the Ethical Committee of The Medical Research Committee in Kuwait University.

2.3. Calculation of Scores

An overall NK score was calculated based on the number of correct answers to questions in section two of the questionnaire. All questions were equally weighted (0 = incorrect or missing answer, 1 = correct answer). The highest possible score was 39. The percentage of correct answers was also calculated. Those with a percentage of correct knowledge higher than the mean overall NK score of the sample were labeled as having high overall NK.

NK scores on the different nutritional domains were calculated. The scores were defined as the number of correct responses to questions related to that domain. Table 1 indicates which questions were used in the different nutritional domain scores. All questions were equally weighted in the calculations (0 = incorrect or missing answer, 1 = correct answer). The scores were then converted into percentages of correct response.

Table 1. Socio-demographics and health-related factors of the sample.

	Frequency (n = 378)	
	n	(%)
Age		
<=18	56	(14.8)
19 - 20	133	(35.2)
21 - 22	118	(31.2)
>=23	71	(18.8)
Type of college		
Scientific college	211	(55.8)
Non-scientific	167	(44.2)
Marital status		
Ever married	25	(6.6)
Never married	353	(93.4)
Body mass index		
<18.5	20	(5.3)
18.5 - 25	199	(52.6)
25.1 - 30	110	(29.1)
≥30.1	49	(13.0)
Dental status		
Healthy	270	(71.4)
Unhealthy	57	(15.1)
Treated	51	(13.5)
Teeth removed		
Low (0)	246	(65.1)
Med (1 - 2)	86	(22.8)
High (=>3)	46	(12.2)
Chronic disease present	37	(9.8)
Doing physical activity	251	(66.4)
Currently on a diet	43	(11.4)

2.4. Statistical Analysis

All statistical analyses were performed using SPSS version 15.0 (SPSS Inc., Chicago, IL, USA, 2006). Percentages were used to summarize categorical variables where appropriate. The mean percentage of correct response and the 95% confidence intervals (CI) around the mean were calculated for the overall NK score as well as scores on specific nutritional domains. The associations between the scores on different nutritional domains were summarized using the Spearman's correlation coefficient. However, before assessing the correlation between any two scores, shared question were excluded from both, to avoid creating inaccurate associations. A two tailed p-value of less than 0.05 was considered statistically significant.

Multivariate binary logistic regression was used to adjust for possible confounders in the associations between having high NK (dependent variable) and different socio-demographic and health-related variables. The possible confounders included were age, college type, and body mass index measured.

3. RESULTS

The sample included students aged between 17 and 32 years old with a mean age of 20.8 years (standard deviation = 2.4 years). The prevalence of obesity and overweight were high in the sample (13.0% and 29.1%, respectively). Only 9.8% had known chronic disease, and 11.4% had been on a special diet at the time of sampling. **Table 2** provides an overview on the socio-demographic and health-related factors of the study's sample.

The mean percentage of overall NK in the sample was 56.9% (95% C.I. = 55.7 - 58.0). The percentages of correct response on each of the 39 NK questions used are presented in the online appendix table. Only two nutritional domains achieved a mean percentage of NK higher than 60%. These were NK on sodium (61.4%; CI= 57.7 - 65.1), and NK on carbohydrates (61.2%; CI = 58.2 - 64.2). The lowest mean NK percentages were those on cholesterol (47.3%; CI = 45.1 - 49.5) and protein (47.8%; CI = 45.3 - 50.3). **Table 1** shows the mean percentages of correct response of overall NK as well as NK on different nutritional domains.

Only older age, healthier dental status, and higher academic achievement in high school were significantly and independently associated with higher overall NK (**Table 3**). Other factors, such as obesity (adjusted OR = 1.02; p-value = 0.995) or being on a diet (adjusted OR = 0.80; p-value = 0.508), where not associated with high overall NK. **Table 4** summarizes the correlations between NK scores of different nutritional domains. Most of the calculated correlations were weak, but statistically significant. The strongest correlation was between the scores of cholesterol and fat (r = 0.256; p-value < 0.001), followed by the correlation between cholesterol and protein (r = 0.255; p-value < 0.001). While the NK score on cholesterol correlated with all other domains, the score on "calories/food intake" did not correlate with over half of the domains.

4. DISCUSSION

This study measured the level of overall NK among 378 male college students and identified the socio-demographic and health-related determinants of having high NK. It also explored NK on different nutritional domains and the correlations between them.

4.1. Overall Nutritional Knowledge

In line with high levels of obesity among male college students, this study reports that their overall NK was low. The overall NK of the sample was similar to that reported in a study from England [5] but higher than another study done in Australia [7]. In comparison to this study's results, a previous study on students from Kuwait University reported higher overall NK (72.2% vs. 56.9%) [8]. A possible reason their higher reported levels could have resulted from their inclusion of students in health-related colleges, whom presumably had higher NK, or that the difference may be related to the study instrument.

A study done in the United States (US), from which the 39 NK questions in were adopted, reported a higher NK score in those between 17 and 34 years of age among a sample of navy personnel [6]. Their sample still scored higher despite most of them not exceeding high school education. Hence the reported difference between the two studies could be due to better nutritional education in earlier years of life, *i.e.* school years. This emphasizes the need to implement better nutritional educational programs in Kuwaiti schools, especially since obesity also starts from an early age in Kuwait [9]. The low percentage of correct NK in this study is alarming, since NK is related to a better food intake [3-5]. Moreover, many in the Kuwaiti population have less education than the studied sample and are expected to have even lower NK.

Table 2. Percentages of correct response on the overall nutritional knowledge and specific nutritional domains.

Question on:	The number of the questions used in score calculation	Knowledge score (%)	
		Mean	[95% CI]
Overall knowledge	**All questions**	**56.9**	**[55.7 - 58.0]**
Sodium	16, 32	61.4	[57.7 - 65.1]
Carbohydrates	18, 21, 37	61.2	[58.2 - 64.2]
Vitamins/minerals	2, 3, 11, 24, 25, 27, 31	57.0	[55.0 - 59.0]
Calories/food intake	9, 19, 21, 29, 36, 37, 38	57.0	[55.2 - 58.8]
Weight loss diet	4, 12, 18, 26, 34	54.8	[52.5 - 57.1]
Fat	8, 12, 13, 15, 21, 29, 35	52.7	[50.7 - 54.6]
Fibers	6, 17, 30	49.7	[46.9 - 52.4]
Protein	7, 14, 24, 33	47.8	[45.3 - 50.3]
Cholesterol	10, 13, 20, 22, 28, 39	47.3	[45.1 - 49.5]

Abbreviations: CI, confidence interval.

Table 3. Association between high overall nutritional knowledge score and Socio-demographic characteristics.

Socio-demographic characteristics	Adjusted OR[†]		p-value for trend
	OR	(95% CI)	
Age			0.004
<=18	Ref.		
19 - 20	1.1	(0.6 - 2.0)	
21 - 22	1.7	(0.9 - 3.3)	
>=23	2.3[*]	(1.1 - 4.7)	
Dental status			0.001
Healthy	Ref.		
Unhealthy but not treated	0.7	(0.4 - 1.2)	
Unhealthy but treated	0.4[**]	(0.2 - 0.7)	
High school grade			0.035
Low	Ref.		
Average	1.4	(0.8 - 2.4)	
High	1.9[*]	(1.0 - 3.4)	

Abbreviations: OR, odds ratio; CI, confidence interval. [†]Adjusted for age, college type, and BMI. [*]p-value < 0.05. [**]p-value < 0.01.

Table 4. Correlations between knowledge on different nutritional domains.

Nutrient score	Fiber	Fats	Weight loss diet	Protein	Cholesterol	Sodium	Carbohydrates	Calories/food intake
Vitamins/minerals	0.198[***]	0.193[***]	0.122[*]	0.146[**†]	0.156[**]	0.086	0.070	0.133[*]
Fibers		0.168[**]	0.221[***]	0.126[*]	0.226[***]	0.167[**]	0.076	−0.026
Fats			0.085[†]	0.210[***]	0.256[***†]	0.078	0.227[***]	0.021[†]
Weight loss diet				0.159[**]	0.148[**]	0.183[***]	0.110[*†]	0.087
Protein					0.255[***]	0.132[*]	0.142[**]	0.049
Cholesterol						0.163[**]	0.130[*]	0.115[*]
Sodium							0.145[**]	0.143[**]
Carbohydrates								0.013[†]

[*]p-value < 0.05. [**]p-value < 0.01. [***]p-value < 0.001. [†]Correlation coefficient and p-value were calculated after excluding overlapping questions.

4.2. Determinants of Overall Nutritional Knowledge

This study did not report a significant difference in overall NK between obese and non-obese participants, though in both NK is low. This is in contrast to several studies which report higher NK among the Obese [6,10]. Also, there is lack of association between NK and other reported determinants of obesity such as dieting and exercising [11]. The lack of significance between these factors may indicate the presence of barriers such that individuals may not value the importance of NK in weight loss or that higher level of knowledge would not benefit them. Such barriers deserve attention and should be addressed in future research.

The reported association between older age and higher level of overall NK was comparable to other studies from Australia [7], England [5], and the United States [6]. However, data on this association remain inconsistent [8, 12]. This study also reported that participants with poor dental status were less likely to have high overall NK (p-value for trend = 0.001). Similar studies that address this association could not be found. This study presumes that knowing less about nutrition is associated with less care about dental hygiene and higher consumption of food which can lead to dental caries and disease.

Similar to the aforementioned study done on navy recruits, this study reported that higher academic achievement in high school was positively associated with having high NK [13]. Since proper nutritional education is not implemented in Kuwaiti schools, this study assumed that those with better school achievement had higher general knowledge and that included better NK.

4.3. Knowledge on Nutritional Domains

Among College student, NK scores on the different nutritional domains were low. Knowing the different scores helps direct educational programs toward which domain to tackle most. With regards to NK on sodium and car-

bohydrates, college student from different regions show different scores [6-8,14]. In this study, the scores on sodium and carbohydrates were the highest. This could be a secondary to daily Kuwaiti meals being salty and rich in carbohydrates as the major component. Also, since hypertension and diabetes are common in Kuwait, carbohydrates and salt are addressed more than others. There is much room for improvement in NK of both, since higher intake of either is linked to cardiovascular disease and hypertension.

Nutritional knowledge on vitamins A and C as well as calcium and iron were lower than those reported in other studies [6,8,14]. Although a high percentage of our sample links calcium to osteoporosis, whether this knowledge is translated into better calcium intake is not yet clear.

In comparison to a US study, this study reported similar knowledge on calories and food intake but lower NK on weight loss [6]. People with lower NK on calories and food intake or on weight losing diets are less likely to create and follow a successful weight reduction program without help. Thus, improving knowledge on these domains is important to avoid weight gain.

Both percentages of NK on fat and fiber included the value of 50% in their 95% confidence interval. Therefore, it cannot be told for sure whether these scores were due to arbitrary answering of the true/false questions or due to equal number of people with correct versus false NK. In any case, knowledge on both was low compared to other studies [6,8,14-16]. The finding that most participants had misconceptions regarding facts on cholesterol is worrisome, since this makes them less likely to avoid food with high cholesterol.

As evident from the discussion above, improvement in nutritional education is much needed in all domains, with more emphasis on some. Furthermore, future research should focus on the association between knowledge on these nutritional domains and the level of their intake among Kuwaiti college students.

4.4. Correlation between Knowledge on Different Nutritional Domains

In this study NK on carbohydrates and fat were positively correlated. This correlation was expected since the two are often addressed together in public and are essential parts of the regular Kuwaiti meal. On the other hand, carbohydrates and fibers were not correlated, may be because fibers are not addressed enough. The lack of association between NK on carbohydrate and calories/food intake reported in this study was probably not valid since the NK score on carbohydrates depended on one question only after excluding the shared questions. It is unfortunate that this study could not properly assess this important association, especially since carbohydrates are

a major source of caloric intake in Kuwaiti meals.

The correlation between NK on cholesterol and fat was expected, since both are a form of lipids. However, most of the study's participants (65.9%) confused fat with cholesterol. These findings, in addition to the misconception on cholesterol, are worrisome since it indicates that individuals are less likely to avoid meals with both high fat and cholesterol contents.

The level of NK on cholesterol and fibers were the lowest in this study's sample but were positively correlated. In a separate analysis (not shown), this study found that this correlation was only true among those with high NK. It was assumed that the lack of correlation in the low NK group was secondary to arbitrary answering and that only people who pursue NK beyond the level of common knowledge are knowledgeable about both. NK scores on protein correlated with both that of cholesterol and fat. This was expected since knowledge scores of fat and cholesterol were significantly correlated.

Although this study expected NK on weight loss diet to correlate with NK on carbohydrates and fat, only knowledge on carbohydrates was statistically significant. The reason for this may be that those who wish to lose weight focus more on reducing their carbohydrate intake (e.g. rise and bread) rather than fat intake. Interestingly, the study did not find an association between NK on fat and that of calories/food intake, probably due to the same reason. Those who knew more about weight losing diet also knew more about fiber probably because weight reducing diets encourage incorporating more fiber-rich food into daily meals. The absence of correlation between NK on calories/food intake and NK of weight loss diet could be that participants focus on food quantity, rather than content when pursuing a weight losing diet.

This study shows that NK is an inter-related subject and that the correlations between different nutritional domains may be due to the type of daily food or nutritional education. It would be interesting to study these correlations in different cultures with different dietary habits, since they may not necessarily remain the same.

This study has several limitations. It was done on college students, whom presumably have higher NK compared to many in the general population. Therefore, drawing inferences from the study's results, regarding the level of knowledge, to the general population is questionable. With regards to NK questions that were used in section two of our questionnaire, the validity of these questions, as a whole, in assessing NK was not previously assessed. However, this limitation is also shared in most of similar literature measuring NK, since questions often differ from one study to another.

5. CONCLUSION

Although in line with high levels of obesity among

college students, low NK doesn't seem to be a major determinant of obesity. This indicates the presence of barriers hindering this association. Although NK on most nutritional domains is low, they are weakly correlated. NK should therefore be improved in this population.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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