



HYGIENIC CHARACTERISTICS OF NUTRITION AMONG FIRST-YEAR FOREIGN STUDENTS STUDYING AT THE YEREVAN STATE MEDICAL UNIVERSITY

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Abstract

In a foreign country, student diets quickly deteriorate leading to unhealthy habits that may have adverse effects on their health. The dietary patterns of foreign students in Armenia whose number has increased since late 1990s have never been evaluated. The need to assess dietary changes of foreign medical students is of greater importance, since healthy practices adopted early in life may not only improve their health, but also enhance their psychological readiness to participate in creation of healthy behavior among their peers. This study aimed to give the hygienic characteristics of nutrition among first-year foreign students studying at the Yerevan State Medical University after M. Heratsi (YSMU).

The study utilized one-group pre-test/post-test design. The sample included 144 newly arrived foreign medical students who had not been diagnosed with any pathological conditions. The nutritional intake was obtained through the analysis of an average daily set of food items derived from a self-administered questionnaire. Pre- and post-tests were conducted at the beginning and at the end of the first year of education at YSMU, correspondingly.

Data analysis revealed a statistically significant decrease in consumption of meat, milk, vegetable, fruit, and bread groups at posttest. The consumption of fats and sweets group was significantly increased. At post-measure, the mean reported intakes of meat, vegetable, fruit and bread groups were significantly lower compared to Food Guide Pyramid requirements. Frequencies of having breakfast and lunch also decreased at post-test. Body Mass Index statistically significantly decreased from pre- to post-measure.

This study demonstrates that dietary habits of foreign medical students significantly deteriorate during their first year of study, which, in turn, may have substantial impact on students' health as well as academic performance. The revealed dietary alterations may serve as a basis for development of nutritional educational programs that can be included in curriculum of first-year foreign students.

Keywords: foreign medical students, nutrition, dietary changes

Introduction

The student lifestyle changes significantly in a foreign country. In new setting the students undergo exposure to dietary and climate changes as well as changes in social environment. The research has suggested that dietary patterns

change dramatically following arrival of students in a foreign country and students are at risk for development of unhealthy eating habits during their first year of education [Reeves S., Henry C., 2000]. When students start their education in a foreign country, their diets often deteriorate, the quality of their diets declines, and they often gain weight [College Students, 2006]. As a result, the level of physical and psychological health among first-year students declines [DeBate R. et al., 2001].

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Importantly, harmful eating habits developed early in college years increase the future risk of development of diseases, including diabetes, hypertension, coronary artery disease, and other functional disabilities [Georgiou C. et al., 1997; Cole S. et al., 2001].

The research has identified significant changes in dietary patterns of immigrant students: consumption of carbohydrates (particularly sugar) and fats, which are calorie-providing nutrients, often exceeds recommended levels in diets of foreign students; protein consumption significantly decreases [Reeves S., Henry C., 2000]. Another research suggested that consumption of meat, meat alternatives, dairy products, fruits and vegetables significantly decreased after students arrived in a foreign country (the United States of America) [Pan Y. et al., 1999]. Additionally, research has shown that students tend to consume saltier snack items. They typically have little variety in their diet and are often prone to consumption of significant amounts of high-fat snacks, which are conveniently available [Hiza H., Gerrior S., 2002]. Furthermore, students usually underestimate their meal sizes, and eat more than they think they are eating [College Students, 2006].

Several influential factors contribute to the adoption of poor dietary practices after moving away from one's native country and entering a university. The roots of these changes appear to be related to stress, sedentary lifestyle, lack of availability of familiar food, peer pressure, and limited finances [College Students, 2006]. Additional factors such as skipping breakfast due to irregular class schedules and class overload disrupt normal eating patterns and lead to development of unhealthy habits that may further have adverse effects on student health [College Students, 2006].

The research has indicated that cultural values and attitudes of foreign students might also play an important role in the development of their diet behaviors and eating disorders. In a study conducted among Asian college student-women studying in the United States the intake of milk and cheese group foods was inadequate, compared

with the recommended intake due to food preferences based on cultural and religious beliefs [Tsai C. et al., 1998]

The research has demonstrated that attitudes towards healthy eating patterns develop particularly during the early period of their student years [Parveen R., 2006]. It has been reported that early exposure to nutritional messages designed to promote food habits that are preventive of chronic illness later in life are expected to lead young adults to adopt healthful food patterns [Georgiou C. et al., 1997]. This, in turn, can help prevent diseases and improve overall quality of life for many years to come [Levine E., Guthrie J., 1997; Stefániková Z. et al., 2001].

Understanding the pattern of changes in the diet of foreign students can lead to development of nutritional intervention educational program to affect their behavior during the first year of their study. Therefore, the assessment of dietary patterns of foreign students is of great importance.

The number of foreign students studying in Armenia has increased dramatically since late 1990. Currently, approximately 4 000 foreign students study in Armenia. However, issues relevant to nutrition of foreign students studying at higher educational institutions in Armenia have never been investigated.

Of a greater importance is the need to assess dietary changes of foreign medical students, since healthy practices adopted early in their life may not only improve their health, but also enhance their psychological readiness to participate in creation of environment of healthy behavior among their peers [Parveen R., 2006].

Currently, approximately 1600 foreign students from India, Iran, Syria, Lebanon, the United States, and the Russian Federation, etc. study at the Yerevan State Medical University (YSMU). It takes 6-7 years for foreign medical students to gain a medical doctor's degree in Armenia. Residency study takes additional 2-3 years to complete. Students' early years of study at the medical university are the most important for establishment of healthy lifestyle behaviors, since attitudes towards healthy eating patterns

begin during young adulthood [Parveen R., 2006]. Therefore, this study aimed to give hygienic characteristics of nutrition in the first year foreign students studying at the Yerevan State Medical University.

Material and Methods

The study utilized a one-group pretest-posttest design according to the nomenclature developed by Campbell and Stanley. This design provides the apparent validity and reliability and is logically feasible for this study [Campbell D., Stanley J., 1963].

The evaluation of dietary habits of the first year foreign students studying at YSMU was conducted twice. Dietary patterns of foreign students in their native countries were measured upon their arrival in Armenia at the beginning of education at YSMU. The post-test, which evaluated dietary habits of the same students developed during their study at YSMU, was conducted at the end of the first year of education.

The study was conducted among foreign students currently taking the preparatory courses and newly arrived first-year foreign students since it is their first year of education in Armenia. Students who have been in Armenia more than one year were not included in the study since responses from those students could introduce recall problems. Additionally, students who had any diagnosed pathological conditions revealed by the Students' Polyclinics were not included in the study since they might have changed their dietary patterns due to health problems.

Overall 144 foreign students without any diagnosed pathological conditions were included in this study: 74 newly arrived first-year students and 70 students from preparatory courses.

This sample size provides 80% power that was calculated using formula for sample size for one group:

$$n = \frac{(Z_{\alpha/2} + Z_{\beta})^2 \sigma^2}{d^2} = 144$$

where $Z_{\alpha/2} = 1.96$ (is a cut-off for two-sided test with 95 % CI), $\alpha = 0.05$, $\sigma = 2.7$ (estimates of population variances for total bread group servings), $d = 0.63$ (estimated detectable differ-

ence of 0.63 bread group serving in average outcome).

From this formula $Z_{\beta} = 0.84$ corresponding to 80% power.

Semi-quantitative self-administered food frequency questionnaire (FFQ) was used to conduct pre- and post-measures. The questionnaire was adapted from Nurses' Health Study Dietary Questionnaire [Walter W., 1990] and Blocks FFQ [Gibson R., 1993]. The questionnaires have proved validity and reliability [Walter W., 1990; Gibson R., 1993].

The adapted FFQ has two main components: list of foods and set of frequency-of-use response categories. Food groups and serving sizes are presented according to Food Guide Pyramid (FGP) definitions for each food category [The Food Guide Pyramid, 1992]. In addition to information about usual food consumption patterns the study questionnaire included items on demographics such as age of participant, gender, residency status as well as body weight and height.

The Statistical Package for the Social Sciences (SPSS, version 11.0, Chicago) was used for data entry. To verify that only valid ranges of numbers were used, data encoding and editing was performed by the procedure of range checking [Aday I., 1996].

At pre-measure, statistical significance of difference in consumption of food groups' servings between the first year students and students from preparatory courses was assessed by independent sample *t* test for continuous variables [Hassard T., 1991]. One sample *t* test was performed at post-measure to compare reported serving sizes of food items consumed by students in Armenia with the FGP requirements. For pre- and post-measure difference, statistical significance was determined by paired samples *t* test for continuous variables. For categorical variables the statistical significance of difference between pre- and post-measure was determined by performing McNemar's test [Hassard T., 1991].

The study was approved by the Institutional Review Board committee at the College of Health

Sciences of the American University of Armenia in March 2007. An oral informed consent was obtained each time.

Table 1.
Socio-demographic characteristics of study participants at pre-measure

Variable	Pre-Measure N=144
Age, (mean \pm SD)	20.6 \pm 2.6
Gender, % (n):	
Male	60.4% (87)
Female	39.6% (57)
Country of permanent living, % (n):	
Iran	59% (85)
India	26.4% (38)
Georgia	3.5% (5)
Other	11.1 % (16)

Results

The mean age of participants was about 21. Among the participants, 60.4 % were male and 39.6% female. The largest percentage of participants (59%) was from Iran, 26.4% from India, 3.5% from Georgia and 11.1% from other countries such as Syria, Lebanon, Greece, etc. (Table 1).

Mean body weight of participants upon arrival was about 67.5 kg at pre-measure and 65 kg at post-measure. The analysis revealed that decrease in mean weight of participants was statistically significant. The height and weight of participants were used to calculate the body mass index (BMI = kg/m²). Data analysis revealed statistically significant decrease in BMI of participants from pre- to post-measure. The largest percentage of participants reported leaving in a rented home (61.1%), 31.9% in a dormitory and 6.9% in own home (Table 2).

The independent sample *t* test for continuous variables did not reveal statistically significant difference between the first year students and students from preparatory courses on mean servings of milk, cheese and yogurt group at pre-

measure (Table 3). Furthermore, mean servings of vegetable group and meat group (meat, poultry, fish, dry beans, eggs and nuts group) did not vary significantly in both groups at pre-measure. Mean servings for fruit group, bread (bread, cereals and pasta group) and fats and sweets group (fats, oils, and sweets group) did not also differ significantly between the first year students and students from preparatory courses at pre-measure. Therefore, first-year students and students from preparatory courses were combined and analyzed as one sample.

Paired samples *t* test was performed to reveal the differences in food consumption patterns (including FGP servings of food groups) at pre- and post-measure (Table 4.).

From pre- to post-test data analysis revealed statistically significant decrease in consumption of meat group (by 3.1 servings). However, the decrease in consumption of hotdogs and hamburgers was not statistically significant. The statistically significant decrease in consumption of milk group (by 2.9 servings) was also reported from pre- to post measure. Furthermore, statistically significant decrease was recorded in consumption of vegetable and fruit groups (by 5.3 servings and 8.8 servings, accordingly). At post-measure the consumption of bread group statistically significant decreased by 3.3 servings.

Table 2.
Socio-demographic and anthropometrical characteristics of the study participants at pre- and post-measure

Variable	Pre-Measure N=144	Post-Measure N=144
Body weight, kg*	67.5 \pm 17.9	65.1 \pm 12.4
Body height, cm	170.6 \pm 8.7	171.6 \pm 8.8
BMI, kg/m ² *	23 \pm 5.3	22.1 \pm 3.1
Place of living, % (n):		
Dormitory	0.7% (1)	31.9% (46)
Home (rented)	2.1% (3)	61.1% (88)
Home	97.2% (140)	6.9% (10)

*P< 0.01 between pre- and post-measure

Table 3.

Consumption of food groups by first-year students and preparatory-course students at pre-measure

Food groups and food items	First-year Students FGP Servings Mean ± SD (N=74)	Prep. Course Students FGP Servings Mean ± SD (N=70)	Significance (2-tailed)
Milk, yogurt and cheese group	4.98 ± 5.2	6.16 ± 3.8	0.12
Vegetable group	6.93 ± 6.1	7.61 ± 7.1	0.54
Fruit group	10.2 ± 9.9	10.7 ± 6.7	0.73
Meat, poultry, fish, dry beans, eggs and nuts group	4.36 ± 3.7	5.45 ± 3.3	0.068
Bread, cereal, rice and pasta group	6.27 ± 4.1	5.14 ± 4.3	0.11
Fats, oils and sweets group	3.56 ± 3.2	3.81 ± 3.1	0.63

Table 4.

Consumption of food groups and food items at pre- and post-measure

Food groups and food items	Pre-Measure FGP Servings Mean ± SD (N=144)	Post-Measure FGP Servings Mean ± SD (N=144)	Significance (2-tailed)
Milk, yogurt and cheese group	5.59 ± 4.5	2.7 ± 2.1	0.0001
Vegetable group	7.28 ± 6.6	1.97 ± 1.9	0.0001
Fruit group	10.4 ± 8.4	1.65 ± 1.5	0.0001
Meat, poultry, fish, dry beans, eggs and nuts group	4.92 ± 3.6	1.82 ± 1.1	0.0001
Hotdog	0.23 ± 0.5	0.19 ± 0.3	0.446
Hamburger	0.24 ± 0.4	0.17 ± 0.2	0.155
Fish	0.27 ± 0.5	0.07 ± 0.1	0.0001
Chicken	0.68 ± 0.9	0.26 ± 0.3	0.0001
Beans	0.47 ± 0.6	0.25 ± 0.4	0.0001
Nuts	0.72 ± 1.0	0.17 ± 0.3	0.0001
Bread, cereal, rice and pasta group	5.68 ± 4.3	2.43 ± 2.2	0.0001
Fats, oils and sweets group	3.7 ± 3.2	6.47 ± 5.0	0.0001
Butter	0.32 ± 0.4	0.88 ± 1.3	0.0001
Chocolate	0.6 ± 0.8	1.26 ± 1.7	0.0001
Candy	0.41 ± 0.6	0.67 ± 1.2	0.017
Cake	0.37 ± 0.7	0.48 ± 0.8	0.05
Sugar	1.08 ± 1.6	1.59 ± 1.7	0.017

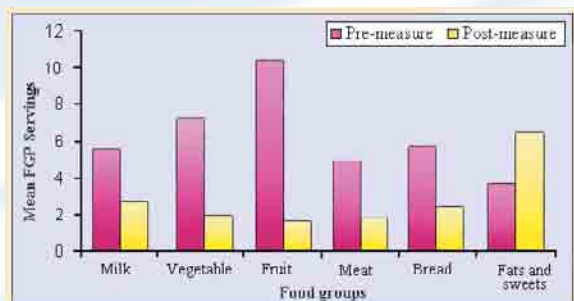


Figure 1. Consumption of food groups at pre- and post-measure.

Most important, statistically significant increase was recorded in consumption of fats and sweets group (by 2.8 servings) from pre- to post-measure. Paired samples *t* tests were further performed on food items in this category to reveal items that constituted increase in total fats and sweets group (Table 4.).

The results showed statistical significant increase in consumption of chocolates (by 0.7 servings), candy (by 0.3 servings), and butter (by 0.6 servings) from pre- to post-measure. Furthermore, statistical significant increase in consumption of sugar (by 0.5 servings) was also reported. An increase in consumption of cake was recorded (by 0.1 servings), with marginal significance.

McNemar test revealed that frequencies of

having breakfast and lunch also decreased significantly at post-test ($p < 0.0001$ and $p < 0.017$, appropriately). Moreover, the regimen of meal consumption (fixed and varying hours of having meal) was also significantly changed. More students (91% vs. 54.8%) reported eating at variable hours at post-measure (Table 5).

To meet the daily minimum servings according to FGP recommendations it is necessary to consume minimum 2 servings each of fruits, milk and meat; 3 servings of vegetables; and 6 servings of bread group [*The Food Guide Pyramid, 1992*]. At post-measure the mean reported intakes of meat (1.8 servings), vegetable (1.9 servings), fruit (1.6 servings) and bread (2.4 servings) groups were significantly lower compared to FGP requirements [*The Food Guide Pyramid, 1992*]. Meanwhile, the mean reported intake of fat and sweets group was significantly higher compared to FGP requirements (6.5 servings vs. sparingly).

Discussion

The results of this study demonstrate that the first-year foreign students change their dietary habits after arrival in Armenia. The consumption of meat, vegetable, fruit and bread groups decreased compared to FGP recommendations. However, the study found a significant increase in consumption of the fat and sweets group. It is

Table 5.

Dietary habits of study participants at pre- and post-measure

Variable	Pre-Measure (N=144) % (n)	Post-Measure (N=144) % (n)	Significance (2 tailed)
Usually eating meals at:			
Fixed hours	45.1% (65)	9.1% (13)	0.0001
Variable hours	54.9% (79)	90.9% (131)	0.0001
Frequency of eating breakfast:			
4-6 times a week	69.4% (100)	58.3% (84)	0.017
1-3 times a week	30.6% (44)	41.7% (60)	0.017
Frequency of eating lunch:			
4-6 times a week	91.7% (132)	67.4% (97)	0.0001
1-3 times a week	8.3% (12)	32.6% (47)	0.0001

likely that the general failure to meet the recommended servings of all food groups is due to the large percentage of students, who skip meals, decrease serving sizes, and avoid certain nutritious foods [Brevard P., Ricketts C., 1996]. These patterns can be explained by irregular class schedules, class overload as well as by insufficient food preparing skills and lack of finance among foreign students who live far from their families [McArthur L. et al., 2000; College Students, 2006].

Decrease in meat consumption is consistent with other study findings [Reeves S., Henry C., 2000; Hiza H., Gerrior S., 2002]. This decrease is presumed to be due to the cost, rather than dietary preferences, since meat products such as hot dogs and hamburgers were still eaten regularly. Fish is much cheaper and easier to buy in native countries of foreign students (Iran, India) because of the close proximity of the sea and this may explain why less fish is eaten in Armenia. The decrease in consumptions of both red and white meat might be explained by the lack of time and food preparing skills among foreign students [McArthur L. et al., 2000]. However, there are some studies that found an increase in meat group consumption among foreign students, although the protein increase was very small [Anderson A. et al., 1995; Schultz J. et al., 2003].

The reason for a decrease in both fruit and vegetables consumption is likely to be due to the fact that fruit and vegetables are comparatively more expensive in Armenia and there is not as much variety as on Iranian or Indian market. The research similarly found that there was a decrease in the vegetables consumed and the variety of vegetables eaten on arrival in foreign country but conversely found an increase in the consumption of fruit [DeBate R. et al., 2001].

Indian and Persian cuisines are distinguished by the higher proportionate use of rice, which is included in the bread group [; Wikipedia: Indian Cuisine, 2007; Wikipedia: Persian Cuisine, 2007]. However, the obtained data show that study participants consume less bread group servings than the FGP recommendations. Often skipping meals and insufficient food preparing skills might

explain decrease in bread group consumption.

The present study has shown a significant increase in consumption of fat and sweets group. Moreover, the study determined that consumed serving sizes of fat and sweets group are much higher than FGP recommendations. These findings are similar to earlier study findings suggesting that foreign students usually increase fat consumption in their diet since students consume more fast-food and sweets [French S. et al., 2001; Hiza H., Gerrior S., 2002]. University “food malls” is considered to provide a multitude of affordable and convenient fast-food variants to students. These fast foods are high in fat and offer high calorie choices contributing to an unbalanced diet [Hiza H., Gerrior S., 2002].

However, the increase in consumption of the fat and sweets group was not as much to increase students’ weight. The study revealed a decrease in mean weight and therefore a decrease in BMI of foreign students indicating the imbalance between energy intake and expenditures. This would suggest that the students are not able to modulate their energy intakes and diet of foreign students does not provide sufficient energy to cover their energy expenditure [DiGiacchino R. et al., 2001]. Therefore, foreign students are not able to remain in energy balance and weight stable. This might be explained by often skipping meals and failure to eat servings according to FGP recommendations. However, there are studies that found the increase of body weight after starting education at the universities. This is explained by the fact that foreign students typically have little time for preparing food and often tend to consume large amounts of fast food, which offer a quick and convenient means of obtaining meals [Belaski A., 2001; French S. et al., 2001].

The insufficient intake of all food groups with the exception of increased consumption of fat and sweets group is associated with low intake of essential nutrients such as proteins, vitamins, minerals, etc. The revealed unhealthy eating habits among foreign students might have substantial impact on their health as well as academic performance.

However, it is impossible to show in the present study that revealed changes in dietary habits of foreign medical students are due to education in a foreign country. These changes may be attributable to starting education at the university. This suggests a need to conduct a study that will also explore dietary changes among local medical students during their first year at YSMU and further comparison of the results may demonstrate the extent to which a foreign country affects dietary changes of foreign medical students.

This study has some limitations. First of all, there is low generalizability of the results since only foreign students from medical university were included in the study, which might not be representative of the whole foreign student population in Armenia. However, healthy practices adopted by foreign medical students are expected to enhance their psychological readiness to participate in creation of the environment of

healthy behavior among their peers from foreign countries [Parveen R., 2006].

The recall bias is one of the most frequent types of biases in these types of studies. However, recall bias was minimized in this study since the pre-measure data regarding dietary habits in native countries of foreign students were collected upon their arrival in Armenia after winter holidays.

Conclusion

Dietary habits of YSMU foreign medical students significantly deteriorate by the end of the first year of study. The observed dramatic decrease in consumption of important FGP food groups may have substantial impact on students' physical and psychological health. Revealed dietary alterations can aid in development of early nutritional intervention programs that are based on nutritional education and appropriate management of available and largely affordable food items.

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