

Student's habits related to fruits and vegetables and their determinants

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Abstract: The aim of the study was to determine the importance of students' nutritional knowledge and preferences in determining their habits related to fruits and vegetables. The survey was conducted in December 2014 among 247 students of the first and final year of study on nutrition sciences at the Warsaw University of Life Sciences. Participants' nutritional knowledge, frequency of consumption of the various groups of vegetables and fruits, preferences, and socio-demographic characteristics were assessed. Frequency analysis, multi-way tables, Chi square and the U Mann-Whitney tests were performed. Significance of the differences was determined at $p \leq 0,05$. The level of nutrition knowledge was assessed as satisfying. The final year students had significantly higher levels of nutritional knowledge than the ones beginning their studies. The nutritional knowledge significantly differentiated the frequency of consumption of certain vegetables and fruits. The higher was the level of nutritional knowledge, the more often respondents ate dried fruit, root vegetables, nightshade plants and frozen vegetables. The nutritional knowledge had no effect on how many times fruits and vegetables were consumed during the day. The differences in the consumption of fruits and vegetables were also demonstrated after taking into account the socio-demographic situation and preferences for individual groups of products. A significant impact of nutritional knowledge on the consumption of some vegetables and fruits within a group of students confirms the importance of nutritional education for students, not just the ones studying in the fields that include this knowledge in the program of the studies.

Keywords: students, nutritional knowledge, fruits, vegetables, consumption, higher education.

Introduction

Proper nutrition is based on providing adequate amounts of all essential nutrients for the body as well as providing energy as needed depending on age, sex, physical activity and physiological state. The choice of food and the frequency of its consumption vitally impact the proper satisfaction of the needs of the body and can reduce the risk of many diseases (Wang, Li, 2014). Vegetables and fruits constitute one of the most important food groups. They are good sources of among other things vitamins, minerals and fiber in the diet. In order to improve the general health of the population and to reduce the risk of certain non-infectious diseases World Health Organization recommends consumption of 3 - 5 servings of vegetables and 2 - 4 servings of fruit a day, which makes 400 - 500 g of fruit or vegetable daily except for potatoes and other tubers rich in starch (Fruits and vegetables... 2004). The research shows, however, that almost half of the EU citizens do not meet the recommendations for consumption of vegetables and fruits in the amount of 400 grams per day per person. The largest intake of fruits and their products per capita was recorded in Luxembourg, Ireland, Austria, Greece and Italy, and the lowest in Bulgaria, Latvia, Romania, Slovakia and Poland (Fruit and vegetable..., 2012). The already existing research showed that among the youth the consumption of fruit and vegetable was also insufficient in comparison to dietary guidelines (Kowalska, 2010; Larson, Neumark-Sztainer, 2007; Pearson, Biddle, 2009).

Studying tends to alter the nutritional behaviors as a result of lifestyle changes at times accompanied by the change of the place of residence. The diet of the students is also affected by their financial situation, the offer of the universities' canteens, individual tastes and the level of nutritional knowledge. The lifestyle of students is characterized by irregularity, intensive studying and, increasingly, gainful employment linked with the fast pace of life. All the aforementioned factors contribute to irregular diet, including adverse changes in the consumption of fruit and vegetables. People with higher education are often recognized in society as a model of healthy behavior. Due to their subsequent modeling impact it is necessary to implement healthy nutritional behaviors among students. Dietary preferences bear vital importance among the factors determining the choice of food and its consumption – simultaneously they often consolidate deficiencies in the diet (Szczęsna, Wojtala, 2005). On the contrary nutritional knowledge is regarded as a factor contributing to the occurrence of recommended behaviors.

Understanding the relation between those factors and eating behaviors is important from the perspective of organizing the education on nutrition for students.

The aim of the study was to determine the importance of students' nutritional knowledge and preferences in determining their habits related to fruits and vegetables.

Methodology

The survey was conducted in December 2014 among 247 students of the Faculty of Human Nutrition and Consumer Sciences, Warsaw University of Life Sciences in Poland. In the study group 128 respondents (52.2%) were in the final year (fifth year of university), and 119 respondents (47.8%) in the first year of studies. Women accounted for 90% of the study population. More than half of respondents (51.4%) came from cities with over 50 thousand residents, 23.1% from towns up to 50 thousand residents and 25.5% from the rural environment. Almost half of the respondents (48.6%) declared that while studying they live in their family home, others live in a rented room or apartment (27.1%) or in a dormitory (24.3%). The vast majority of respondents (78.2%) assessed their financial situation as average, about 1/5 of the respondents (19.0%) as above average, and 2.8% as below average.

The assessment of nutritional knowledge was conducted using the Nutritional Knowledge Scale (Kwestionariusz do..., 2014). The scale contains 25 statements about food and nutrition with the possibility to respond: "I do not agree", "I agree" or "I do not have an opinion". The usual frequency of consumption of vegetables, ie. roots (eg. carrots, parsley, radish), cucurbits (eg. cucumber, pumpkin, zucchini), brassica and leaf vegetables (eg. cabbage, broccoli, lettuce, spinach), solanaceous vegetables (eg. tomato, peppers), potatoes, legumes and frozen vegetables, and fruits (local, southern, frozen, dried) was expressed on the 6 – point scale, where: 1 – never, 2 – less often than once a week, 3 – once a week, 4 – 3 - 4 times a week, 5 – once a day, 6 – several times a day. In addition, study participants indicated the number of servings of fruits and vegetables they consumed during the day. Preferences of the participants considering different groups of vegetables and fruit were shown on a 5-point hedonic scale, where: 1 – I strongly dislike it, 2 – I do not like it, 3 – I neither like nor dislike it, 4 – I like it, 5 – I like it very much. The socio-demographic situation of students was characterized in terms of three traits, namely: the place of origin (rural environment, city below 50 thousand residents, the city over 50 thousand residents), place of residence during the studies (family home, dormitory, rented room or apartment, others) and declared financial situation (below average, average, above average).

Statistical analysis was performed using Statistica StatSoft 10.0 GB. During the assessment of nutritional knowledge, in the case of individual statements for each correct answer („agree” or „disagree”) the respondent obtained 1 point and 0 points for an incorrect answer or „no opinion”. Then, based on the total number of points obtained the subjects were separated into three groups: characterized by insufficient nutritional knowledge (0 - 8 points), satisfactory knowledge (9 - 16 points) and a good nutritional knowledge (17 - 25 points). During the statistical analysis the frequency analysis was performed and cross-tables were used. The test of the significance of differences between groups for categorical variables was performed using a Chi-square test. Comparison of the nonparametric features was performed with Mann-Whitney U test (U MW) or Kruskal-Wallis test (KW). Spearman's rank correlation coefficient (rho) was applied to describe the strength of dependence between the two variables described using ordinal scales. The significance of differences was determined at $p \leq 0.05$.

Results and Discussion

More than a half of the respondents had knowledge about nutrition on a good level, while approximately 2/5 of people – on a sufficient level. Significantly more students in their final year of studying in comparison with those of the first year were characterized by a good level of nutritional knowledge. However, significantly more first-year students had sufficient knowledge of nutrition. Similar differences in nutritional knowledge of students in the fields related to food, nutrition and medicine has been indicated in other studies (Kołajtis-Dołowy, 2010; Wyka, Żechałko-Czajkowska, 2006). The percentage of people with insufficient knowledge of nutrition was small and there were no differences found after taking into account the year of studies (Table 1).

Table 1

Structure of respondents with their level of nutritional knowledge and the year of their university career (%)

Level of nutritional knowledge	First year of studying	Last year of studying	Total population
Insufficient	4.2	0.0	2.0
Sufficient (IS)	72.3	14.1	42.1
Good (IS)	23.5	85.9	55.9

IS – statistically significant differences at $p < 0.05$

Source: own research

The degree of preference for seven groups of fruits and vegetables proved to fit in the range 4.0 - 5.0, which means the participants liked the products. The local and southern fruits proved to be the most popular (mean value ≥ 4.5). The nightshade plants, root vegetables, brassicas and leaf vegetables, and cucurbits were all among the popular products (mean value of 4.0 - 4.4). The dried fruits, potatoes and legumes were less appreciated (mean value of 3.5 - 3.9). The lowest preferences were declared for frozen vegetables (3.4 ± 1.0) and frozen fruit (3.2 ± 0.9) (Table 2).

Table 2

The preferences for fruits and vegetables within the study population (%)

Products	Respondents' preferences*					X \pm SD**
	1	2	3	4	5	
local fruits	0.0	0.8	2.8	44.6	51.8	4.5 \pm 0.6
southern fruits	0.0	1.2	2.8	38.9	57.1	4.5 \pm 0.6
frozen fruits	4.5	18.6	38.1	34.8	4.0	3.2 \pm 0.9
dried fruits	6.9	11.4	19.1	46.3	16.3	3.5 \pm 1.1
root vegetables	0.0	1.6	11.7	66.8	19.8	4.0 \pm 0.6
cucurbits	1.2	2.8	15.0	58.3	22.7	4.0 \pm 0.8
brassicas and leaf vegetables	0.8	2.0	13.0	57.9	26.3	4.1 \pm 0.7
nightshade plants	0.8	0.8	4.9	47.8	45.8	4.4 \pm 0.7
potatoes	1.2	7.3	24.7	49.4	17.4	3.7 \pm 0.9
legumes	3.6	9.3	22.7	51.8	12.6	3.6 \pm 0.9
frozen vegetables	5.3	13.0	29.6	43.3	8.9	3.4 \pm 1.0

*the 5-point scale where: 1 - I strongly dislike it, 2 - I do not like it, 3 - I neither like nor dislike it, 4 - I like it, 5 - I like it very much.

** X - mean value; SD - standard deviation

Source: own research

Only in the case of preferences for potatoes and frozen vegetables differences were found between first and final year students. Final year students were fonder of potatoes (3.9 ± 1.0) and frozen vegetables (3.5 ± 0.9) compared with first year students (3.6 ± 1.0 and 3.2 ± 1.1).

The frequency of eating fruits and vegetables is presented in Table 3. Majority of respondents consumed nightshade plants (45.7%) and national fruits (38.1%) on daily basis (Table 3). Declared frequency of consumption of specific groups of fruits and vegetables was low. Only in the case of local fruits and nightshade vegetables the average frequency was slightly higher than 3-4 times per week (mean values > 4.0). However, in the case of frozen fruit and vegetables, legumes and dried fruits the average frequency of consumption was less than once a week (average value < 3.0). Too rare consumption of fruits and vegetables in the population of Polish students was also demonstrated in other studies (Kowalska, 2010; Stefańska, Ostrowska, 2011).

Table 3

The frequency of consumption of vegetables and fruits within the study population (%)

Products	Frequency of consumption*						X ± SD**
	1	2	3	4	5	6	
local fruits	0.0	3.6	19.0	39.3	27.2	10.9	4.2 ± 1.0
southern fruits	0.4	10.5	27.1	43.3	15.5	3.2	3.7 ± 1.0
frozen fruits	23.9	64.0	7.6	4.5	0.0	0.0	1.9 ± 0.7
dried fruits	13.0	51.8	19.0	10.1	4.9	1.2	2.5 ± 1.1
root vegetables	0.0	8.5	29.1	39.7	16.2	6.5	3.8 ± 1.0
curcubits	0.0	19.0	35.2	33.2	7.7	4.9	3.4 ± 1.0
brassicac and leaf vegetables	0.8	13.4	40.9	30.4	9.2	5.3	3.5 ± 1.0
nightshade plants	0.4	3.6	12.6	37.7	25.5	20.2	4.5 ± 1.1
potataoes	2.8	20.2	31.2	38.9	6.9	0.0	3.3 ± 1.0
legumes	5.3	62.3	22.3	7.7	2.0	0.4	2.4 ± 0.8
frozen vegetables	8.1	48.2	27.5	13.0	2.0	1.2	2.6 ± 1.0

* 6-point scale, where 1 – never; 2 – less than 1 time per week; 3 – once a week; 4 – 3-4 times a week, 5 – once a day; 6 – several times a day

** X - mean value; SD - standard deviation

Source: own study

Final year students were characterized by significantly higher frequency ($p = 0.029$) of consuming frozen vegetables (2.7 ± 0.9) compared with the first year students (2.4 ± 0.9). In the case of the frequency of consumption of other fruits and vegetables there were no statistically significant differences found depending on the year of studying. However, the bigger was the city represented by the students, the more often they consumed cucurbit vegetables and nightshade plants (Table 4).

Table 4

The frequency of consumption of selected vegetables with regard of their place of origin

Products	Place of origin	X ± SD*	Significance
Curcubits	Rural environment	3.13 ± 0.98	0.009
	City below 50 thousand	3.61 ± 1.00	
	City above 50 thousand	3.52 ± 1.06	
Nightshade plants	Rural environment	4.05 ± 1.01	< 0.001
	City below 50 thousand	4.53 ± 1.02	
	City above 50 thousand	4.61 ± 1.12	

* X – mean value (6-point scale, 1 – never to 6 - several times a day); SD - standard deviation

Source: own study

People living in the family home consumed brassicas and leaf vegetables and potatoes more often. (Table 5).

Table 5

The frequency of consumption of selected vegetables and potatoes with regard to the place of residence while studying

Products	Place of residence	X ± SD*	Significance
Brassicac and leaf vegetables	Family home	3.65 ± 0.95	0.017
	Dormitory	3.25 ± 0.98	
	Rented room or apartment	3.40 ± 1.13	
Potatoes	Family home	3.47 ± 0.91	0.002
	Dormitory	3.15 ± 0.90	
	Rented room or apartment	3.00 ± 1.00	

* X - mean value (6-point scale, 1 - never to 6 - several times a day); SD - standard deviation

Source: own study

The higher was the level of nutritional knowledge of study subjects, the more often they ate dried fruit, root vegetables, nightshade plants and frozen vegetables. Nevertheless, the correlations between these variable were significant but weak (Table 6).

Table 6

Coefficients of bilateral correlation between the level of nutritional knowledge and frequency of consumption of fruits and vegetables

Products	Level of nutritional knowledge	
	Coefficient of bilateral correlation	Significance
Dried fruits	0.19	0.003
Root vegetables	0.17	0.007
Nightshade plants	0.16	0.012
Frozen vegetables	0.18	0.004

Source: own study

There was no statistically significant relation indicated between the level of nutritional knowledge and the frequency of consumption of local and southern fruits nor frozen vegetables, cucurbits, brassicas and leaf vegetables, potatoes and legumes. Some researchers have shown that the higher level of knowledge is usually accompanied by a more healthy eating habits (Goryńska-Goldmann, Ratajczak, 2010; Kolodinsky, Harvey-Berino, 2007), but the lack of association between these variables was also observed in some research (Misiarz, Malczyk, 2013; Uramowska-Żyto, Kozłowska-Wojciechowska, 2004).

In the case of local fruits ($r = 0.30$), southern fruits ($r = 0.24$), frozen fruits ($r = 0.32$), dried fruits ($r = 0.64$), root vegetables ($r = 0.20$), cucurbits ($r = 0.31$), brassica and leaf vegetables ($r = 0.22$), solanaceous vegetables ($r = 0.35$), potatoes ($r = 0.31$), legumes ($r = 0.45$) and frozen vegetables ($r = 0.60$), it was indicated that the more preferred was a group of fruits or vegetables among the respondents, the more often products belonging to it were consumed. The strongest bilateral relation between preferences and frequency of consumption was observed for the two most rarely consumed groups of products, namely dried fruits and frozen vegetables.

Approximately 1/3 of the study population (33.6%) declared that they consume three servings of vegetables and fruits a day. Every fifth student consumed two (20.6%) or four (19.0%) servings of vegetables and fruits. More than 4 servings per day were consumed by 15.4% of respondents, and one serving by 11.4% of people. An insufficient number of servings of fruits and vegetables per day was also demonstrated in other studies (Larson, Neumark-Sztainer, 2007; Stefańska, Ostrowska, 2011, Wyka, Żechałko-Czajkowska, 2006). There were no significant differences indicated between the number of servings of vegetables and fruits consumed per day and the year of studying, the place of origin, the place of residence during the studies, the preferences, the nutritional knowledge of the respondents. However, other studies have shown that a greater percentage of people with higher level of nutritional knowledge ate at least five portions of fruits and vegetables a day, compared to those with lower levels of knowledge (Wardle, Parmenter, 2000).

Approximately 2/3 of the surveyed students ate fruits for lunch and 1/3 students for breakfast (Table 7).

Table 7

Structure of respondents with regard to the meals containing vegetables and fruit (%)

Product	Meal (%)					
	Breakfast	Lunch	Dinner	Teatime	Supper	Snacks
Fruits	30.0	61.9	4.5	13.0	16.2	11.7
Vegetables	55.1	23.9	93.5	36.4	71.7	1.7

The values do not add up to 100 because each respondent could have given more than one answer.

Source: own study

A small percentage of people eat fruits as a part of dinner. Vegetables are most often eaten for dinner, while 3/4 of respondents consumed them for dinner, and more than half of the respondents for breakfast. The others ate them during teatime or lunch (Table 7). Nevertheless, another research have shown that the vegetables were most often consumed during the main meals, rarely between meals, and fruits were regarded as snacks (Stefańska, Ostrowska, 2011).

Conclusions

The analysis indicated that:

- final year students had significantly higher levels of nutritional knowledge than ones who had just started their studies;
- nutritional knowledge of the respondents significantly differentiated the frequency of consumption of certain vegetables and fruits. Preferences declared in regard to different groups of vegetables and fruits determined the frequency of consumption of all groups of fruits and vegetables, though the strongest correlations were found for the least frequently consumed products;
- there were no differences indicated in the number of servings of fruits and vegetables consumed after taking into account the nutritional knowledge and respondents' preferences for these groups of products.

The significant impact of nutritional knowledge and preferences on eating some vegetables and fruits confirms the legitimacy of including this group of products in nutritional education for the general population. In the case of students, not just ones studying nutrition sciences where nutritional knowledge is included in the curricula, such education is of particular importance. Its aim should be to disseminate the knowledge taking into account the already established preferences for vegetables and fruits.

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