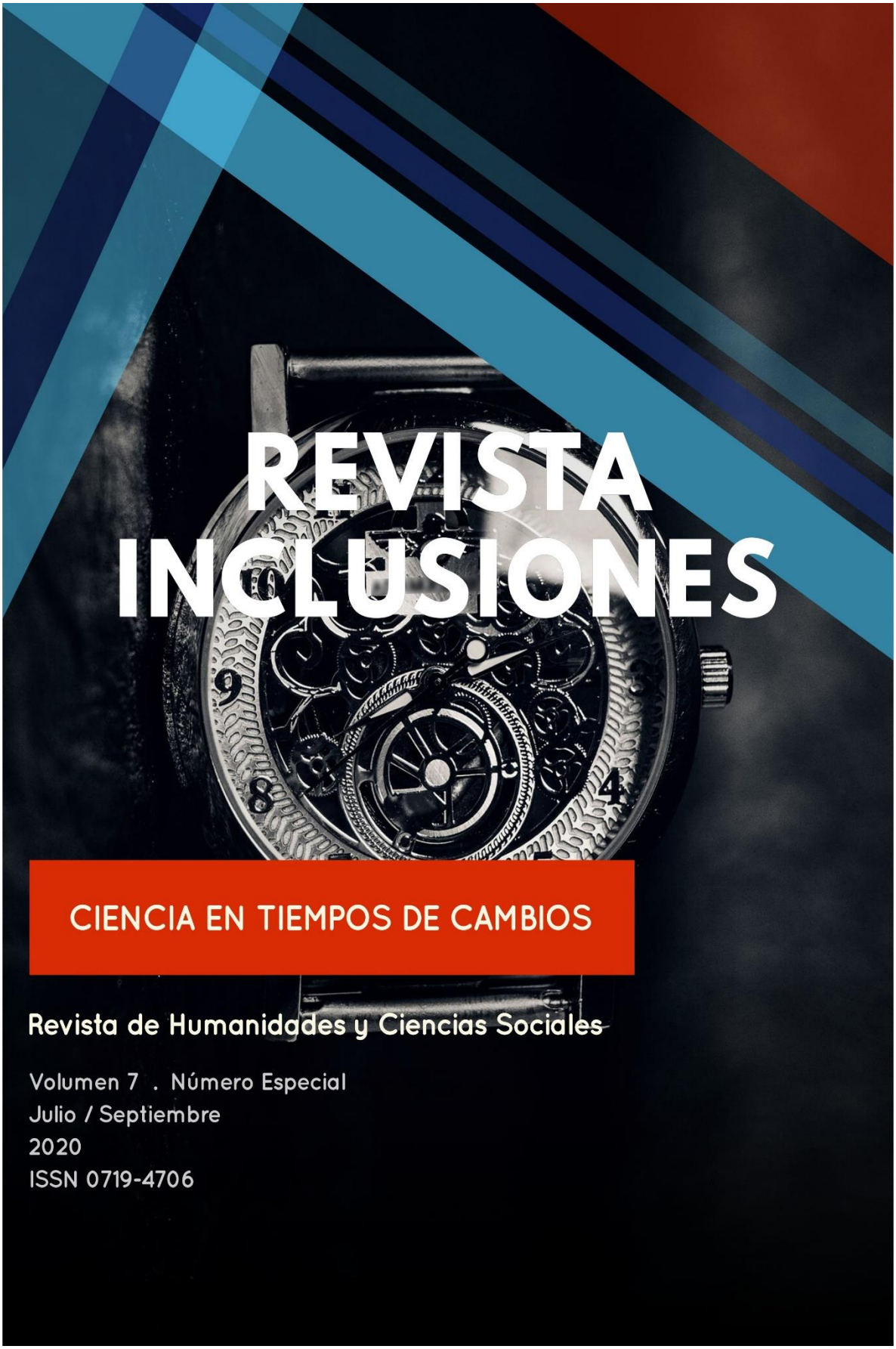

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MAJORING INFLUENCE ON THE DIET QUALITY IN UNIVERSITY STUDENTS

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Abstract

Disordered eating in students is often associated with the lack of knowledge on these issues. The purpose of the present study was to identify the association between diet quality of the students, their majoring and their competence in nutritiology. The comparative analysis of dietary habits, energy and macronutrientin take and eating behaviour in students, who majored in nutrition technology (NTD) and in economics (ED), was performed. Food diaries were analyzed, questionnaire survey and testing was conducted among 187 male and female first year and fourth year students from the Orel State University of Economics and Trade. Statistical analysis was conducted by Wilcoxon T-test, Mann-Whitney U-test, Pearson's χ^2-test and McNemar's test. The results of the study showed that first year NTD and ED students lacked protein and had excessive amount of fats and carbohydrates in their diet, energy value exceeded the norm. Fourth year NTD students protein consumption was 3.9 % below the norm, ED students – 15.4 % below the norm. Fats and carbohydrates content exceeded the normal values by 4.9 % and 3.2 % in NTD students and by 20 % and 25.9 % in ED students, respectively. Energy value of NTD and ED student diets was 2.7 % and 21.4 % higher than the norm, respectively. The differences in parameters values between the groups were statistically significant ($p \leq 0.01$). Positive changes were observed in NTD fourth year students meal patterns. However, there was no significant difference between the data on meals frequency and daily food consumption distribution in NTD and ED students. The association between the changes of eating behavior

stereotypes and competence in nutritiology was identified in NTD and ED students ($p \leq 0.01$). The share of fourth year NTD students with adequate eating behavior increased by 11.6 % in comparison with ED students. The limiting type of deviant eating behavior in NTD students prevailed. Thus, the increase of competence in nutritiology positively influences on the improvement student diet quality.

Keywords

Students – energy and macronutrient consumption – meal patterns – eating behavior – majoring

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Introduction

Young students represent a specific population group that has their own peculiarities in a way of life, values, behavior stereotypes and motivation. At present, the level of physical development and health status in students cause serious concern. Many teenagers suffer from obesity, diabetes mellitus, cardiovascular disorders and other nutrition related diseases, which develop in student years because of disordered eating.[1] Nutrition disbalance regarding macronutrients and micronutrients and energy value is observed in the significant part of modern students. The scientists highlight the deficit of iodine, selenium, zinc, the majority of water-soluble and fat-soluble vitamins, native proteins consumption and the excess carbohydrates and fats intake[2]. Inadequacy of students diet is associated with the limited range of the consumed products, excessive consumption of refinements, high-caloric products, fast food and beverages, containing synthetic additives, colorants and preservatives in great amounts[3]. In the majority of students the dietary habits do not comply with the hygienic principles of balanced diet. Mostly, students do not have regular meals, 1–2 meals per day, skip breakfast and have the main daily meal share at evening time. Many of them do not go to the canteen and prefer snacks to main meals[4]. There is some research data on the dependence of academic performance on the meal patterns: students with high academic performance in 80 % of cases have three meals per day, students with low performance had two meals per day[5].

[1] M. M. Melnikova, “Unbalanced nutrition as a risk factor of nutrition related diseases development”, Journal of Novosibirsk State Pedagogical University num 1(17) (2014); N. F. Lysova, “Peculiarities of nutrition of students from NSPU”, Sibirskiy pedagogical Journal num 9 (2012); C. Radnitz; K. L. Loeb; K. L. Keller; K. Boutelle y S. Marcus, “Effect of default menus on food selection and consumption in a college dining hall simulation study”, Public Health Nutr. (2018) Feb 7:1; K. Peltzer; S. Pengpid; V. Sychareun; A. J. G. Ferrer; W. Y. Low yT. N. Huu, “Turnbull, “Prehypertension and psychosocial risk factors among university students in ASEAN countries”, BMC Cardiovasc Disord. num 17(1) (2017); K. C. Hootman; K. A. Guertin y PhD P. A. Cassan, “Longitudinal changes in anthropometry and body composition in university freshmen”, J Am Coll Health num 65(4) (2017); S. K. Lipson y K. R. Sonneville, ”Eating disorder symptoms among undergraduate and graduate students at 12 U.S. colleges and universities”, Eat Behav. Num 24 (2017) y A. S. Al-Rethaiaa; A. E. Fahmy y N. M. Al-Shwaiyat, “Obesity and eating habits among college students in Saudi Arabia: a cross sectional study”, Nutr J. num 9 (2010).

[2] A. S. Goreva; E. A. Dyusenbaev y K. S. Tulenkova, “Analysis of students eating behavior”, Health and Education Millennium Vol: 17 num 4 (2015).

[3] O. П. Balykova; A. P. Tsybusov; D. S. Blinov; N. N. Chernova y S. A. Lyapina, “The study of higher education students eating behavior as one of the main factors of health improvement”, Integration of education num 2 (2012); R. Poinhos; A. Diogo; V. Elisee; S. Pinhão y B. Oliveira, “Eating behaviour among undergraduate students. Comparing nutrition students with other courses”, Appetite num 84 (2015) y L. Wellard-Cole; J. Jung; J. Kay; A. Rangan y K. Chapman, “Examining the Frequency and Contribution of Foods Eaten Away From Home in the Diets of 18- to 30-Year-Old Australians Using Smartphone Dietary Assessment (MYMeals): Protocol for a Cross-Sectional Study”, JMIR Res Protoc num 7(1) (2018).

[4] I. N. Isaeva; G. V. Vozzhennikova; V. I. Gorbunov; A. M. Shutov y A. S. Verushkina, “Nutrition and some parameters of nutritional status in students”, Uliyanovsk Medical and Biological Journal, num 2 (2011); N. A. Drozhzhina y L. V. Marsimenko, “Peculiarities of eating behavior formation in students”, Issues of Dietology. Vol: 2 num 2 (2012); A. Dougkas; A. M. Minihane; D. I. Givens, “Differential effects of dairy snacks on appetite, but not overall energy intake”, Br J Nutr num 108 (2012) y C. Radnitz; K. L. Loeb; K. L. Keller; K. Boutelle y M. B. Schwartz, “Effect of default menus on food selection and consumption in a college dining hall simulation study”, Public Health Nutr. (2018) Feb 7:1.

[5] O. E. Bakumenko y A. F. Doronin, “The study of actual eating behavior in students from higher educational institutions”, Food industry num 11 (2008).

The identified nutrition disorders are observed not only in Russian students, but also in students from other countries and are associated with lack of competence in nutritiology[6]. The main sources of information about healthy nutrition are Internet resources, mass media and advertisement and not scientifically based recommendations[7]. The importance and effectiveness of educational programs for students diet quality improvement are supported by scientific studies[8]. However, these works mostly do not contain objective and all-sided evaluation of students eating habits change by the influence of competence in nutritiology.

The purpose of the present study was to identify the association between diet quality of students and their majoring and their competence in nutritiology. The authors suggested that increase of competence in nutritional principles positively influenced on nutritional and energy value, meal patterns and eating behavior of students.

Materials and Methods

The study was conducted in 2012 and 2016. The objects of the study were young people (male and female) who studied in the Orel State University of Economics and Trade. The study included the students from the departments of nutrition technologies (NTD) – 91 students (41 males and 50 females), and from the department of economics (ED) – 96 students (49 males and 47 females). During all the period of education NTD students had curricular disciplines on food production and nutrition, that gave them knowledge in nutritiology, unlike ED students. Average age of first year students was 19.9 ± 1.3 years old. According to the results of the preliminary questionnaire, all the examined students were classified as group one of physical work activity, i.e. a group with very low physical activity. The study entry criteria included informed participant consent, providing of the required information, being higher education student, age of 18–23 years old. Study exclusion criteria were acute infectious or somatic diseases during the study.

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[8] O.N. Glagoleva; D.V. Turchaninov y E.A. Vilms, "Efficiency of educational programs for the improvement of population dietary structure and anemias prevention", Hygiene and sanitary, num 94(7) (2015); C. Kyrkou; F. Tsakoumaki; M. Fotiou; A. Dimitropoulou y M. Symeonidou, "Changing Trends in Nutritional Behavior among University Students in Greece, between 2006 and 2016", Nutrients num 10(1) (2018); O. Matvienko; D. S. Lewis y E. Schafer, "A college nutrition science course as an intervention to prevent weight gain in female college freshman", J Nutr Educ num 33 (2001); L. M. Miller; L. A. Beckett; J. J. Bergman; M. D. Wilson; E. A. Applegate y T. N. Gibson, "Developing Nutrition Label Reading Skills: A Web-Based Practice Approach", J Med Internet Res.num 19(1) (2017); N. Yahia; C. A. Brown; M. Rapley y M. Chung, "Level of nutrition knowledge and its association with fat consumption among college students", BMC Public Health. Num 16(1) (2016); A. Korinth; S. Schiess y J. Westenhoefer, "Eating behaviour and eating disorders in students of nutrition sciences", Public Health Nutr. Num 13(1) (2010); R. Roy; B. Kelly; A. Rangan y M. Allman-Farinelli, "Food Environment Interventions to Improve the Dietary Behavior of Young Adults in Tertiary Education Settings: A Systematic Literature Review", J Acad Nutr Diet. Num 115(10) (2015) y J. Sandrick; D. Tracy; A. Eliasson; A. Roth y J. Bartel, "Effect of a Counseling Session Bolstered by Text Messaging on Self-Selected Health Behaviors in College Students: A Preliminary Randomized Controlled Trial", JMIR Mhealth Uhealth num 5(5) (2017).

The study (Figure 1) included several stages: evaluation of students individual dietary intake and meal patterns; identification of eating behavior disorders; evaluation of the healthy nutrition and healthy lifestyle awareness and identification of information sources on students healthy nutrition. Parameters comparison was performed on two levels (C): C1 — comparison by the number of academic years; C2 — comparison by majoring.

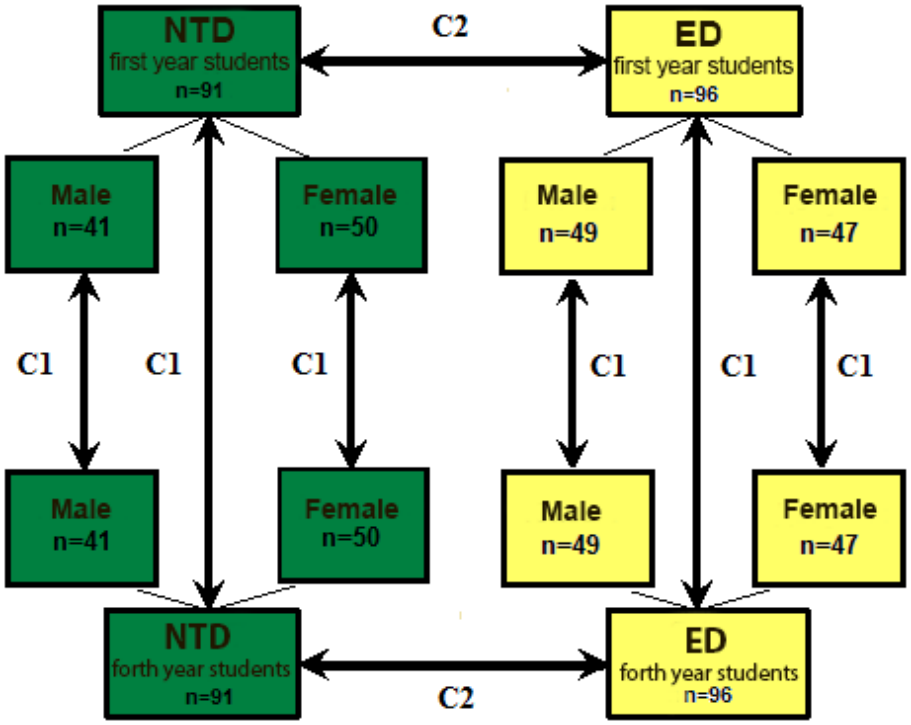

Figure 1
Study design

The authors used the method of 24-hour dietary regimen for evaluation of students individual dietary intake. For two weeks first year students (2012) and the same fourth year students (2016) had to keep their food diaries, where they wrote down information on the consumed dishes and products, time and amount of the consumed food. Dietary intake chemical content and energy value evaluation criteria were based on mean values for men and women aged 18–29 from the first group of physical work intensity, accepted according to the MR 2.3.1.2432-08 “Norms of physiological needs in energy and nutrients for different populations groups in the Russian Federation” (12.18.2008)[9]. Energy and nutrient intake was calculated based on Tables of chemical content and energy value of Russian food products[10].

The sociological method “Dutch Eating Behavior Questionnaire” (DEBQ, 1986, Netherlands) was used to evaluate the students eating behavior.

[9] MR 2.3.1.2432-08 “Norms of physiological needs in energy and nutrients for different populations groups in the Russian Federation”, approved by the Chief State Medical Officer of the Russian Federation on December 28th 2008.

[10] I. M. Skurikhin y V. A. Tutelian, Tables of chemical content and energy value of Russian food products (Moscow: DeLi Print, 2007).

The level of students awareness about healthy nutrition principles and healthy lifestyle was assessed by the test, which consisted of 30 questions. Successful test completion was at more than 15 correct answers. Questionnaire survey was used for identification of information sources on healthy nutrition. The obtained data was analyzed using package software Statistica–6 and MSExcel. The choice of statistical methods depended on the character of the studied features distribution and data types (qualitative and quantitative). Shapiro-Wilk test and Kolmogorov-Smirnov test were used to check the normality of distribution of proteins, fats, carbohydrates and energy. In all the studied cases the distribution was abnormal. The comparison of mean daily protein, fat and carbohydrate contents and energy values in the dietary intake of students from the associated groups (first and fourth year students) was performed by Wilcoxon's t-test, and in non-associated groups (NTD and ED) by Mann-Whitney U-test. The difference of statistical significance was set at $p \leq 0.01$. For estimation of statistical significance of difference between the meal pattern of non-associated groups, the authors used Pearsons's chi-square test, and between associated groups – McNemar's test. Critical level of significance was set at $p \leq 0.01$ and $p \leq 0.05$.

The significance of changes in eating behavior, level of awareness on the principles of healthy nutrition and association of information sources on healthy nutrition and majoring of students from non-associated groups was estimated by Pearson's chi-square test. Critical level of significance was set at $p \leq 0.01$. Nutrition is characterized as well-balanced, when a person receives during the day an adequate amount of the necessary macronutrients and micronutrients with the consumed food with respect to the energy needs. It is important to distribute the food energy value by time and by food intake frequency. According to the methodic recommendations[11], optimal meal pattern is from three to five meals a day with the following energy distribution: breakfast – 25 %, lunch – 35 %, snack – 15 %, dinner – 25 %. Based on the analysis of the data from students food diaries, the authors evaluated students meal patterns in each of the tested groups on different academic years. The data on number of students, who followed optimal meal pattern, is presented in Table 1.

Parameter	Number of students, %			
	NTD (n = 91)		ED (n = 96)	
	C_1		C_1	
	First academic year	Fourth academic year	First academic year	Fourth academic year
3–5 meals a day pattern	56.0*	65.9*	59.4	56.3
Distribution of food consumption in the first part of the day	39.6**	46.2**	34.3	31.3

Table 1

Meal pattern of first year and fourth year students of different majoring

* – parameter values are significantly different at $p < 0.01$, $\chi^2 = 9.00$;

** – parameter values are significantly different at $p < 0.05$, $\chi^2 = 6.00$.

According to the presented data, 42.3 % of the first year respondents did not follow the 3–5 meals a day pattern. Thus, 44 % of the tested NTD students and 40.6 % of the tested ED students had 1–2 meals per day, that were characterized by irregular timing and

[11] MR "The method of 24-hour individual dietary regimen evaluation", approved by the Leading non-staff specialist, dietitian of the Ministry of Healthcare of the Russian Federation on November 1st 2016.

spacing, or more than 5 meals per day. Main daily food share was consumed in the second part of the day in 63.1 % students (in 60.4 % NTD students and 65.6 % ED students).

By the fourth year only NTD students had positive changes in their meal pattern. The number of NTD students, who had 3–5 meals per day, increased by 9.9 % ($p < 0.01$), the number of students, who had meal before noon, increased by 6.6 % ($p < 0.05$) in comparison with the first year students. Similar dynamics in ED students was not observed.

There were no statistically significant differences identified on meal pattern and main daily food share consumption between NTD and ED students regardless of their academic year. Nutritional composition (proteins, fats, carbohydrates content) and energy value of the actual daily dietary intake of the students are presented in detail in Table 2.

Parameter	Groups of the tested students							
	Male				Female			
	NTD (n = 41)		ED (n = 49)		NTD (n = 50)		ED (n = 47)	
	C_1		C_1		C_1		C_1	
	First year	Fourth year	First year	Fourth year	First year	Fourth year	First year	Fourth year
Proteins content, g								
Norm	72				61			
Factual (Me)	61.4*	68.1*	64.1	60.5	51.3**	58.8**	52.7	52.3
1 quartile (Q_1)	57.3	66.0	55.2	57.9	46.2	56.9	49.9	49.3
3 quartile (Q_3)	66.2	72.2	68.7	65.5	54.5	60.7	55.6	54.2
Fats content, g								
Norm	81				67			
Factual (Me)	97.9*	82.3*	96.5	99.6	79.7**	72.7**	78.5	80.4
1 quartile (Q_1)	87.2	80.2	86.7	87.5	74.6	69.6	76.6	76.9
3 quartile (Q_3)	103.6	86.1	104.3	102.6	83.7	74.5	85.8	85.9
Carbohydrates content, g								
Norm	358				289			
Factual (Me)	410.3*	362.8*	435.0	450.6	372.3**	301.2**	378.6	370.6
1 quartile (Q_1)	353.1	324.6	391.2	420.5	342.2	276.7	331.4	327.8
3 quartile (Q_3)	464.6	383.1	467.8	461.8	395.8	314.7	397.1	400.5
Energy value, kcal								
Norm	2,450				2,000			
Factual (Me)	2,734.2*	2,464.2*	2,849.9	2,882.5	2,374.5**	2,074.4**	2,432.0	2,437.4
1 quartile (Q_1)	2,567.1	2,322.3	2,645.4	2,738.1	2,294.7	2,006.1	2,292.9	2,289.7
3 quartile (Q_3)	3,006.8	2,533.8	3,109.7	3,030.7	2,524.4	2,137.9	2,511.3	2,525.4

Table 2

Content of proteins, fats and carbohydrates and energy value in students average daily intake in comparison with the recommended norms

*$T_{0.01} = 252$, T_{emp} when compared with proteins, fats, carbohydrates and energy consumption is equal to 97, 12, 84 and 44, respectively, at $p < 0.01$

**$T_{0.01} = 397$, T_{emp} when compared with proteins, fats, carbohydrates and energy consumption is equal to 66.5, 101, 27 and 30 at $p < 0.01$

Based on the analysis of actual students food consumption, it was identified that first year students lacked protein in their diet. Protein consumption in NTD and ED students (males) was lower than physiological norm by 14.7 % and 11 %, respectively.

Protein consumption in the females was lower than the norm by 15.9 % (NTD) and 13.6 % (ED). By the fourth year positive tendency in protein consumption was observed only in NTD students. In males dietary protein content was 94.6 %, in females – 96.5 % from the normal, which was statistically significantly higher than during the first academic year ($p < 0.01$). No positive tendencies were observed in ED fourth year students nutrition. The level of protein consumption in males (89.0 %) and in females (86.4 %) was not significantly different from the same parameters during the first academic year (84.1 and 85.7 %, respectively). Fats content in the food intake of the tested first year students exceeded the norm. NTD and ED students (males) consumption was more than the norm by 25.8 % and 19.1 %, females consumption — by 19.3 % and 17.2 %, respectively. By the fourth year in NTD students of both sexes the consumption of fats significantly decreased ($p < 0.01$) and was closer to normal – 102.1 % in males and 108.4 % in females. In fourth year ED students general content of fats in their intake did not change significantly in comparison with the first year students and was equal to 123.0 % (in males) and 120.0 % (in females). The amount of carbohydrates, consumed by all the first year student groups, did not meet the physiological norms. In males the consumption of carbohydrates exceeded the norm by 17.9 % (NTD) and 21.5 % (ED), in female – by 28.3 % (NTD) and 31.0 % (ED). By the graduation, carbohydrates consumption in NTD students (males) significantly reduced ($p < 0.01$) and was closer to the norm – 101.3 % and 104.2 %, respectively. In fourth year ED students similar positive tendency was not observed. Carbohydrates content in students food intake (males) became 125.9 % from the norm and in females – 128.2 %, and did not differ from the data obtained during the first academic year. Due to increased consumption of fats and carbohydrates, the energy value of the daily food consumption in all the tested first year student groups exceeded the norm. NTD and ED students (males) daily food energy value exceeded the norm by 15.6 % and 16.3 %, in females it exceeded the norm by 19.1 % and 21.6 %, respectively. By the fourth academic year energy values of NTD students of both sexes daily food consumption significantly decreased ($p < 0.01$) and was closer to the normal – 100.6 % in males and 103.7 % in females. By the fourth academic year, energy value of ED students daily food consumption did not change significantly in comparison with the first year students and was equal to 128.0 % from the norm in males and 121.9 % in females. The identified disbalance in nutrients and energy consumption in NTD and ED first year students is explained by the limited amount of food products available for 2 weeks intake. Besides, the frequency of main products consumption did not comply with the healthy nutrition recommendations. Lack of proteins in first year students nutrition is explained by rare consumption of products and meals with valuable proteins source. Meat and fish products were present in the dietary intake as sausages, meat and fish half-finished products, tinned dishes more than three times per week, and genuine meat and fish – not more than one time per week. Rare consumption of milk and fermented milk products (especially cottage cheese) was also noted in students. Not more than 1/3 of NTD and ED first year students consumed these products every day. Disbalance of carbohydrates and fats in first year students is explained by daily consumption of confectionery, fast food (French fries, hot dogs, hamburgers, concentrates, chips, dried bread snacks) and fizzy drinks. For breakfast first year students from both groups preferred to have dishes from refined cereals (instant cereals, dry breakfast cereals) and not from whole grains. First year students preferred potatoes, pasta and white rice as a side dish. Fresh vegetables, fruit and berries were consumed rare, while tinned vegetables and fruit jams were eaten every day. Reassessment of the main products consumption frequency showed that NTD fourth year students two-week food intake was diverse. They started to consume fermented milk products, eggs, fresh vegetables, greenery, fruit and berries, meat and poultry dishes, fish and seafood, whole cereals, peas, beans more often and reduced the consumption of bakery and confectionary, high caloric souses (mayonnaise) and fast food. This tendency positively

influenced on nutritional content of the students actual food intake. The range of consumed products in ED students did not change significantly, as well as the frequency of consumed products. The summarized results of the comparative analysis of main nutrients and energy consumption by NTD and ED first year and fourth year students are presented in Figure 2.

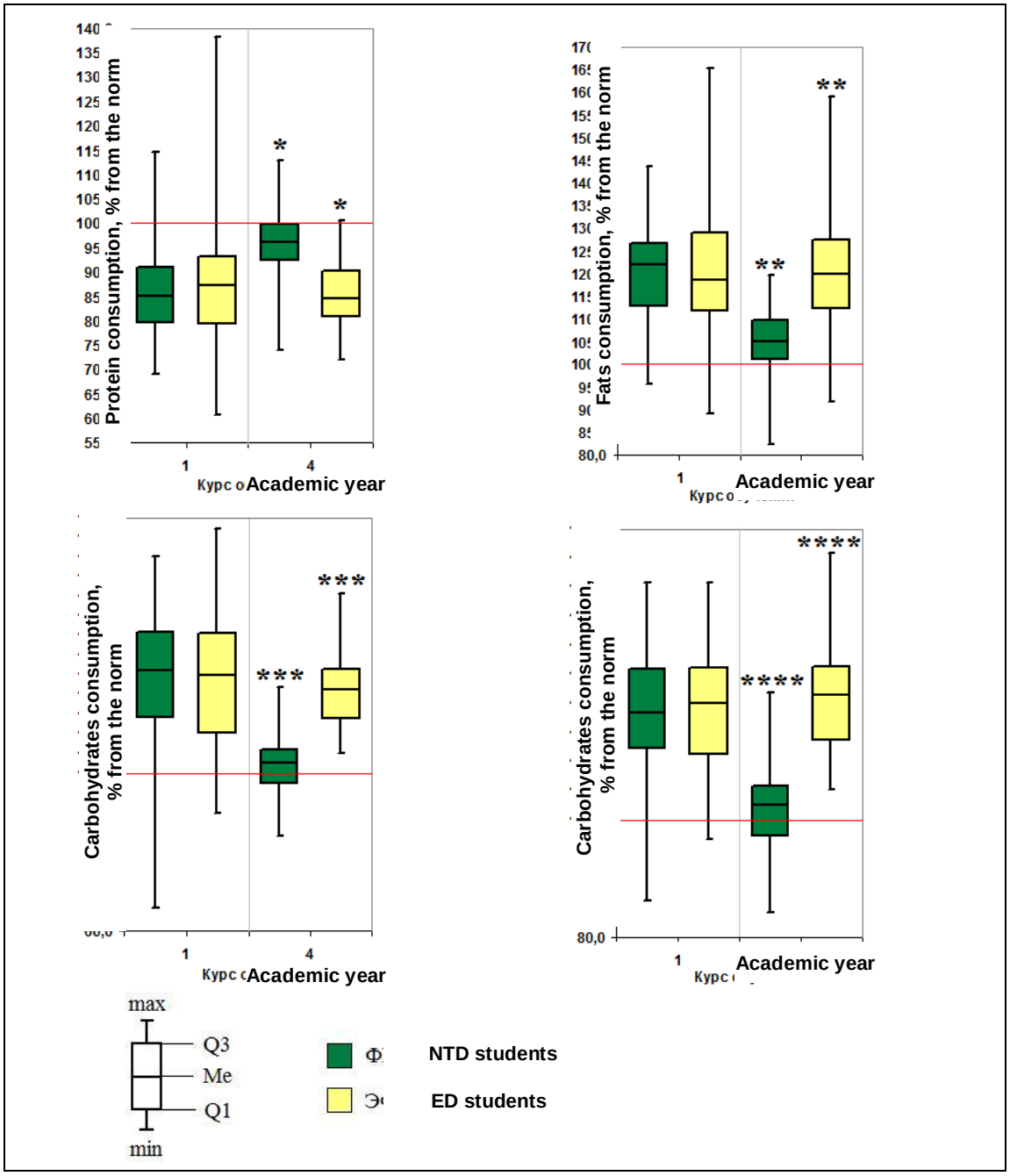

Figure 2
Summarized results of the comparative analysis of main nutrients and energy consumption by NTD and ED first and fourth year students

The difference is statistically different at:
* U = 874.5, p ≤ 0.01; ** U = 1,120, p ≤ 0.01; *** U = 616, p ≤ 0.01; **** U = 383.5, p ≤ 0.01

The analysis of the present data showed that NTD and ED first year students had a deficit of protein and excess of fats and carbohydrates in their dietary intake, food energy value was higher than the norm. Statistically significant difference in main nutrients and energy consumption between the groups was not observed.

NTD fourth year students median of protein consumption was lower than the norm by 3.9 % and ED students – by 15.4 %. Medians of fat and carbohydrates content exceeded the norm by 4.9 % and 3.2 % in NTD students and by 20 % and 25.9 % in ED students. The same parameter of energy value in NTD value was higher by 2.7 % and in ED students by 21.4 %. It should be mentioned that all the analyzed parameters had significant differences in NTD and ED students ($p \leq 0.01$). Besides, interquartile range of all the parameters was lower in NTD students.

The formation of dietary intake and meal pattern is determined by the type of eating behavior. For this reason, during the next study stage the authors evaluated students eating behavior by DEBQ testing. Eating behavior was evaluated as adequate (well-balanced) and inadequate (deviant) depending on a number of parameters, in particular, the place that it occupies in the hierarchy of values, quantitative and qualitative nutrition parameters. Deviant eating behavior is divided into the following types: external, emotiogenic and limited[12]. The results of NTD and ED first and fourth year students evaluation of eating behavior types are presented in Table 3.

Type of eating behavior	Number of students, %			
	First academic year		Fourth academic year	
	C_2		C_2*	
	NTD (n = 91)	ED (n = 96)	NTD (n = 91)	ED (n = 96)
Adequate	16.5	17.7	23.1	11.5
Deviant, including	83.5	82.3	76.9	88.5
Limited	19.8	21.9	32.9	20.8
External	34.1	41.7	18.7	42.7
Emotiogenic	29.6	18.7	25.3	25.0

Table 3

Distribution of students by the type of eating behavior

*Association between factorial and effective parameters was statistically significant at $p < 0.01$, $\chi^2 = 15.998$

The test results showed that in first year students the distribution of eating behavior types did not depend on the majoring. The majority of the first year students had deviant eating behavior with the prevalence of external type.

Retesting of the fourth year students showed that the distribution of respondents by eating behavior types had changed. The number of NTD students with adequate eating behavior increased by 11.6 % in comparison with ED students. NTD students deviant eating behavior was primarily of limited type, and among ED students external type of deviant eating behavior still prevailed. The recorded distribution of the respondents by the types of eating behavior statistically significantly depended on the scope of education ($p < 0.01$).

[12] E.G. Blinova; I.S. Akimova; O.S. Bogunova y L.V. Demakova, “Human body composition and students eating behavior”, Hygiene and sanitary num 8 (2015).

The identified disordered eating in students results from the influence of a number of factors. Incompetence in Food Culture is the main one. This fact is confirmed by the first year students testing results on their awareness of healthy nutrition principles and healthy lifestyle.

The level of students awareness on the principles of healthy nutrition and healthy lifestyle was evaluated by the tests. The results of the testing are presented in Figure 3.

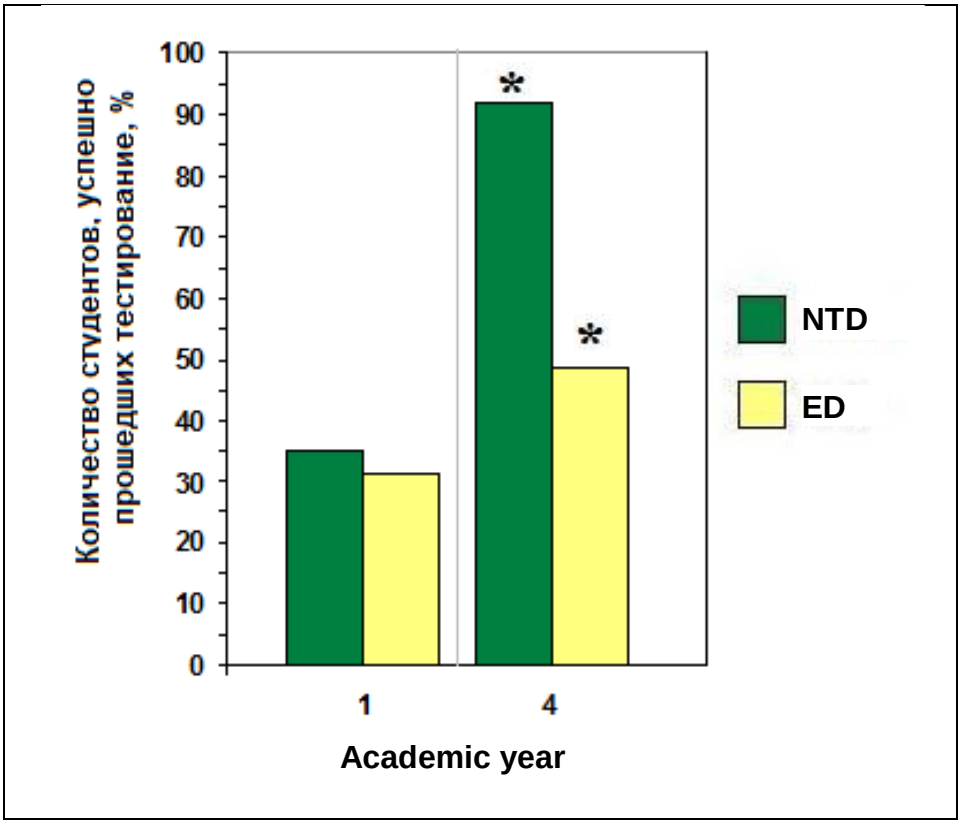

Figure 3
Comparative analysis of the test results on the level
of the NTD and ED first year and fourth year students awareness
of healthy nutrition principals and healthy lifestyle
*Association between factorial and effective parameters was statistically significant at $p < 0.01$, $\chi^2 = 41.847$

The share of NTD and ED first year students, who gave right answers on more than 50 % of questions, was 35.2 % and 31.3 %, respectively. The groups of respondents did not differ significantly from each other by this parameter. It should be noted that absolute majority of students, regardless of the majoring, were aware that disordered eating could lead to different diseases development. The survey, performed among fourth year students, showed significant increase of awareness in NTD students. The number of NTD students, who completed the test successfully, was higher than ED students ($p < 0.01$). NTD fourth year respondents had higher level of awareness in comparison with ED students on optimal protein contents, most useful fats, what products contained polyunsaturated fatty acids, which carbohydrates were more useful, how to enrich the intake with dietary fibers, vitamins and minerals.

To identify the sources of information on healthy nutrition, the questionnaire survey was conducted among the students. The obtained results are presented in Table 4.

Source of information	Number of students, %			
	First academic year		Fourth academic year	
	C2		C2*	
	NTD (n=91)	ED (n=96)	NTD (n=91)	ED (n=96)
Internet	9.9	7.3	5.5	29.2
Popular magazines, TV programs	11.0	8.3	6.6	21.8
Parents advice	64.8	72.9	2.2	18.7
Doctors recommendations	7.7	6.3	5.5	7.3
Friends advice	3.3	5.2	3.3	16.7
Educational and scientific literature	3.3	–	36.3	4.2
Lecturers	–	–	40.6	–
Other	–	–	–	2.1

Table 4
Correlation between the sources of information on healthy nutrition and students majoring.

* Association between factorial and effective parameters was statistically significant at $p < 0.01$, $\chi^2 = 114.722$

Parents' advice was in priority for the majority of NTD and ED first year students. From 7.3 % to 11.0 % of first year students mentioned popular magazines, TV programs and Internet as a source of information. Insignificant part of students relied on doctors recommendations and friends advice. The respondents did not rely on academic and scientific literature. There was no significant difference by the analyzed factors in NTD and ED first year students.

Regardless of the majoring, the number of students, who mentioned parents' advice as the main source of information, significantly decreased by the fourth academic year. NTD students primarily mentioned lecturers' advice, educational and scientific literature, while ED students received information primarily from the Internet, popular magazines and TV programs. The share of ED students, who followed their friends advice, also increased. The identified association between the majoring and sources of information on healthy nutrition was statistically significant ($p < 0.01$).

Discussion

The present study was conducted for evaluation of association between students diet quality, their majoring and level of competence in nutritiology. For this purpose the authors conducted comparative analysis of the dietary habits, energy and macronutrient intake and eating behaviour among the students from the department of nutritional technologies and the department of economics in the beginning of their education in 2012 and in the end of their education in 2016.

The obtained results showed that NTD students, unlike ED students, changed their dietary habits and improved their food culture.

Detailed analysis of the food diaries showed that the majority of first year students, regardless of the majoring and gender, had disbalance in their dietary intake by the main

nutrients and energy value as well as meal pattern disorders. The nutrition of the majority of students was characterized by the deficit of protein, excessive consumption of fats and carbohydrates and high energy value. Students dietary intake contained insufficient amount of meat, fish, milk and fermented milk products, vegetables and fruit. Carbohydrates and fats oriented dietary intake was explained by high consumption of bakery, confectionary, pasta, potatoes, fizzy drinks and fast food. Food consumption frequency was not optimal and was characterized by irregular timing and spacing. Many young people did not have breakfast, skipped lunch and preferred late-night eating. The obtained results agree with other research data on the actual students nutrition[13].

The identified disordered eating in students results from a number of factors. Lack of competence in Food Culture is the main one. This fact is confirmed by the test results of first year students on their awareness of healthy nutrition principles and healthy lifestyle. Besides, first year students relied on parents' advice as a source of information on nutritiology, and barely read educational or scientific literature, which agreed with other research data[14].

By the fourth academic year, energy and macronutrient intake improved only in NTD students. Proteins, fats, carbohydrates content and energy value in ED students diet remained unbalanced. The identified difference in NTD and ED students by the analyzed parameters was statistically significant. Positive changes were also observed in fourth year students meal pattern, but there were no significant changes in meals frequency and main daily food share consumption between NTD and ED students. It is difficult for students to regulate the time, duration and frequency of meal consumption because of peculiarities of curriculum and household, even though they understand the need to change their eating habits[15]

Test results of the fourth year students showed that the level of NTD students awareness on healthy lifestyle, balanced nutrition and reasonable selection of food products was significantly higher than in ED students.

[13] V. A. Schelkanovtsev; L. A. Mayurnikova y S. F. Zinchuk, "Evaluation of pupils and students nutrition in Kemerovo", Sibir Medical Journal num 1 (2007); T. N. Petrova; A. A. Zuikova y O. N. Krasnorutskaya, 'Evaluation of actual medical students nutrition: problems and solutions", Journal of new medicinal technologies, Vol: XX num 2 (2013); R. Tam; B. Yassa; H. Parker; H. O'Connor y M. Allman-Farinelli, "University students' on-campus food purchasing behaviors, preferences, and opinions on food availability", Nutrition num 37 (2017): 7; O. I. Topal; I. S. Molin y R. G. Zueva, "The study of students dietary structure" Journal of milk production num 1 (2011); E. A. Vilms; M. S. Turchaninova; M. I. Shupina; D. M. Gogol y D. V. Turchaninov, "Hygienic evaluation of lipid component in the structure of students nutrition", Hygiene and sanitary num 8 (2015); H. Dykstra; A. Davey; J. O. Fisher; H. Polonsky y S. Sherman, "Breakfast-Skipping and Selecting Low-Nutritional-Quality Foods for Breakfast Are Common among Low-Income Urban Children, Regardless of Food Security Status", J Nutr. Num 146(3) (2016) y El W. Ansari; S. Suominen y A. Samara, "Eating Habits and Dietary Intake: Is Adherence to Dietary Guidelines Associated with Importance of Healthy Eating among Undergraduate University Students in Finland?", Cent Eur J Public Health num 23(4) (2015).

[14] K. Y. Kolbasina, "Social views on healthy nutrition: empirical study", Journal of Baltic federal university named after I. Kant. Vol: 5 (2013) y K. Cannoosamy; P. Pugo-Gunsam y R. Jeewon, "Consumer knowledge and attitudes toward nutritional labels", J Nutr Educ Behav num 46 (2014).

[15] O. A. Karabinskaya; V. G. Izatulin; O. A. Makarov; O. V. Kolesnikova; A. N. Kalyagiv y A. B. Atamanyukh, "The main problems of students nutrition in association with their way of life" Sibir Medical Journal num 4 (2011): 122 y A. G. Setko; S. G. Ponomareva y E. P. Scherbinina, "Role of nutrient supply in main organs and systems functioning in students", Hygiene and sanitary num 3 (2012): 51.

There were changes in the choice of information source as well. NTD students prioritized the knowledge obtained from lecturers and educational and scientific literature. ED students primarily used information from the Internet and mass media, which could be unreliable and even false[16]

Positive tendencies in the NTD students nutritional quality were associated with the fact that they obtained special knowledge on human physiology, dietary hygiene, food content and nutrients metabolism and technological procession, as well as acquired practical skills in preparation of healthy and balanced food. The obtained volume of knowledge allows the students to form their dietary intake based on the accepted norms and to follow recommendations on healthy nutrition.

Researchers opinion on the influence of nutritiology education on the transformation of eating behavior is not consistent. It was shown that education could either increase the risk of eating disorders development[17] or not influence eating behavior at all[18]. The present study identified the association between eating behavior stereotypes changes and level of competence in nutritiology. By the fourth academic year, the number of NTD students with adequate eating behavior increased in comparison with ED students. In NTD students with deviant eating behavior, limited type prevailed, which was, probably, associated with the specialized knowledge that allowed them to enhance self-control in dietary habits.

It should be mentioned that the present study had some limitations. The students dietary intake full value was evaluated from the point of view of main nutrients consumption. Students represent an age-sex group, which is characterized by intensive growth and high psychoemotional tension. Thus, the evaluation of dietary intake of vitamins, macroelements and microelements content is also important, which will be included into the further studies. The identification of the association between students diet and their level of health is also interesting to the researchers.

Conclusion

Results of the study showed that increase of competence level in nutritiology positively influences on the nutritional and energy value of the dietary intake, meal pattern and eating behavior in students. Students, who are competent in nutritiology and nutrition hygiene, can reasonably select healthy food products, improve the nutritional intake, change eating habits and increase the diet quality in general. Their choice of information sources on nutrition focus on educational and scientific literature, and not the Internet and mass media.

[16] P. Fassier; A. Chhim; V. Andreeva; S. Hercberg y P. Latino-Martel, “Seeking health- and nutrition-related information on the Internet in a large population of French adults: Results of the NutriNet-Santé study”, British Journal of Nutrition, num 115 (11) (2016).

[17] M. Y. Hong; T. L. Shepanski y J. B. Gaylis, “Majoring in nutrition influences BMI of female college students”, J Nutr Sci. num 5 (2016) y N. Reinstein; W. M. Koszewski; B. Chamberlin y C. Smith-Johnson, “Prevalence of eating disorders among dietetics students: does nutrition education make a difference?“J Am Diet Assoc.num 92(8) (1992).

[18] V. A. Lyapin; N. V. Semenova y E. A. Demchuk, “Eating behavior of students from different institutions of higher education”, Omskiy Scientific Journal num 2(134) (2014) y N. Harris; D. Gee; D. d'Acquisto; D. Ogan y K. Pritchett, “Eating disorder risk, exercise dependence, and body weight dissatisfaction among female nutrition and exercise science university majors”, J Behav Addict.num 4(3) (2015).

Educational process in colleges and universities gives students a unique possibility to form good dietary habits that is based on scientific data. During the academic years students have to be given the basics of healthy lifestyle, in particular, healthy eating. This can be realized by the inclusion of courses on healthy nutrition into the curricular program of the students of different majoring. Nutrition risks management will allow the students to improve their quality of life and academic performance and decrease the rate of nutrition related diseases.

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