Rocz Panstw Zakl Hig 2022;73(3):285-291
http://wydawnictwa.pzh.gov.pl/roczniki_pzh/ https://doi.org/10.32394/rpzh.2022.0225

ORIGINAL ARTICLE

SUPPLY OF ENERGY AND SELECTED NUTRIENTS IN MEALS CONSUMED BY MOROCCAN STUDENTS AT HOME AND ON A UNIVERSITY CAMPUS

Maria Elarbaoui[1], *Ali Jafri*[2], *Houria Makhlouki*[1], *Basma Ellahi*[3], *Abdelfettah Derouiche*[1]

[1]Laboratory of Biology and Health, Research Unit: Human Nutrition, URAC 34, Faculty of Sciences Ben Msik, Hassan II University of Casablanca, Casablanca, Morocco
[2]Mohammed VI University of Health Sciences, UM6SS, Casablanca, Morocco
[3]Faculty of Health and Social Care, Chester University, Chester, United Kingdom

ABSTRACT

Background. Student life is often accompanied by changes in eating behavior. Adopting a balanced and varied diet and healthy eating habits can promote the health, growth and intellectual development of young people at different stages of life. According to the WHO, a healthy diet helps protect against all forms of malnutrition, as well as against non-communicable diseases. The nutritional and energy intake must follow nutritional norms, for example energy intake must be adapted to expenditure. To avoid excessive weight gain, fat should not exceed 30% of total energy intake

Objective. The goal of this study was to compare energy consumption, macronutrients and selected minerals in food rations consumed by students at university campus and at home.

Materials and Method. The subjects were chosen at random from among volunteer students from Hassan II University in Casablanca. A sample of 130 students (54 women and 76 men) aged 18 to 25, participated in this study. Anthropometric measurements were performed to assess general characteristics, and records of one-day food intakes at university and at the parental home were performed by 24-hour food diary, and as well as conducting face-to-face. Variables were expressed as mean ± standard deviation (SD). The Kolmogorov–Smirnov test was used to check the normality of data.

Results. In accordance with the body mass index classifications, 69.5% of male university students and 77.7% of female were in normal weight categories. The overweight classes were 25.1% and 5.6%, respectively, for men and women. Assessment of the energy and nutritional intakes of university and home meals shows that students consume more calories, protein, carbohydrates, sodium, potassium, and iodine at home than at university, but these contributions remain insufficient in relation to the RDAs. Students consume more fat, especially saturated fatty acids, at university than at home. More than half of students exceed the recommended daily recommendations for saturated fatty acids.

Conclusion. These results indicate that a university students' diet is influenced by their behaviors, attitudes, and knowledge. Hence the importance of nutrition education, based on what foods to consume rather than what foods to avoid, a societal issue that requires a multidisciplinary, multisectoral and culturally appropriate approach.

Key words: *nutrients, intakes, university students, anthropometric measurements, energy consumption*

INTRODUCTION

Good physical activity and proper nutrition are essential for a healthy lifestyle, affecting not only health but also physical and mental development [1]. In a Greek study, it was reported that students who lived away from home developed more unfavorable eating habits than students who lived at home [2]. Bad eating habits have also been observed among Turkish university students [3]. Both of these studies reinforce my previous point that it is not young people who pay less attention to healthier diets/foods, but environmental factors, such as (in this case) being away from home. In Morocco, the nutrition of young adults is not yet qualified, because there are not yet studies to elucidate this aspect.

Consuming a balanced and healthy diet throughout the life-course helps to prevent malnutrition in all its forms as well as a range of noncommunicable diseases (NCDs). However, People are now consuming more foods high in energy, fats, free sugars and salt/sodium, and many people do not eat enough fruit, vegetables and other dietary fibre such as whole grains.

Corresponding author: Maria Elarbaoui, Laboratory of Biology and Health, Research Unit: Human Nutrition, URAC 34, Faculty of Sciences Ben Msik, Hassan II University of Casablanca, Morocco, Avenue Cdt Driss El Harti, B.P 7955, Sidi Othmane, Casablanca /20660, Morocco, e-mail: elarbaonuilamaria@gmail.com or maria.elarbaoui-etu@etu.univh2c.ma

In addition, the exact make-up of a diversified, balanced and healthy diet will vary depending on individual characteristics (e.g. age, gender, lifestyle and degree of physical activity), cultural context, locally available foods and dietary customs [4].

In an American study, it was reported that Americans are also heavily influenced by many factors. Some examples of these influences that contribute to an individual's food choices include individual factors, such as knowledge, personal taste preference, mood, hunger level, health status, special diet requirements, ethnicity...or also environmental factors such as weather etc. Alternatively, advertisements also influence food choices. Restaurants and markets often take advantage of this. On the other hand, the indirect factors outside of one's control may also affect food choices [5].

Morocco has made limited progress towards meeting targets for diet-related non-communicable diseases (NCDs) [6]. This last is located on the southwest coast of the Mediterranean Sea. This country is undergoing a demographic and epidemiological transition. Over during last decades, Morocco has experienced a nutritional transition. The causes of this nutritional transition are not well understood. But, maybe it's about socioeconomic or demographic factors that are related to dietary habits in Morocco [7]. Besides, the country has shown no progress towards the obesity target, with around 32.2% of adult women (aged 18 and over) and 19.4% of adult men living with obesity. The prevalence of obesity in Morocco is higher than the regional average of 18.4% for women and 7.8% for men. At the same time, diabetes is estimated to affect 13.4% of adult women and 14.0% of adult men.' It is therefore not a problem of "young people", but a problem of society in general [6].

The current study's aim was to determine students' nutritional status using anthropometric measurements, as well as compare and analyze their energy and nutritional intakes (protein, carbohydrates, fat, potassium, sodium and iodine) of meals consumed by students at the university and at home, with the standard reference values of energy and individual nutrients of university students.

MATERIAL AND METHODS

Design Study

A cross-sectional study was carried out between December 2017 and March 2018 to collect data. The study was conducted with 130 volunteer students aged 18 to 25 years (76 men and 54 women), enrolled at the Hassan II University of Casablanca, Morocco. Most of the students were from Casablanca. Based on the parameters applied in this research study, the methodology we are using is the convenience and snowballing sampling. The assessment of their daily food intake on campus and in the parental home was carried out by 24-hour food diary. The composition of all food intakes has been photographed. The conversion of the meals into nutritional data was carried out using the food composition table (Ciqual) and the intakes per 100 g of macro- and micronutrients were calculated by the EuroFIR method.

Study participants

The study concerned adults aged 18 to 25 years from the Ben Msik Faculty of Sciences, Hassan II University in Casablanca. Students were healthy adults aged between 18 and 25 years with no history of renal disease.

Inclusion criteria

Subjects aged between 18 and 25 years old.

Exclusion criteria

(1) Students under 18 and over 25 years; (2) Students refusing to sign the informed consent; (3) Students who brought back their 24 hours food records incomplete; (4) Students who are not enrolled at the university or have chronic diseases (illnesses that could affect the results – heart or kidney failure, diabetes, etc); (5) Students being taking antidiuretic drugs the week before the study.

Data collection

The evaluation of the energy and nutritional intakes of student meals taken at university and at home was carried out on a collection of intakes over defined days (one day on campus and one day at home) of 103 students by food diary.

The participants are led to indicate the types and times of consumption of food and drinks with an estimate of the quantities consumed; taking pictures of their meals (at each meal, the participant weighs the food and gives a very detailed description of the dish eaten by photographing it at the beginning). The collection of these data allows the determination of consumption profiles and also to evaluate the different nutritional intakes. In the event that the participants did not photograph the food or meals before consuming them, the quantification is left to the discretion of the investigator.

24 hours food diary

Food recording food journals is considered the gold standard because it provides accurate information on food intake. In this survey, students were asked to write down in the food diary the details of their 24-hour food and drink consumption and the pictures of the catches. The recording is made in real time at the time of food intake.

The Ciqual database

Data conversion is done through a French ANSES - Ciqual food composition table [8]. Database allows the conversion of food into nutrients per 100 g of food which makes it possible to estimate the nutritional and energy intake of the nutrients consumed during the day and therefore the nutritional quality of student meals. The conversion of the data of the nutrients obtained in 100 g by Ciqual into the actual weight consumed is done by means of the EuroFIR calculation method [9]. EuroFIR provides the nutrient content of foods using the calculation methods used to determine the nutrient values of multicomponent foods.

Anthropometric measurements

Anthropometric measurements were taken at the university, according to the World Health Organization (WHO) recommendations, and collected by qualified researchers according to WHO standards [10] Weight was measured by the Omron HBF-511T-E body composition monitor in participants wearing light clothing and barefoot [11]. The height was measured using a stadiometer graduated in centimeters (Seca 213). Body mass index (BMI) was calculated by dividing weight by the square of height (kg / m2), (BMI <18.5 – underweight; 18.5<BMI<25 - normal weight; 25<BMI<30 - overweight; BMI> 30 - obese) [12].

Statistical analysis

SPSS Statistics software (IBM SPSS Statistics 25.0) was used for all statistical analyse [13].Variables were expressed as mean ± standard deviation (SD). The *Kolmogorov–Smirnov* test was used to check the normality of data. Since the variables are normally distributed, parametric tests were therefore performed. To compare the differences between the groups, the Student test was conducted. The significance level was established as 5% (<0.05).

RESULTS

The macronutrient and micronutrient intake of Moroccan students was estimated in this pilot study. Results are presented as mean ± standard deviation.

Characteristics of the participants

In our study, men represent 41.6% (54/130) and women 58.5% (76/130). For all recruited students, the average age of participants was 21.57 ± 0.14 years. For all parameters, statistical analysis revealed no significant difference between men and women (Table 1).

The means of energy supply from university and home meals (Table 2) show that energy intakes from home meals are significantly higher ($p<0.05$). Analysis of average protein intakes from university and home

Table 1. General characteristics of the studied population by sex

	Men		Women		Total	
	n	Mean ± SD	n	Mean ± SD	n	Mean ± SD
Age (years)	76	21.76 ± 0.27	54	21.41 ± 0.13	130	21.57 ± 0.14
Height (cm)	76	176.32 ± 0.95	54	161.71 ± 0.71	130	168.66 ± 0.93
Weight (kg)	76	69.33 ± 1.58	54	60.74 ± 1.92	130	64.83 ± 1.32
BMI (Body Mass Index) (kg/m2)	76	22.32 ± 0.42	54	23.15 ± 0.67	130	22.76 ± 0.40
WC (waist circumference), cm	76	80.82 ± 1.14	54	73.59 ± 1.41	130	76.88 ± 0.99
WHR(waist-hip ratio)	76	0.82 ± 0.01	54	0.73 ± 0.01	130	0.77 ± 0.01

SD - standard deviation

Table 2. Average energy supply from meals consume at university and at home for both sexes

	Average energy supply from meals consumed at university in kcal /d	Average energy supply from meals consumed at home in kcal /d	p value
Total (n=130)	1576 ± 44.09	1834 ± 52.62	0.0456*
Women (n=54) Mean ± SD	1604 ± 59.27	1803 ± 67.61	0.0283*
Men (n=76) Mean ± SD	1556 ± 62.80	1855 ± 76.41	0.0030**

SD – standard deviation; The significance level was established as 5% ($p<0.05$).
*Statistically significant differences defined as $p<0.05$.

Table 3. Average nutrients and minerals supply from meals consume at university and at home

Nutrients, minerals	Meals consumed at university (n=130) Mean ±SD	Meals consumed at home (n=130) Mean ±SD	*p*-value
Protein (%)	14.08 ± 0.39	16.26 ± 0.92	0.030*
Carbohydrate (%)	48.69 ± 1.11	50.5 ± 1.21	0.270
Lipids (%)	34.18 ± 0.90	30.21 ± 0.84	0.001**
FA (Fatty acids)	44.88 ± 2.01	48.16 ± 1.93	0.240
FAT(Trans fatty acids)	17.92 ± 0.98	19.19 ± 0.91	0.340
MUFA(Monounsaturated fatty acids), (g)	18.61 ± 0.99	19.58 ± 0.90	0.470
PUFA (Polyunsaturated fatty acids), (g)	8.35 ± 0.44	9.385 ± 0.56	0 .150
Lipid index of meals	0.744 ± 0.04	0.762 ± 0.04	0.780
Potassium (mg)	1289 ± 64.32	1905 ± 76.44	<0.0001****
Sodium chloride (g)	4.896 ± 0.20	6.925 ± 0.26	<0.0001****
Iodine (µg)	67.97 ± 5.53	90.94 ± 5.04	0.002**

SD - standard deviation. Variables are normally distributed (*Kolmogorov–Smirnov* test), p values by t- *Student's* test for medians. *Statistically significant differences defined as p<0.05.

meals shows that the difference between the intake of home meals (16.26%) and university meals (14.08%) is significant p<0.05. On the other hand, the difference between the carbohydrate intake at university and at home is not significant (p>0.05). The mean lipid intakes shown in Table 3 indicate that the lipid intakes from university meals are higher than those taken at home, 34.18% and 30.21% respectively.

Analysis of potassium and sodium chloride intakes in meals taken at home and at the university shown in Table 3 indicates that the difference between meals taken at university and at home is highly significant p<0.0001. With regard to average intakes of iodine the difference between meals taken at the University and at home is significant p<0.05.

DISCUSSION

In this survey, 130 university students participated in our study to evaluate the one-day energy and nutritional intake of their food on campus and at home. Data analysis allows us to assess the quantity and quality of food consumed by participants, as well as their nutritional habits.

An assessment of the energy intake from university and home meals for 130 students shows that the energy intake from home students is higher than the energy intake at university (1834 52.62 kcal/d vs 1576 44.09 kcal/d). However, these data show that the energy intake is lower than the recommended values of 2000 – 2700 kcal/day. For moderate physical activity [14]. Analysis of these energy intakes shows that 61% of students consume more energy at home, while 27% consume more energy at university than at home, while 12% of participants have no fluctuations in their diet.

These results are different from those of a study of university students' food consumption and out-of-home eating habits. A total of 289 students aged 18–24 years old from three major Albanian universities were polled for this study. Despite the fact that carbohydrate, sugar, and protein content are all high at home (AH) and saturated fats, amounts appear higher outside of the home (OH). There are no significant differences between foods consumed AH and foods consumed OH [15]

The nutritional intake of 130 participants shows that protein intake at home 16.26± 0.92% is high compared to protein intake at university 14.08± 0.39%, indicating that students consume more protein at home than university. Analysis of the results of protein intake shows that 41% of students during a day at home have a protein intake that is higher than the reference values (16.26 ± 0.92), and 37% of students during a day at university have a protein intake (14.08 ± 0.39), these values fall within the reference values of 12 to 15% according to the WHO.

Similarly, studies have in Albania shown that the Dietary composition of AH intake was richer in proteins, while OH intake was richer in saturated fats[15]. These results are not similar to the results of Energy and nutrient intake and food patterns among Turkish university students. This survey was conducted on a sample of 400 students (167 female and 233 male) aged between 19 and 24 years five universities in Ankara. The percentages of energy supplied from proteins at university were found to be (12.9% in males, and 13.2% in females) [3].

The carbohydrate intake of students from meals taken at university is 48.69 ± 1.11% and 50.5 ± 1.218% at home, this carbohydrate intake is close to the reference values which correspond to 50% - 60% according to the World Health Organization (WHO). These results indicate that students' carbohydrate needs are met, and that there is no significant difference between carbohydrate intakes from college and home meals.

The evaluation of our lipid intake from meals taken at university and at home indicates that students' home lipid intakes fall within the reference values which are 25 to 30% [16], which is contrary to university. In addition, the lipid intakes of 67% of students during a day at university and 47% of students during a day at home is over 30%, which almost exceeds the recommended daily intakes (25 -30%), this shows that half of students consume more fat.

These results are similar to the results found in a survey by the university of Valencia in Spain (n = 918) which found that according to the percentage of lipid 35.05% of students have values above the Spanish nutritional objectives (<35%) [17].

The evaluation of the fatty acids (FA) intake in meals taken at university and at home shows that approximately 45% to 48% of the total energy is supplied by fatty acids and that the FA intake of meals taken at home is higher than the intake of meals taken at university (48.16 ± 1.93; 44.88 ± 2.01 respectively), which is higher than the reference value which represents 30% according to the WHO [18].

Intakes of saturated fatty acids from meals taken at university are 17.92 ± 0.99 % and 19.19 ± 0.92% for meals taken at home. 88% of daytime students at university and 89% of daytime students at home have an AGS intake greater than 8%, which falls within the reference values of 5 - 10% according to the WHO. This shows that more than half of the students favor the consumption of saturated fatty acids.

Regarding the lipid index, there is no significant difference between meals taken at university and meals taken at home 0.74 ± 0.05 and 0.76 ± 0.04 respectively, which is higher than the reference value which is <0.4.

The assessment of sodium chloride intake in students indicates that students consume more salt at home than at university. Their sodium chloride intake at home is higher than 5g/d, which exceeds the recommended intake according to the WHO [18] . 40% of college students and 59% of home students exceed recommended salt intake. Comparing college meals to those eaten at home shows that students consume more salt at home than at college.

In the same vein, the University of São Paulo conducted a study to determine the sodium chloride concentration in the 24-hour meals of 19 students (9 women and 10 men) and they found that in their diets, 85 % of men exceeds 6 g of salt per day [19].

Our sodium results higher than the recommendations could be explained by the change in eating behavior. In fact, Morocco has recorded a nutritional transition, resulting in changes in eating habits and lifestyle changes, especially in larger cities like the region of Casablanca. And as a result, processed foods and fast-food restaurants have increased dramatically [20].

Analysis of potassium intakes in meals taken at home and at university show that students consume during a day at home (1905 ± 76.44 kcal /d) and at university (1289 ± 64.32 kcal /d), which is lower than the recommended daily allowance which corresponds to 3500 mg (WHO, 2015) and that only 2% of meals at university and 5% at home cover the needs in potassium.

Cook and Col's studies has shown that people who consume more sodium or less potassium have a higher risk of hypertension and high blood pressure [21]. Although high blood pressure is linked to an increased risk of cardiovascular disease, the connection between sodium or potassium intake and cardiovascular disease incidence or mortality is not always clear. Some studies have indicated that the combination of sodium and potassium intakes is a more significant risk factor for hypertension and CVD than each factor alone [22]. A survey of the estimated usual sodium and potassium intake of 12,267 adults in the United States who were tracked for an average of 14.8 years found a strong monotonic relationship between increased sodium-to-potassium ratio and risk of death from cardiovascular disease and ischemic heart disease [20] .

Analysis of the iodine intake of meals taken at university and at home shows that students during a day at university consume 67.97 ± 5.535 µg/d and during a day at home consume 90.94 ± 5.044 µg/d, which indicates that the students consume iodine in a small amount, which is far from the recommended iodine intakes (150 µg/d). 89% of students for a day at university and 86% of students for a day at home have an iodine intake of less than 150 µg/d. Our results are similar to the results of a nutritional intake assessment survey of 805 University of Leipzig employees and students, which found that nutritional iodine deficiency is 32% to 46% [23].

Since it is the most common cause of preventable mental illness worldwide, iodine deficiency remains a significant global challenge to health and development [24] . Hence a lot of effort has been spent into fighting iodine deficiency disorders [25] .

The assessment of energy and nutritional intakes from university and home meals shows a deficiency in student energy intakes from both, university and parental home meals compared to recommendations of 2,000 - 2,700 kcal/day [26]. Differences in nutritional, protein and fat intakes between university and home

meals. Indeed, energy and protein intakes are higher in home meals and lipids are higher in those taken at university. For micronutrient intakes, the results indicate increased potassium deficiency exceeding 50% of daily recommendations. A home sodium intake exceeding 40% of recommendations and an iodine intake deficiency of 89% and 86% respectively in food intakes on campus and at home.

Eating habits were examined among a sample of University of Alberta female students who had all completed at least one nutrition course, to determine whether the female students had similar eating habits to those recommended in the Canada's Food Guide (CFG) or the Traditional Mediterranean Diet Pyramid (PRMT). None of the students consumed the minimum number of servings of legumes, seeds, nuts, olive oil.

The majority of participants did not follow the minimum recommendations, such is our case. The results of this study suggest that nutrition education alone may be insufficient to ensure optimal eating habits among female university students.

Limitations

Our study has a few limitations. First, the study was carried out only on students of the University Hassan II, of the city of Casablanca, even if it is the largest city of Morocco, but it is not sufficiently large and representative sample of the population. The main was a 24-hour food diary, which was semi-quantitative or quantitative. This method was created to provide information about food consumption, frequency of consumption, and servings; however, it is unreliable for measuring total diet, total energy intake, or total nutrient intake. Among the limits also the quality of our sampling. Further research will be needed with better methodology. Besides, the 24-hour Dietary Recall (24HR). A single administration of a 24HR is unable to account for day-to-day variation, two or more non-consecutive recalls are required to estimate usual dietary intake distributions. Multiple administrations are also recommended when 24HRs are used to examine diet and health or other variables.

This study was also limited by contextual technicalities, such as the lack of national food composition tables and little to no research in this area. Due to similarities in dieting and nutritional habits, the Ciqual nutritional composition table managed by ANSES (the French Agency for Food, Environmental and Occupational Health Safety) was used [8].

CONCLUSIONS

This pilot cross-sectional study shows that students have eating habits that do not meet their needs for macronutrients and micronutrients, which will have an impact on their health. All forms of malnutrition are risk factors for non-communicable diseases such as diabetes, heart disease, stroke, and cancer.

Acknowledgments

The authors express their gratitude to the researchers and students who decided to take part in this pilot study.

Statement of authorship:

Abdelfettah Derouiche, Maria Elarbaoui, Ali Jafri, Houria Makhlouki and Basma Ellahi contributed to preparation and revision of the manuscript for publication. Ali Jafri and Maria Elarbaoui performed the statistical analysis. The final manuscript has been read and approved by all the authors.

Conflict of interest

No conflicts of interest declared by Authors.

Funding sources

This study was funded by the British Council.

Ethical approval

In this study, all participants signed a statement of consent.

REFERENCES

1. *Drewnowski A., Evans W.J.*: Nutrition, Physical Activity, and Quality of Life in Older Adults: Summary. J Gerontol: Series A, 2001;56(suppl_2):89-94, doi: 10.1093/gerona/56.suppl_2.89.
2. *Papadaki A., Hondros G. , Scott J.A., Kapsokefalou M.*: Eating habits of university students living at, or away from home in Greece, Appetite, 2007;49(1):169-176, doi: 10.1016/j.appet.2007.01.008.
3. *Neslişah, R., Emine, A.Y.*: Energy and nutrient intake and food patterns among Turkish university students. Nutr Res Practice, 2011;5(2):117-123. doi: 10.4162/nrp.2011.5.2.117.15.
4. Healthy diet. https://www.who.int/news-room/fact-sheets/detail/healthy-diet (consulté le 29 avril 2022).
5. Fof_lesson_7_final.pdf. Lesson 7 – Understanding Influences on Food Choices. Available at: https://cns.ucdavis.edu/sites/g/files/dgvnsk416/files/inline-files/fof_lesson_7_final.pdf (Accessed: 29 April 2022).
6. Rapport mondial sur la nutrition [Global Nutrition Raport]. 2021 (Accessed at: 29 January 2022).
7. *El Rhazi K, Nejjari C, Romaguera D, Feart C, Obtel M, Zidouh A, Bekkali R, Gateau PB.*: Adherence to a Mediterranean diet in Morocco and its correlates: cross-sectional analysis of a sample of the adult Moroccan population. BMC Public Health. 2012 May11;12:345. doi: 10.1186/1471-2458-12-345.
8. ANSES. Ciqual Table de composition nutritionnelle des aliments. https://ciqual.anses.fr/ (consulté le 30 avril 2021).

9. *Church S.M*: EuroFIR Synthesis report No 7: Food composition explained. Nutrition Bulletin, 2009;34(3):250-272, doi: 10.1111/j.1467-3010.2009.01775.x.
10. de *Onis M*., *Habicht J.P*.: Anthropometric reference data for international use: recommendations from a World Health Organization Expert Committee. Am. J. Clin. Nutr. 1996;64:650–658. https://doi.org/10.1093/ajcn/64.4.650
11. *Jafri A, Jabari M, Dahhak M, Saile R, Derouiche A*.: Obesity and its related factors among women from popular neighborhoods in Casablanca, Morocco. Ethn Dis. 2013;23(3):369-73.
12. *Han, S.S., Kim, K.W., Kim, K.-I., Na, K.Y., Chae, D.-W., Kim, S., Chin, H.J*.: Lean Mass Index: A Better Predictor of Mortality than Body Mass Index in Elderly Asians. J Am Geriatr Soc. 2010;58:312-317. https://doi.org/10.1111/j.1532-5415.2009.02672.x.
13. *Ibm C.R*.: IBM SPSS Statistics for Windows, Version Q3 25.0. Armonk, NY: IBM Corporation, 2017.
14. *Kotseva K, De Backer G, De Bacquer D, Rydén L, Hoes A, Grobbee D, Maggioni A, Marques-Vidal P, Jennings C, Abreu A, Aguiar C, Badariene J, Bruthans J, Castro Conde A, Cifkova R, Crowley J, Davletov K, Deckers J, De Smedt D, De Sutter J, Dilic M, Dolzhenko M, Dzerve V, Erglis A, Fras Z, Gaita D, Gotcheva N, Heuschmann P, Hasan-Ali H, Jankowski P, Lalic N, Lehto S, Lovic D, Mancas S, Mellbin L, Milicic D, Mirrakhimov E, Oganov R, Pogosova N, Reiner Z, Stöerk S, Tokgözoğlu L, Tsioufis C, Vulic D, Wood D;* EUROASPIRE Investigators: Lifestyle and impact on cardiovascular risk factor control in coronary patients across 27 countries: Results from the European Society of Cardiology ESC-EORP EUROASPIRE V registry. Eur J Prev Cardiol. 2019May;26(8):824-835. doi: 10.1177/2047487318825350
15. *Llanaj E., Ádány R., Lachat C., D'Haese M*.: Examining food intake and eating out of home patterns among university students, PLOS ONE, 2018;13(10):e0197874, doi: 10.1371/journal.pone.0197874.
16. *Bachmann, P., Marti-Massoud, C., Blanc-Vincent, M. P., Desport, J. C., Colomb, V., Dieu, L., & Senesse, P*.: Summary version of the standards, options and recommendations for palliative or terminal nutrition in adults with progressive cancer. British J. Cancer, 2001;89(1), S107-S110.
17. *Soriano J.M., Rico H., Moltó J.C., Mañes J*.: Effect of introduction of HACCP on the microbiological quality of some restaurant meals. Food Control 2002;13(4):253-261, doi: 10.1016/S0956-7135(02)00023-3.
18. WHO. World Health Statistics 2015. World Health Organization, 2015.
19. *McLean, R. M., Farmer, V. L., Nettleton, A., Cameron, C. M., Cook, N. R., Campbell, N. R.,* & TRUE Consortium (International Consortium for Quality Research on Dietary Sodium/Salt). Assessment of dietary sodium intake using a food frequency questionnaire and 24-hour urinary sodium excretion: a systematic literature review. The Journal of Clinical Hypertension, 2017;19(12), 1214-1230. », 2017.
20. *Yang, Q., Liu, T., Kuklina, E. V., Flanders, W. D., Hong, Y., Gillespie, C., Khoury, M. J.*et al.: Sodium and potassium intake and mortality among US adults: prospective data from the Third National Health and Nutrition Examination Survey. Arch Intern Med, 2011;171(13):1183-1191, doi: 10.1001/archinternmed.2011.257.
21. *Ridker P. M., Buring, J. E., Rifai, N., Cook, N. R*.: Development and validation of improved algorithms for the assessment of global cardiovascular risk in women: the Reynolds Risk Score. Jama, 2007;297(6):611-619.
22. *Umesawa, M., Iso, H., Date, C., Yamamoto, A., Toyoshima, H., Watanabe, Y., Inaba, Y.* & JACC Study Group: Relations between dietary sodium and potassium intakes and mortality from cardiovascular disease: the Japan Collaborative Cohort Study for Evaluation of Cancer Risks. Am J Clin Nutr, 2008;88(1):195-202.
23. *Brauer VF, Brauer WH, Führer D, Paschke R*.: Iodine nutrition, nodular thyroid disease, and urinary iodine excretion in a German university study population. Thyroid. 2005 Apr;15(4):364-70. doi: 10.1089/thy.2005.15.364.
24. *Andersson, M., Karumbunathan, V., Zimmermann, M.B.:* Global iodine status in 2011 and trends over the past decade. J. Nutr, 2012;142(4):744-750.
25. *Jafri A, Elarbaoui M., Elkardi Y., Makhlouki H., Ellahi B., Derouiche A*.: Assessment of sodium and iodine intake among university students in Casablanca, Morocco. Nutrition Clinique et Métabolisme, 2021;35(3), 222-225. https://doi.org/10.1016/j.nupar.2020.11.003
26. World Health Organization. WHO_TRS_724_(chp1-chp6).pdf. Consulté le: 29 avril 2022. [On line]. Available at: https://apps.who.int/iris/bitstream/handle/10665/39527/WHO_TRS_724_(chp1-chp6).pdf;jsessionid=C2BDD6EEF37A79FCE8E8EA7EA6E8E277?sequence=1

Received: 11.03.2022
Accepted: 22.07.2022