DIETARY HABITS OF WROCLAW MEDICAL UNIVERSITY STUDENTS (POLAND)

Rafał Ilow[1], Bożena Regulska-Ilow[2], Dorota Różańska[2]*

[1]Wroclaw Medical University, Department of Food Science and Dietetics,
211 Borowska, 50-556 Wroclaw, Poland
[2]Wroclaw Medical University, Department of Dietetics, 34 Parkowa, 51-616 Wroclaw, Poland

ABSTRACT

Background. The World Health Organization considers an unhealthy diet to be related to the risk of cardiovascular diseases development.

Objectives. The aim of this study was to evaluate dietary habits among Wroclaw Medical University students with a view towards the nutritional risk factors for cardiovascular diseases.

Material and Methods. The study was conducted between the years 2004-2012. The study group consisted of 892 women and 276 men. The respondents were asked to complete a questionnaire based on the principles outlined in "The Polish food-based dietary guidelines".

Results. There were numerous eating habits not in compliance with the recommendations. Men failed to take $\geq$ 3 meals/day (10.1% vs 6.3%) at a significantly higher frequency than women. Food products exhibiting a high glycaemic index (GI) were preferred over low GI, especially among men. About 62% of women and 75% of men failed to consume $\geq$ 5 portions of fruits and vegetables per day. Women chose low-fat dairy products and meat significantly more frequently than men. 73% of women and 67% of men declared that they consumed vegetable oils on an irregular basis. About 8% of women and 11% of men used salt without restrictions, while 58% and 64% respectively, used sugar to sweeten beverages.

Conclusions. Improper nutritional habits were observed in a high part of the studied students, especially among men. It is therefore strongly suggested that the rules of proper nutrition be promoted among this group.

Key words: *dietary habits, dietary guidelines, university students, fruits, vegetables*

STRESZCZENIE

Wprowadzenie. Według Światowej Organizacji Zdrowia niezdrowa dieta jest związana z ryzykiem rozwoju chorób sercowo-naczyniowych.

Cel. Celem badań była ocena zwyczajów żywieniowych studentów z Uniwersytetu Medycznego we Wrocławiu, pod kątem żywieniowych czynników ryzyka chorób sercowo-naczyniowych.

Materiał i metody. Badania przeprowadzono w latach 2004-2012. Grupa badana liczyła 892 kobiet i 276 mężczyzn. Uczestnicy badania odpowiadali na pytania zawarte w ankiecie opracowanej na podstawie "Złotej Karty Prawidłowego Żywienia".

Wyniki. Stwierdzono, że liczne zwyczaje żywieniowe badanych studentów nie były zgodne z zaleceniami. Istotnie więcej mężczyzn niż kobiet nie spożywało zalecanych min. 3 posiłków w ciągu dnia (10,1% vs 6,3%). Produkty spożywcze charakteryzujące się wysokim indeksem glikemicznym (IG) były wybierane częściej niż produkty o niskim IG, zwłaszcza przez mężczyzn. Około 62% kobiet i 75% mężczyzn nie spożywało zalecanych min. 5 porcji warzyw i owoców w ciągu dnia. Kobiety wybierały niskotłuszczowe produkty mleczne oraz mięsne istotnie częściej niż mężczyźni. 73% kobiet i 67% mężczyzn deklarowało nieregularne spożycie olejów roślinnych. Około 8% kobiet i 11% mężczyzn dosalało potrawy bez żadnych ograniczeń, a odpowiednio 58% i 64% badanych osób używało cukier do dosładzania napojów.

Wnioski. Nieprawidłowe nawyki żywieniowe zaobserwowano u znacznej części badanych studentów, zwłaszcza wśród mężczyzn. Promowanie zasad prawidłowego odżywiania w tej grupie osób jest zatem wysoce uzasadnione.

Słowa kluczowe: *zwyczaje żywieniowe, zalecenia żywieniowe, studenci, owoce, warzywa*

---

* **Corresponding author:** Dorota Różańska, Wroclaw Medical University, Department of Dietetics, 34 Parkowa, 51-616 Wroclaw, Poland, Tel: +48 71 337 23 96, e-mail: dorota.rozanska@umed.wroc.pl

INTRODUCTION

Many scientific societies emphasize the role of healthy nutrition in the prevention of cardiovascular diseases (CVD) [10, 14, 18]. Many studies have taken into consideration the role of selected food products in the prevention of increased risk for CVD [3, 5, 15, 17].

One particular diet which has been identified as having a beneficial impact on human health is the Mediterranean diet [21]. On the basis of a meta-analysis it has been concluded that this diet can represent a pattern for the prevention of many chronic diseases. It was found that the Mediterranean diet can have a significant impact on reducing not only mortality from CVD, incidences or mortality from cancers and overall mortality, but also incidences of neurodegenerative diseases such as: *Parkinson's* or *Alzheimer's* [21]. The results of the PREMIER study [1] show that behavioral changes (weight loss, moderate physical activity, reduced sodium intake, reduced alcohol consumption) in patients with hypertension, affect a reduction of blood pressure and the prevalence of hypertension among them. However, better results were observed when behavioral modifications were applied together with a DASH (Dietary Approaches to Stop Hypertension) diet [1].

The aim of this cross-sectional study was to evaluate dietary habits among Wroclaw Medical University students with a view towards the nutritional risk factors for cardiovascular diseases.

MATERIALS AND METHODS

The study was conducted between 2004-2012. The study group consisted of 1,168 students (892 women, 276 men) from the Wroclaw Medical University (WMU) in Poland. All individuals were informed about the purpose and methods of the study and agreed to participate in the study. Data were collected from participants anonymously. The women were 22.9±1.4 years old and the men 23.2±1.9 years old. The respondents were asked to complete a questionnaire, which included 46 questions about nutritional habits and lifestyle.

The nutritional habits questionnaire contained questions based on principles highlighted in "The Polish food-based dietary guidelines". According to these recommendations a healthy diet should each day include [6, 23]:

1) At least 3 meals on average – breakfast being obligatory
2) A portion in each meal of: whole-grain bread, oatmeal, groats, pasta or potatoes
3) Vegetables and fruits (can be frozen) in every meal and between them
4) At least 2 full glasses of milk (preferably low-fat) or the same amount of kefir or yoghurt and 1-2 slices of cheese
5) One portion of a choice between: fish, poultry, peas, beans or meat
6) One spoon of vegetable or olive oil and no more than 2 teaspoons of soft margarine (without trans-fats)
7) At least 1 liter per day of mineral water and natural vegetable and fruit juices
8) No excessive amounts of salt, sugar or alcohol.

Weight and height were measured to calculate body mass index (BMI). Weight was measured using an electronic personal scale (Beurer GmbH, Germany) and rounded to the nearest kg. Waist circumference was measured using a non-stretch measuring tape. Measurements of blood pressure were performed using an M6 blood pressure monitor (OMRON, Japan) with arm cuff in 3 sizes. Blood pressure was measured 4 times (2 measurements over 2 visits, one week apart).

Statistical analysis

Linear variables were compared using a non-parametric U *Mann-Whitney* test, while an χ^2 test was performed to compare categorical variables. The differences were considered as statistically significant when a p-value was <0.05. Statistical analyses were carried out using STATISTICA v 10.0 PL software (StatSoft Inc., USA).

RESULTS

Characteristic of the study group

The average BMI was 20.7±2.7 kg/m^2 in women and 23.5±3.2 kg/m^2 in men (p<0.0001) and the average waist circumference was 70.7±7.0 cm and 85.3±8.5 cm respectively (p<0.0001). The average blood pressure among women was 122/76 mmHg, while among men 134/76 mmHg, with a statistical difference found only in regards to systolic blood pressure (p<0.0001). It was revealed that 10% of women and 22.1% of men were smokers at that time of the study (p<0.0001), while 9.4% and 14.5% respectively, were former smokers (p=0.0168).

Nutritional habits

The number of daily meals taken by the students is shown in Figure 1. Men failed to consume the minimum recommended 3 meals a day, significantly more frequently than women (10.1% vs 6.3%). Breakfast was eaten everyday by 89.5% of women and 79% of men (Table 1). More than half of the study group had, what is known in Poland, as a second breakfast (a light lunch usually taken between 10 am and 12 pm) irregularly. Almost 90% of the students had dinner every day. Significantly more men than women had supper every day (86.6% vs 74%). Snacks were eaten everyday by about 1/3 of the study group.
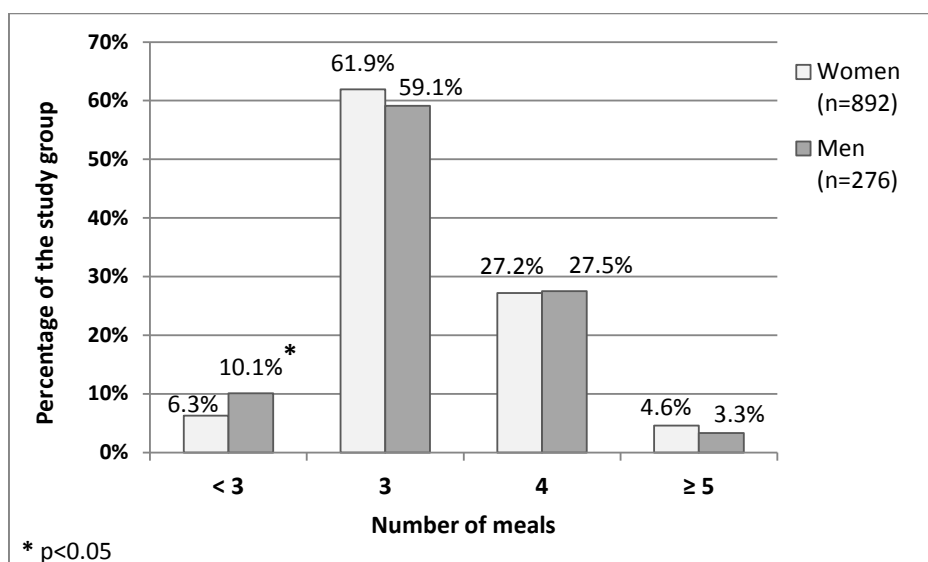
Figure 1. Number of meals consumed daily in the study group

Table 1. Frequency of meal consumption in the study group

Type of meal	Frequency	Women n=892 (%)	Men n=276 (%)	Women vs men (p value)*
Breakfast	Everyday	89.5	79.0	0.0000
	Irregularly	9.1	17.8	0.0001
	Never	1.5	3.3	0.0542
Second breakfast (lunch)	Everyday	24.0	17.8	0.0302
	Irregularly	58.2	52.9	0.1212
	Never	17.8	29.3	0.0000
Dinner	Everyday	87.6	89.5	0.3867
	Irregularly	11.5	9.8	0.4154
	Never	0.9	0.7	0.9184
Afternoon snack	Everyday	12.4	12.3	0.9561
	Irregularly	53.4	39.1	0.0000
	Never	34.2	48.6	0.0000
Supper	Everyday	74.0	86.6	0.0000
	Irregularly	21.1	12.3	0.0012
	Never	4.9	1.1	0.0045
Dinner-supper	Everyday	4.7	3.6	0.4449
	Irregularly	32.1	39.1	0.0300
	Never	63.2	57.2	0.0738
Snacks	Everyday	33.0	28.3	0.1431
	Irregularly	59.9	61.6	0.6080
	Never	7.2	10.1	0.1094

* - χ^2 test

Table 2. Preferences of fat content in selected foods among the study group

Product	Always low-fat		Once low-fat, once fat		Always fat		No preference		Do not eat	
	W* (%)	M** (%)	W (%)	M (%)	W (%)	M (%)	W (%)	M (%)	W (%)	M (%)
Milk	55.4	29.3[a]	20.7	22.1	15.2	31.2[a]	2.5	11.6[a]	6.2	5.8
Yoghurt	17.4	9.1[a]	37.7	17.4[a]	10.5	14.5	31.3	55.4[a]	3.1	3.6
Cottage cheese	47.5	24.3[a]	27.6	24.6	6.6	9.8	13.9	33.7[a]	4.4	7.6[a]
Meat, sausage	41.0	18.5[a]	40.5	48.9[a]	0.7	1.8	15.9	30.8[a]	1.9	0.0[a]

* Women n=892, ** Men n=276, a – significant differences between men and women p<0.05
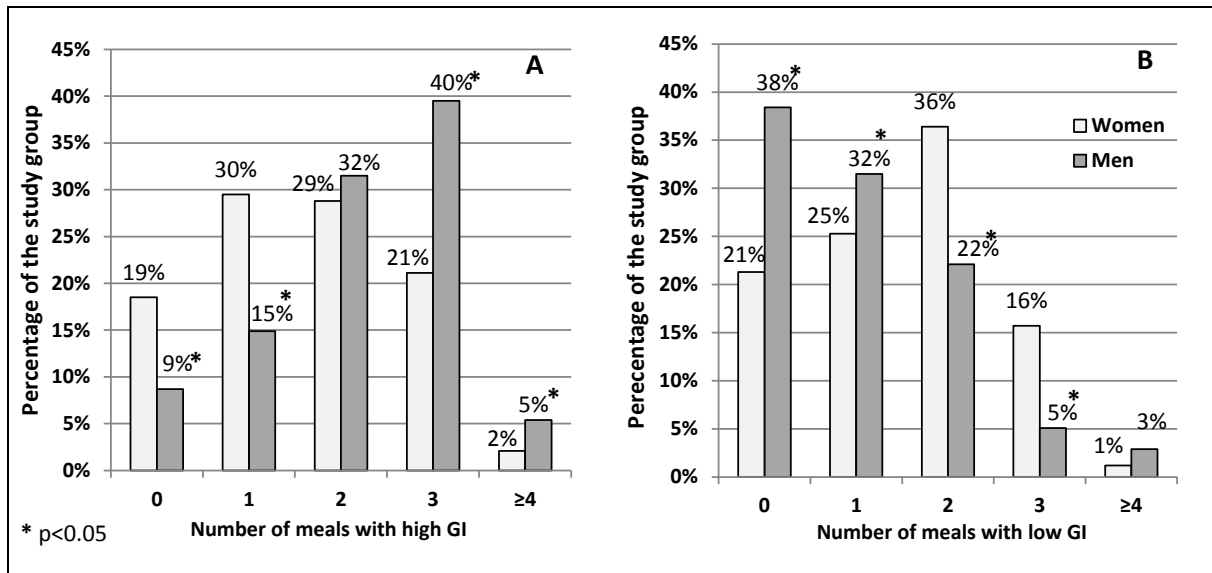
Figure 2. Number of meals with high (A) and low (B) glycaemic index (GI) consumed daily in the study group (women n=892; men n=276)
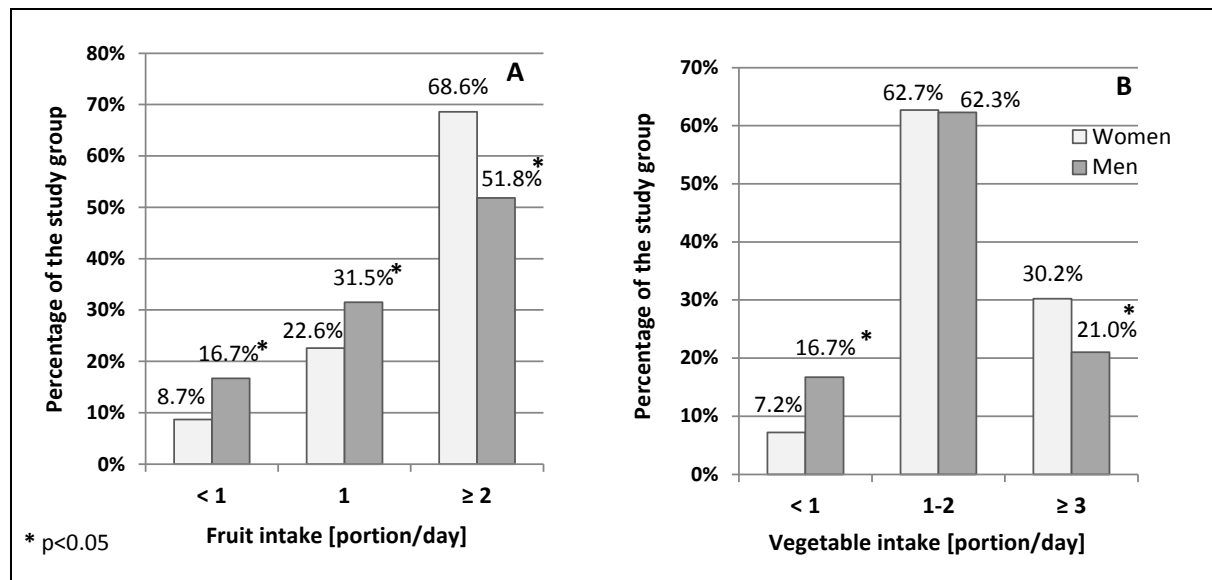

Figure 3. Fruit (A) and vegetable (B) intake [portion/day] in the study group (women n=892; men n=276)

The respondents were asked how many of their meals included low or high glycemic index (GI) products (Figures 2A and 2B). A majority of the study group, especially men, chose high GI products more frequent than low GI. About 70% of men consumed high GI products in 2-3 meals/day, while only 27% low GI. In the group of women about 50% of them had high and low GI products in 2-3 meals/day.

Fruits and vegetables should be eaten at every meal and also between them. Women consumed at least 2 portions of fruit per day, significantly more frequently than men (68.6% vs 51.8%, Figure 3A). Vegetables were also eaten in at least 3 meals/day significantly more frequently by women than men (30.2% vs 21%), as is presented in Figure 3B. Less than 9% of women did not consume fruits or vegetables regularly, while among men, the figure was 16.7%.

Similar numbers of the women and men studied (23.1% vs 26.1%, p=0.3076) consumed at least 2 glasses of milk, kefir or yoghurt per day. However, more men than women declared that they never drink these products or that they drink them irregularly (25.7% vs 15%, p<0.0001). A similar percentage of men and women ate 2 slices of hard cheese daily (19.9% vs 25.6%, p=0.0563). The preferences for fat content in dairy products consumed by the respondents are shown in Table 2. Another recommendation is to eat one portion of fish, poultry, peas, beans or meat every day. Among the study group, 91.3% of women and 98.6% of men (p<0.0001), declared that they eat at least one portion of these products daily. Among the women, 41% always chose low-fat meat while 15.9% did not pay attention to the fat content of their meat, whereas in the men - 18.5% and 30.8%, respectively did this (Table 2).

Table 3. Type of fat customarily used to frying and to spread on bread in the study group

Products	Women n=892 (%)	Men n=276 (%)
Type of frying fat		
Butter	1.0	1.1
Hard margarine	2.0	2.5
Butter−vegetable oil mixtures	0.3	1.1
Vegetable oil	56.1	50.0
Butter or vegetable oil	15.2	15.2
Hard margarines or vegetable oil	11.7	11.2
Soft margarines or vegetable oil	2.1	4.7
Butter−vegetable oil mixtures or vegetable oil	1.8	4.0
Lard or vegetable oil	2.1	4.7
Other fats or fat mixtures	1.8	1.3
No frying	5.7	4.0
Type of fat spreading on bread		
Butter	30.7	30.4
Soft margarine	11.7	16.3
Butter−vegetable oil mixtures	8.6	10.9
Butter or soft margarine	9.5	8.7
Butter or butter−vegetable oil mixtures	11.1	11.2
Soft margarines or butter−vegetable oil mixtures	4.8	5.1
Other fats or fat mixtures	0.2	0.4
None	23.3	17.0

Table 4. Mineral water, fruit and vegetable juices and tea consumption in the study group

Daily drinks intake [liter/day]	Mineral water		Fruit and vegetable juices		Tea	
	Women (n=892)	Men (n=276)	Women (n=892)	Men (n=276)	Women (n=892)	Men (n=276)
0	23.7	23.2	54.6	59.8	4.8	12.0
0.25	13.3	6.2	24.8	19.2	5.5	14.5
0.5	28.0	19.9	16.3	13.4	24.8	24.3
0.75	11.1	10.5	2.2	2.5	28.8	20.3
1.0	13.3	16.3	1.7	4.0	21.5	14.1
1.25	3.1	4.0	0.3	0.0	7.5	6.5
1.5	5.9	13.4	0.1	1.1	3.7	6.9
2.0	0.8	3.3	0.0	0.0	2.1	0.7
> 2.0	0.7	3.3	0.0	0.0	1.2	0.7

A large number of those studied, 72.9% of women and 67.4% of men (p=0.0778), declared they did not eat vegetable oil or olive oil regularly. Only about 20% of both groups consumed the recommended 1 tablespoon of these oils per day. Among the study population, 6.4% of women and 7.2% of men ate 2 tablespoons of oils per day (p=0.6164), whereas 1.4% and 4.7% respectively, ate 3 or more spoons of oils per day (p=0.0007). When asked about frying habits, 56.1% of women and 50% of men (p=0.0775) usually used vegetable oil (Table 3). Only 11.7% of women and 16.3% of men chose soft margarines to spread on bread (p=0.0432), while 30.7% and 30.4% respectively, used butter (p=0.9291). However, 23.3% of women and 17% of men (p=0.0271), did not spread the bread (Table 3).
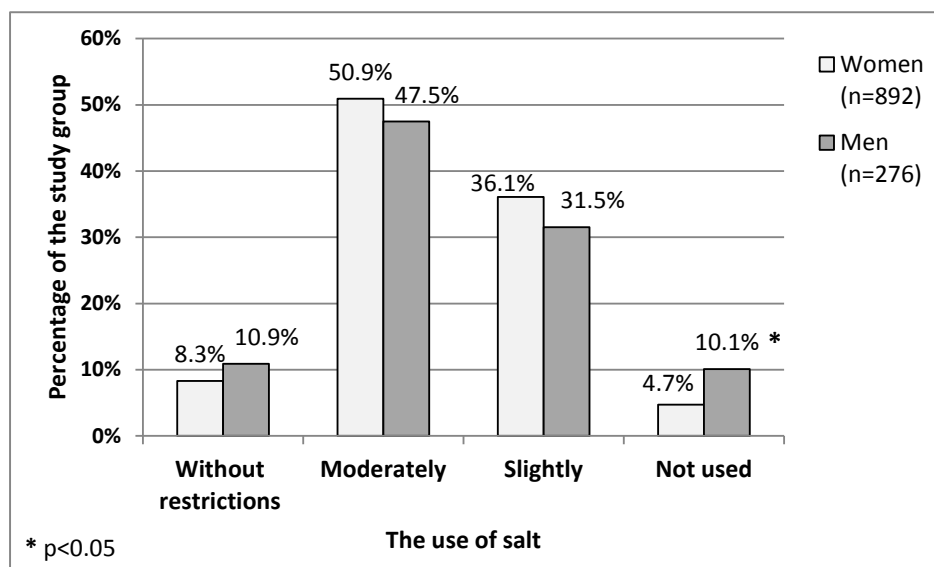
Figure 4. The use of salt in the study group

One further recommendation is to drink at least 1 liter per day of mineral water and natural vegetable or fruit juices. Significantly more men than women (40.2% vs 23.9%, p<0.0001) consumed the recommended amount of mineral water, while a similar percentage of both groups (23.7% vs 23.2%) did not consume mineral water regularly (Table 4). Only 5.1% of men and 2.1% of women (p=0.0099) reported they consumed the daily allowance of at least 1 liter of natural vegetable and fruit juices.

The respondents were also asked about their use of additional salt in meals and the use of sugar to sweeten beverages. Among the students, about 8% of women and 11% of men, used salt without restriction, while only 4.7% and 10.1% respectively, did not use salt at all (Figure 4). About 57.5% of women and 64.1% of men declared that they used sugar to sweeten beverages (p=0.0507). It was noted that among those students who declared adding sugar to beverages, the average sugar intake in women was 24.7 g/day, while in men it was 30.8 g/day.

DISCUSSION

Improper dietary habits, *i.e.* an impaired balance between daily energy intake and energy expenditure, may lead to the development of obesity, and further to CVD. Among the examined students, 7.1% of women and 27.5% of men, had excessive body mass (BMI ≥25 kg/m^2) which might be an effect of an unhealthy lifestyle; *e.g.* high energy intake and low physical activity. In 2009, excessive body weight was observed in more than 45% of women and 61% of men in Poland. The highest percentage increase of people being overweight or obese since 2004, was observed among 20-49 year old women, and among 20-39 year old and >70 year old men [26]. Therefore, the monitoring of

dietary habits among young people seems to be very important due to the need to counteract the development of obesity in subsequent years of life. Excessive body weight is a significant public health problem because it correlates to CVD, hypertension, diabetes and selected types of cancers. In 2010, CVD was responsible for 51.8% of deaths among women and 40.8% among men in Poland [26]. The World Health Organization considers an unhealthy diet (mainly high intake of salt, saturated fatty acids (SFA), trans-fat, cholesterol and low intake of fruits, vegetables and fish) to be related to the risk of contracting CVD [14].

In Polish [23] and American guidelines [24], eating breakfast is underscored as one of the most important dietary habits in health maintenance especially among children, adolescents and adults. The authors of the prospective study [16] observed that a lower number of days in which breakfast was consumed during adolescence, was associated with a higher risk of increased BMI in young adulthood. Moreover, eating breakfast has a beneficial impact on weight loss and weight loss maintenance. Skipping breakfast inhibits this process. Another nutritional factor associated with body weight is the number of meals eaten daily. *Marín-Guerrero* et al. [13] assessed the relationship between eating behavior and obesity in the Spanish population aged 25–64 years. It was found that obesity occurred more frequently in those men and women who took 2 meals per day than in those having 3 or 4 meals per day.

The amount of meals daily and the frequency of eating breakfast were adequate in the majority of the study group herein, however the unrecommended habit of having snacks was observed in about 30% (everyday) and 60% (irregularly) of the students. Eating snacks between main meals may lead to increased energy intake and to later excessive weight

gain. More than 90% of the study population complied with the recommendation to eat at least 3 meals daily, which was similar to results obtained in other studies conducted among young people [8, 9]. In a previous study by *Ilow* [6] slightly fewer men and women from WMU, than in the present study, declared having ≥3 meals per day. In a group of Chinese students 79% had three meals daily and 4.2% had four meals daily [20]. The habit of having breakfast everyday was observed in most of the study population, which was similar to the WMU students between 1998-2003 [6]. Skipping breakfast among students was not as frequent as in pupils of the Middle School and Secondary School in Olesnica in the Voivodeship of Lower Silesia (Poland) [8, 9]. However, the habit of having breakfast regularly, was observed only in about 60% of women and 49% of men from University of Economics in Wroclaw [11]. The frequency of breakfast among students depends on location, as was observed by *Stefanska* et al. [22]. A higher percentage of students who lived in the family home (85% women, 77% men) than those who lived in a student dormitory or rented room (72% and 57%, respectively) had breakfast every day. In contrast to the regular breakfast habits observed in Wroclaw, as well as in the Beijing University [20], about two-thirds of students from the Lebanese American University (in Beirut) had breakfast irregularly [27].

In the majority of the study population, there was an insufficient intake of fruits and vegetables. About 62% of women and 75% of men did not consume the recommended 5 portions of these products per day. Consumption of at least 400 g/day of fruits and vegetables is the portion emphasized in every dietary guideline. The protective role of these products stems from the content of antioxidant vitamins, polyphenols and dietary fiber, especially soluble fractions, within them. Fruits and vegetables are very valuable components of the diet because they are rich in healthy nutrients, while at the same time, low in calories with the vast majority of them not inducing high postprandial glucose. These products are the basis of the Mediterranean and DASH diets, which were considered helpful in the prevention and treatment of *e.g.* coronary heart disease and hypertension. The importance of eating a sufficient amount of fruits and vegetables, and their protective role against CVD has been observed by many authors [3, 5]. Among students from WMU in the years prior to this study, almost twice as many consumed fruits irregularly, which may indicate an increased frequency of consumption of these products. Taking into account vegetables, such a change was only observed among women [6]. *Kowalska* [11] found that only 51.5% of women and 41.2% of men from University of Economics in Wroclaw had eaten fruits and vegetables everyday. Fruit and vegetable consumption should also be monitored

and promoted among adolescents, due to the studies showing an insufficient intake of these products within this age group [7, 8, 9]. An unsatisfactory consumption of fruits and vegetables was also noted among students from other countries, such as China and Lebanon [20, 27].

A properly balanced diet should include dairy products and one portion of meat, poultry, fish or legumes but it is always emphasized that meat and dairy products should be low-fat, because they are sources of atherogenic SFA. Many guidelines have indicated that the SFA content in one's diet should be reduced in view of its negative impact on the cardiovascular system [10, 18, 24]. The latest Guideline on Lifestyle Management to Reduce Cardiovascular Risk [4] states that, adults who are required to reduce their LDL-cholesterol level, should obtain 5% to 6% of their calories from SFA in the diet. On the other hand, it is recommended to consume vegetable oils and soft margarines every day, because they are sources of unsaturated fatty acids. It was observed that in Poland, between 1990-1999, mortality due to coronary heart disease decreased. These positive changes were attributed *inter alia* to the increased consumption of vegetable oils and the reduced consumption of animal fats, causing the ratio between polyunsaturated to saturated fatty acids to increase [29].

Preferences about sources of fat were different between men and women. Women paid more attention to fat content in dairy products and meat than men, thus choosing low-fat products more often. Similar preferences were observed for fat content in milk among women from WMU in years previous to this study [6]. However, men from WMU in the *Ilow* [6] study chose low-fat milk more frequently and fatty milk less so, than the men in this study, thus indicating an unfavorable change of dietary habits in this area. There were no significant changes in preference for fat content in meat between the women from the previous study and the present one, whereas there were differences among men. Only 18.5% of students from this study always chose low-fat meat, while in the *Ilow* study [6], the figure was more than 41%. On the other hand, about 31% of students from the present study paid no attention to the fat content in meat while in *Ilow* [6] previous study, the figure was only about 18%.

Most of the study population, as in the previous results [6], did not consume vegetable oil or olive oil regularly, which may lead to insufficient intake of unsaturated fatty acids, and to further development of dyslipidemia in this group. If vegetable oils were present in the students' diets, they were generally used for frying, while rarely as an addition to salads. Taking into account the spreading of fat on bread, about one-third of the study group chose butter, which may cause

excessive atherogenic SFA ($C_{12:0}$, $C_{14:0}$) content in their diets. When comparing the previous and present study groups, it was found that butter was more frequently preferred by the current group. Additionally, students from the more recent study reported spreading no fat on their bread at a greater frequency than their peers earlier [6]. Among pupils from Olesnica (Poland), butter was also the most frequently chosen fat for bread. In Secondary School 34.5% of girls and 43.4% of boys used butter [9], while in Middle School it was 49.2% and 33.3% respectively [8].

Nowadays, a significant role is given to the amount and type of carbohydrates present in human nutrition. In a meta-analysis of observational studies it was found that, low GI and glycemic load (GL) were independently associated with a reduced risk of type 2 diabetes, coronary heart disease, gallbladder disease, breast cancer and all diseases combined [2]. The eating of low GI foods, compared with high GI, at breakfast by children aged 9 to 12 years, caused lower energy intake at lunch in this group, what may be an important factor in weight control [25]. Food with low GI and GL should dominate one's diet, especially at breakfast, because they cause lower energy intake at other meals, which is helpful in the maintenance of proper body weight. In the study population, meals containing high GI products were preferred more than those with low GI, especially among men. Only about 32% of women and 18% of men preferred whole-grain bread. White bread or white and whole-grain bread, were usually chosen by pupils and students from other studies [8, 9, 12]. It is worth noted that not only sweets, but also bread and other cereal product intake is significantly correlated with the value of dietary GL, what was shown in the study conducted among female dietetics students from WMU [19]. Therefore it is important to choose low GI food from this group.

Another recommendation is to avoid adding sugar to beverages and meals as an important point in the obesity, diabetes and CVD prevention [14, 23]. In the study population compared to the results obtained by *Zaborowicz* et al. [28] a similar percentage of women (55.2% vs 57.5%) and smaller percentage of men (64.1% vs 71%) declared using sugar to sweeten beverages.

Among important recommendations, low sodium intake should be the subject of particular attention. The figures regarding use of additional salt in meals, in the study population, can be encouraging, because only about 8.3% of women and 11.8% of men used salt without restriction. Similar results were obtained by *Ilow* [6] in the previous study among WMU students. In the study conducted by *Zaborowicz* et al. [28] 11.9% of women and 14.5% of men declared adding salt to dishes. An excessive amount of salt in the diet is one of the features of inadequate nutrition pointed out by the Polish Forum for Prevention of Cardiovascular Diseases [10]. In Polish, European and American guidelines it is recommended to reduce salt intake due to its role in the development of hypertension [10, 18, 24]. The amount of sodium in the diet can be reduced not only by avoiding added salt, but also by limiting the consumption of highly processed foods including: canned, smoked or pickled foods, sausages, hard cheese and snacks such as chips.

CONCLUSIONS

In the study presented herein, the dietary habits of students were assessed based on the principles pointed out in "The Polish food-based dietary guidelines". Some proper habits were observed in this population, however there were also numerous eating patterns not in compliance with these recommendations. Nutritional habits among students should be monitored, because they change over time, and sometimes these transitions are negative. The incorrect nutritional habits observed among a number of students may lead to health problems, such as obesity and cardiovascular diseases in future. The study population should modify their diets through a higher consumption of whole grain products, low glycaemic index food, low-fat dairy products, vegetable oils, fruits, vegetables and increased consumption of mineral water. Conversely, the consumption of snacks, butter, salt and sugar should be avoided.

In conclusion, there were a significant number of improper nutritional habits among the study population, and it is emphatically suggested that the rules of proper nutrition be promoted among this group.

Conflict of interest
None declared.

REFERENCES

1. *Appel L.J., Champagne C.M., Harsha D.W., Cooper L.S., Obarzanek E., Elmer P.J., Stevens V.J., Vollmer W.M., Lin P.H., Svetkey L.P., Stedman S.W., Young D.R.*; Writing Group of the PREMIER Collaborative Research Group: Effects of comprehensive lifestyle modification on blood pressure control: main results of the PREMIER clinical trial. JAMA 2003;289:2083-2093.

2. *Barclay A.W., Petocz P., McMillan-Price J., Flood V.M., Prvan T., Mitchell P., Brand-Miller J.C.*: Glycemic index, glycemic load, and chronic disease risk-a meta-analysis of observational studies. Am J Clin Nutr 2008;87:627-637.

3. *Crowe F.L., Roddam A.W., Key T.J., Appleby P.N., Overvad K., Jakobsen M.U., Tjønneland A., Hansen L., Boeing H., Weikert C., Linseisen J., Kaaks R., Trichopoulou A., Misirli G., Lagiou P., Sacerdote C., Pala V., Palli D., Tumino R., Panico S., Bueno-de-Mesquita H.B., Boer J., van Gils C.H., Beulens J.W., Barricarte A., Rodríguez L., Larrañaga N., Sánchez M.J., Tormo M.J., Buckland G., Lund E., Hedblad B., Melander O., Jansson J.H., Wennberg P., Wareham N.J., Slimani N., Romieu I., Jenab M., Danesh J., Gallo V., Norat T., Riboli E.*; European Prospective Investigation into Cancer and Nutrition (EPIC)-Heart Study Collaborators: Fruit and vegetable intake and mortality from ischaemic heart disease: results from the European Prospective Investigation into Cancer and Nutrition (EPIC)-Heart study. Eur Heart J 2011;32:1235-1243.

4. *Eckel R.H., Jakicic J.M., Ard J.D., de Jesus J.M., Houston Miller N., Hubbard V.S., Lee I.M., Lichtenstein A.H., Loria C.M., Millen B.E., Nonas C.A., Sacks F.M., Smith S.C. Jr, Svetkey L.P., Wadden T.A., Yanovski S.Z.*: 2013 AHA/ACC Guideline on Lifestyle Management to Reduce Cardiovascular Risk: A Report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines. Circulation 2014;129(25 Suppl 2):S76-S99.

5. *He F.J., Nowson C.A., Lucas M., MacGregor G.A.*: Increased consumption of fruit and vegetables is related to a reduced risk of coronary heart disease: meta-analysis of cohort studies. J Hum Hypertens 2007;21:717-728.

6. *Ilow R.*: Assessment of the dietary habits of students of Wroclaw Medical University. Adv Clin Exp Med 2005;14:929-938 (in Polish).

7. *Ilow R., Płonka K., Regulska-Ilow B., Biernat J.*: Assessment of fruit and vegetable intake among the population of junior high school students from Oleśnica. Rocz Panstw Zakl Hig 2007;58:237-243.

8. *Ilow R., Regulska-Ilow B., Płonka K., Biernat, J.*: Evaluation of the dietary habits of lower secondary school students in Olesnica. Bromat Chem Toksykol 2009;42:693-698 (in Polish).

9. *Ilow R., Regulska-Ilow B., Szarzała-Kruk D., Biernat J.*: Evaluation of the dietary habits of secondary school students in Olesnica. Bromat Chem Toksykol 2008;41:705-710 (in Polish).

10. *Kłosiewicz-Latoszek L., Szostak W.B., Podolec P., Kopeć G., Pająk A., Kozek E., Naruszewicz M., Stańczyk J., Opala G., Windak A., Zdrojewski T., Drygas W., Klupa T., Undas A., Czarnecka D., Sieradzki J.*: Polish Forum for Prevention Guidelines on Diet. Kardiol Pol 2008;66:812-814

11. *Kowalska A.*: Nutrition habits of students of University of Economics in Wroclaw. Rocz Panstw Zakl Hig 2010;61:277-282 (in Polish).

12. *Lebiedzińska A.*: Selected cereal products as functional elements of the diet - frequency consumption of cereal products among university students. Rocz Panstw Zakl Hig 2007;58:295-300 (in Polish).

13. *Marín-Guerrero A.C., Gutiérrez-Fisac J.L., Guallar-Castillón P., Banegas J.R. Rodríguez-Artalejo F.*: Eating behaviours and obesity in the adult population of Spain. Br J Nutr 2008;100:1142–1148.

14. *Mendis S., Puska P., Norrving B.*: Global atlas on cardiovascular disease prevention and control. World Health Organization, Geneva 2011.

15. *Mozaffarian D.*: Fish and n-3 fatty acids for the prevention of fatal coronary heart disease and sudden cardiac death. Am J Clin Nutr 2008;87(suppl):1991S–1996S.

16. *Niemeier H.M., Raynor H.A., Lloyd-Richardson E.E., Rogers M.L., Wing R.R.*: Fast food consumption and breakfast skipping: predictors of weight gain from adolescence to adulthood in a nationally representative sample. J Adolesc Health 2006;39:842-849.

17. *Pan A., Sun Q., Bernstein A.M., Schulze M.B., Manson J.E., Stampfer M.J., Willett W.C., Hu F.B.*: Red meat consumption and mortality: results from 2 prospective cohort studies. Arch Intern Med 2012;172:555-563.

18. *Perk J., De Backer G., Gohlke H., Graham I., Reiner Ž., Verschuren W.M.M., Albus C., Benlian P., Boysen G., Cifkova R., Deaton C., Ebrahim S., Fisher M., Germano G., Hobbs R., Hoes A., Karadeniz S., Mezzani A., Prescott E., Ryden L., Scherer M., Syvänne M., Scholte Op Reimer W.J., Vrints C., Wood D., Zamorano J.L., Zannad F.* European Association for Cardiovascular Prevention & Rehabilitation (EACPR); ESC Committee for Practice Guidelines (CPG): European guidelines on cardiovascular disease prevention in clinical practice (version 2012). The Fifth Joint Task Force of the European Society of Cardiology and Other Societies on Cardiovascular Disease Prevention in Clinical Practice (constituted by representatives of nine societies and by invited experts). Eur Heart J 2012;33:1635–1701.

19. *Różańska D., Kawicka A., Konikowska K., Salomon A., Zatońska K., Szuba A., Regulska-Ilow B.*: Assessment of glycemic load and intake of carbohydrates in the diets of Wroclaw Medical University students (Poland). Rocz Panstw Zakl Hig 2016;67:301-308.

20. *Sakamaki R., Toyama K., Amamoto R., Liu C.J., Shinfuku N.*: Nutritional knowledge, food habits and health attitude of Chinese university students - a cross sectional study. Nutr J 2005, 4:4 doi:10.1186/1475-2891-4-4.

21. *Sofi F., Cesari F., Abbate R., Gensini G.F., Casini A.*: Adherence to Mediterranean diet and health status: meta-analysis. BMJ 2008;337:a1344, doi:10.1136/bmj.a1344

22. *Stefańska E., Ostrowska L., Radziejewska I., Kardasz M.*: Mode of nutrition in students of the Medical University of Bialystok according to their place of residence during the study period. Probl Hig Epidemiol 2010;91:585-590 (in Polish).

23. The Polish food-based dietary guidelines. Czynniki Ryzyka 1997;17-18:7a (in Polish).

24. U.S. Department of Agriculture and U.S. Department of Health and Human Services. Dietary Guidelines for Americans, 2010. 7th Edition, Washington, DC 2010: U.S. Government Printing Office.

25. *Warren J.M., Henry C.J., Simonite V.*: Low glycemic index breakfasts and reduced food intake in preadolescent children. Pediatrics 2003;112:e414-e419.

26. *Wojtyniak B., Goryński P., Moskalewicz B.*: Health situation of the Polish population and its determinants. Narodowy Instytut Zdrowia Publicznego - Państwowy Zakład Higieny. Warszawa, 2012 (in Polish).

27. *Yahia N., Achkar A., Abdallah A., Rizk S.*: Eating habits and obesity among Lebanese university students. Nutr J 2008;7:32 doi:10.1186/1475-2891-7-32.

28. *Zaborowicz K., Czarnocińska J., Galiński G., Kaźmierczak P., Górska K., Durczewski P.:* Evaluation of selected dietary behaviours of students according to gender and nutritional knowledge. Rocz Panstw Zakl Hig 2016;67:45-50.

29. *Zatoński W.A., Willett W.*: Changes in dietary fat and declining coronary heart disease in Poland: population based study. BMJ 2005;331:187-189.