

Adherence to the 2021 dietary guidelines of the European Society of Cardiology on cardiovascular disease prevention in residents of the Pomeranian Voivodeship with increased cardiovascular risk

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KEY WORDS

cardiovascular prevention, compliance, diet, dietary habits, guidelines

ABSTRACT

INTRODUCTION Good eating habits can reduce cardiovascular risk.

OBJECTIVES The aim of this work was to verify the compliance with the new European Society of Cardiology (ESC) dietary guidelines in people with increased risk of cardiovascular disease.

PATIENTS AND METHODS The study included 1244 current or former smokers (636 men and 608 women) at a mean (SD) age of 61.6 (6.4) years who volunteered for the MOLTEST BIS lung cancer prevention program. During the program, 49% of the patients were diagnosed with one of the following: arterial hypertension (AH), diabetes mellitus (DM), or coronary artery disease (CAD). The patients with lung cancer were excluded from the study. The participants completed a Food Frequency Questionnaire (FFQ-6) and their food intake was assessed with a 24-hour dietary recall method.

RESULTS Only 2% of the studied individuals declared consuming more than 2 servings of both fruits and vegetables every day, and only 3% of the respondents confirmed daily nut consumption. Most of them weighed too much, consumed too little fiber, and derived too much energy from total and saturated fats. The mean animal to plant protein ratio was higher than recommended, as was the omega-6 to omega-3 fatty acid ratio. Only 40% of the participants with AH, DM, or CAD had a daily cholesterol intake below 200 mg, and in only 12% of them less than 7% of total energy came from saturated fats.

CONCLUSIONS The smokers with increased cardiovascular risk did not comply with the 2021 ESC dietary recommendations. The most common error was inadequate consumption of vegetables, fruits, and nuts.

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INTRODUCTION Diet is an integral part of lifestyle, and there is no doubt that inappropriate eating habits play an important role in the etiology of cardiovascular diseases (CVDs). Obesity has been proved to be the leading cause of death in some industrialized countries, even preceding smoking.¹ Thus, an improper, obesogenic diet and smoking are 2 the most common causes of death from CVD and cancer.^{2,3} Fortunately, there

is also strong evidence that changing inappropriate eating habits can reduce the risk of civilization diseases.³⁻⁵ According to the 2021 guidelines of the European Society of Cardiology (ESC), a proper diet is recommended as a fundamental part of CVD prevention in all individuals,⁶ because it also reduces the incidence of obesity, diabetes, dyslipidemia, and hypertension, which are common risk factors for cardiovascular death. Based

WHAT'S NEW?

Inappropriate eating habits play an important role in the etiology of cardiovascular diseases. According to the current European Society of Cardiology guidelines, a proper diet is recommended as a fundamental part of prevention in all individuals, because it also reduces the incidence of obesity, diabetes, dyslipidemia, and hypertension, which are common risk factors for cardiovascular death. In our work, we assessed the compliance with those dietary recommendations in a large group of residents of the Pomeranian Voivodeship, Poland with increased cardiovascular risk. We found that their diet was animal-based, rich in ultraprocessed food with high content of saturated fats and simple sugars. What is more, over 90% of the respondents ate too little fiber, vegetables, fruits, and nuts, which was the most common dietary mistake. Considering low effectiveness of meat reduction strategies, it is worth placing more emphasis on promoting daily consumption of vegetables, fruits, and nuts to prevent cardiovascular death.

on many reliable studies, ESC recommends maintaining a normal weight, choosing a more plant-based and fiber-rich food pattern, replacing saturated fats with unsaturated ones, and avoiding highly processed foods that contain trans fats, simple sugars, salt, and nitrates.⁶ Unfortunately, the level of nutritional education in Poland is still too low.⁷⁻¹¹ The largest study assessing the diet and adherence to dietary recommendations in a representative group of Poles, conducted in the years 2013–2014, showed that a significant percentage of Poles had inappropriate eating habits.¹²

It has been proved that even a small dietary modification can potentially reduce the health-related risks and extend life expectancy.^{5,9,13} Moreover, lifestyle changes may be of particular benefit in a population at a high risk of developing a chronic disease. Such a group are undoubtedly former and present smokers. Smoking continues to be one of the most challenging public health problems,¹⁰ and current prevention programs focus primarily on smoking abstinence. However, it seems that nutritional education should also be an integral part of intervention in this high-risk group. In order to create an effective preventive program, it is necessary to assess the eating habits of the target population and find the most common dietary mistakes. Such an opportunity arose during the MOLTEST BIS study, a lung cancer screening program at the Medical University of Gdansk. The patients at a risk of developing lung cancer have even higher cardiovascular risk. As an update to the ESC guidelines was published in 2021, and the crucial role of diet in the prevention of CVD has been further emphasized, the aim of this study was to evaluate the dietary habits of MOLTEST BIS participants and to see if they were in line with the latest ESC recommendations.

PATIENTS AND METHODS All participants of the study were volunteers from the MOLTEST BIS, a lung cancer screening program conducted between 2016 and 2018 at the Department

of Thoracic Surgery, Medical University of Gdansk, Poland. The study included people at a high risk of developing lung cancer in accordance with the guidelines of the National Comprehensive Cancer Network and the International Association for the Study of Lung Cancer, that is, active or former smokers aged 50 to 79 years. Due to their smoking history (≥ 30 pack-years) and age, all the participants were also considered individuals with increased cardiovascular risk.

The project was approved by the independent ethics committee of the Medical University of Gdansk (NKEBN/376/2014), and all the participants provided their written informed consent. The design and methodology of the MOLTEST BIS have been described previously.^{14,15} The program also included an additional section on CVDs and nutrition. During the study, the patients visited a dietitian who took anthropometric measurements of their weight, height, waist circumference, and body composition with bioelectrical impedance (Tanita BC 418 MA, Tanita Corporation, Tokyo, Japan). The dietitian also assessed the dietary intake with a single cycle of a 24-hour dietary recall method. Then, after a brief instruction, the participants completed the Food Frequency Questionnaire (FFQ-6). On the same visit, each participant was also consulted by a cardiologist who, based on the patient history, physical examination, and additional tests (electrocardiogram, laboratory workup) diagnosed arterial hypertension (AH), diabetes mellitus (DM), or coronary artery disease (CAD).

In this study, we analyzed food intake and dietary habits of 1244 people (636 men and 608 women). As many as 49% of them were diagnosed with AH, DM, and/or CAD. The patients diagnosed with lung cancer were excluded from this analysis. The characteristics of the patients are presented in [TABLE 1](#).

FFQ-6 is a semi-qualitative food intake frequency questionnaire adapted for the Polish population by Niedzwiedzka and Wądołowska.¹⁶ The habitual consumption of 62 food items in the last 12 months is assessed in 6 categories. For each of the listed food items, the respondents could declare the frequency of their consumption, choosing from 6 responses, which were scored as follows: (1) never, (2) once a month or less frequently, (3) several times a month, (4) several times a week, (5) daily, or (6) several times a day. The results were presented by indicating the median value of the answer scores for each food item. Additionally, the percentage of respondents who chose answer 5 or 6 (ie, the percentage of people consuming the food product at least once a day) was calculated. The tables shows selected food items from among the 62 assessed ones.

A 24-hour dietary recall was analyzed with Aliant 2.0 software (AnmarSoft, Gdańsk, Poland).

Statistical analysis All statistical calculations were performed using Statistica, version 13.3 (TIBCO Software, Palo Alto, California, United States).

TABLE 1 Characteristics of the study participants

Parameter		All (n = 1244)	Men (n = 636)	Women (n = 608)	P value
Age, y	Mean (SD)	61.6 (6.4)	61.5 (6.6)	61.7 (6.1)	0.56
	Min–max	48–85	49–80	48–85	
BMI, kg/m ²	Mean (SD)	27.7 (4.8)	28.3 (4.7)	27.2 (4.8)	<0.001
	Min–max	13.8–49.5	16.1–48.1	13.8–49.5	
Waist circumference, cm	Mean (SD)	97.2 (14.4)	103 (13.5)	91.2 (12.7)	<0.001
	Min–max	62–145	68–145	62–130	
Fat tissue, %	Mean (SD)	29.2 (8.8)	24.4 (7.2)	34.3 (7.3)	<0.001
	Min–max	2.8–63.6	2.8–63.6	9.2–55.2	
Diagnosed with DM, %		148 (11.9)	83 (13.1)	65 (10.7)	0.2
Diagnosed with AH, %		485 (39)	259 (40.7)	226 (37.2)	0.2
Diagnosed with CAD, %		53 (4.3)	35 (5.5)	18 (3)	0.03

Differences were considered significant at $P < 0.05$.

Abbreviations: AH, arterial hypertension; BMI, body mass index; CAD, coronary artery disease; DM, diabetes mellitus

TABLE 2 Intake of macronutrients per person per day in women and men as compared with the recommendation of the National Food and Nutrition Institute in Warsaw¹⁷

Macronutrients	Recommended/ suggested daily intake ¹⁷	Women (n = 608)		Men (n = 636)	
		Median (IQR)	% of E	Median (IQR)	% of E
Protein, g	10%–20% of E	70 (53–90)	17	67 (52–90)	17
Animal/plant protein ratio	< 1	2.1 (1.4–3.1)	–	2.1 (1.4–3.2)	–
Fat, g	20%–35% of E	70 (49–103)	37 ^a	71 (47–98)	38 ^a
SFA, g	as low as possible	27 (16–42)	14	25 (16–38)	14
MUFA, g	NA	24 (16–36)	13	24 (15–34)	13
PUFA, g	NA	8.1 (4.9–12.7)	7	7.8 (4.9–12.4)	7
Omega 6:3 ratio	<5:1	5.5 (4.2–7.8)	–	5.4 (3.9–7.9)	–
Cholesterol, mg	<300 mg	254 (161–414)	–	241 (147–394)	–
Carbohydrates, g	45%–60% of E	197 (142–263)	45 ^b	200 (147–394)	46 ^b
Sucrose, g	As low as possible	25 (11–46)	7	28 (13–48)	8
Fiber ^c , g	30–45 g	16 (12–23)	–	16 (11–23)	–

a $P = 0.01$ between women and men

b $P = 0.04$

c Daily intake recommended by the European Society of Cardiology⁶ is higher than that recommended for the Polish population (> 25 g/d).

Abbreviations: E, energy; IQR, interquartile range; MUFA, monounsaturated fatty acids; NA, not available; PUFA, polyunsaturated fatty acids; SFA, saturated fatty acids

Quantitative variables were presented as mean and standard deviation (SD) or median and interquartile range (IQR). Qualitative variables were presented as numbers and percentages. The Shapiro–Wilk test was used to check for normal distribution of the quantitative variables. The Levene (Brown–Forsythe) test was used to test the hypothesis of equal variances. The significance of differences between the 2 groups (model of unrelated variables) was tested by the t test or the Mann–Whitney test. The χ^2 test of independence was used for qualitative variables. For all the calculations, the level of significance was set at P of 0.05.

RESULTS **Body mass index** Only 0.9% of the participants were underweight (body mass index

[BMI] <18.5), 28.3% had a normal BMI, 43.2% were overweight, and 27.6% were obese.

Dietary intake The dietary intake of macronutrients in the studied population is presented in **TABLE 2**. It shows that men derived more energy from fats than women, and both sexes consumed more total and saturated fats than recommended. The omega-6 to omega-3 fatty acid ratio was too high in both men and women. Both sexes also consumed too little fiber. The animal to plant protein ratio in the diet was very high, with a median of 2.1 (IQR, 1.4–3.2); the recommended ratio is equal to or less than 1.0.

The participants with AH reported a lower intake of saturated fat and plant protein than

TABLE 3 Food Frequency Questionnaire-6 results^a for all respondents (n = 1244)

Food product	Score, median (IQR)	Respondents who selected answers (5) or (6) (ie, people consuming the food at least once a day), %
Butter	5 (3–5)	50
Vegetables	4 (4–5)	42
Fruits	4 (4–5)	41
Whole meal bread	4 (4–5)	38
White bread	4 (4–5)	36
Potatoes and potato dishes	4 (3–5)	27
Milk and fermented unsweetened milk drinks	4 (3–5)	28
High-quality cured meats (ham, poultry, and pork-beef good-quality cold meats)	4 (3–4)	20
Processed red meat (sausages, meat loaf, hot-dogs, smoked sausages, bacon)	4 (3–4)	16
Olive and vegetable oils	4 (3–4)	17
Sugar added to meals and drinks	4 (1–5)	44
Cheese (hard, blue, and processed)	3 (3–4)	11
White meat unprocessed	3 (3–4)	2
Natural (unsweetened) curd	3 (3–4)	9
Eggs	3 (3–4)	3
Red meat unprocessed	3 (3–4)	3
Chocolate, chocolate sweets, and chocolate bars	3 (2–4)	10
Biscuits, doughnuts, cakes, muffins, croissants, etc	3 (2–4)	6
Legumes	3 (2–3)	1
Fat fish	3 (2–3)	0.4
Nuts	2 (2–3)	3
Beer	2 (1–3)	5
Wine and alcoholic drinks	2 (1–3)	0.6
Seeds	2 (1–3)	4
Vodka and high-proof alcohols	2 (1–2)	0.2
Margarine	1 (1–3)	15
Sweetened beverages	1 (1–2)	3
Salty snacks	1 (1–2)	0.6

a For each food product, the respondents could declare the frequency of consumption, choosing from 6 responses, which were scored as follows: (1) never, (2) once a month or less frequently, (3) several times a month, (4) several times a week, (5) daily, or (6) several times a day.

those without AH, but all consumed more saturated fat and less plant protein than recommended. The analysis of the dietary intake in obese and nonobese participants showed no differences.

Assessment of dietary habits The declared frequency of consumption of various food products in the last 12 months in all studied individuals is presented in **TABLE 3**.

It should be added that 56% of the respondents declared that they eat both fruits and vegetables (except for potatoes) every day, but only 2% consumed more than 2 servings of both fruits and vegetables every day.

Men significantly less frequently than women declared consumption of fruits and vegetables, whole meal bread and groats, milk, fermented milk drinks and natural curd, vegetable oils, and seeds. However, they more often declared consumption of added sugar, refined bread and ready-made breakfast cereals, sausages, offal, red meat, game, fat fish, cheese, lard, potatoes, salty snacks, fruit juice, energy and sweetened drinks, beer, vodka, wine, and soft drinks.

Adherence to the 2021 European Society of Cardiology recommendations Based on the FFQ-6 and the 24-hour dietary recall, the percentage of respondents who adhered to the specific ESC dietary recommendations in cardiovascular prevention was calculated. The results are presented in **TABLE 4**. We found that most of the participants had an abnormal BMI, derived too much energy from total and saturated fats, and consumed too much animal protein as compared with plant protein. Moreover, 90% and more of the respondents ate too little fiber, vegetables, fruits, and nuts.

Compliance with the latest ESC recommendations was also assessed in the subgroup of the participants diagnosed with AH, DM, or CAD. The results are presented in **TABLE 5**. Only 40% of the patients with AH, DM, or CAD had cholesterol intake below 200 mg a day and in only 12% of them less than 7% of energy came from saturated fatty acids (SFAs). Just 1 in 50 respondents in this subgroup declared eating at least 2 servings of both vegetables and fruits every day. The individuals with AH, DM, or CAD also reported significantly lower frequency of nut consumption than the other respondents.

DISCUSSION This is the first study to demonstrate adherence to the latest ESC dietary recommendations⁶ in Poland. We assessed 1244 heavy past or current smokers considered to be at an increased risk of CVD, and unfortunately our population did not meet any of these recommendations.

In its updated guidelines, the ESC underlines that proper nutrition is the cornerstone of CVD prophylaxis.⁶ Currently, there is no doubt that the most important feature of a healthy diet is the adequate consumption of vegetables and fruits. The National Food and Nutrition Institute in Warsaw illustrates this recommendation by pointing out that half of the plate at each meal should be fruits and vegetables.^{17,18}

In our group, only 7% and 5% of the respondents declared that they eat, respectively, fruits or vegetables at least twice a day. Moreover, only 2% of the respondents declared that they consumed at least 2 portions of both vegetables and fruits every day. In other words, the daily consumption of at least 400 g of fruits and vegetables recommended by both the European and Polish guidelines^{6,17,18} was probably realized by only 2% to 7% of our respondents.

TABLE 4 Percentage of adherence to individual elements of a healthy diet pattern according to the 2021 European Society of Cardiology recommendations⁶ among the study participants

2021 ESC recommendation	All (n = 1244)	Men (n = 636)	Women (n = 608)
Energy from saccharose <10% of E	71.2	68.9	73.6
Cholesterol intake <300 mg/d ^a	59.8	61.4	58.3
Fat fish 1–2 times per week	53.8	56.7	50.8 ^b
Energy from fats <35% of E ^a	39.8	36.8	43 ^b
BMI 18.5–24.9 kg/m ²	28.3	22	34.5 ^b
Energy from SFA <10% of E	25.8	27.1	24.4
More plant than animal protein	13.6	14.3	12.9
Fiber intake 30–45 g/d	8	7.4	8.7
>2 servings of fruits per day	7.4	6.1	8.8
>2 servings of vegetables per day	5.4	4.9	6
Daily nut consumption	3	2.7	3.3
>2 servings of fruits and >2 servings of vegetables per day	1.8	1.9	1.6

Data are presented as percentage of patients.

a Parameter not addressed in 2021 ESC guidelines but present in the recommendations for the Polish population¹⁷

b Significant difference ($P < 0.05$) between women and men

Abbreviations: see TABLES 1 and 2

TABLE 5 Percentage of adherence to individual elements of a healthy diet pattern according to the 2021 European Society of Cardiology recommendations⁶ among the participants with and without diagnosis of arterial hypertension, diabetes, or coronary artery disease

2021 ESC recommendations	Participants with diagnosis of AH, DM, or CAD (n = 609)	Participants without diagnosis of AH, DM, or CAD (n = 635)
Energy from saccharose <10% of E	68.5	74.7
Cholesterol intake <200 mg/d ^a	40.4	36.4
Fat fish 1–2 times per week	53.9	53.7
Energy from fats <35% of E ^a	37.8	41.7
BMI 18.5–24.9 kg/m ²	20.4	35.6 ^b
Energy from SFA <7% of E	11.6	10.7
More plant than animal protein	15	12.8
Fiber intake 30–45 g/d	8.6	7.6
>2 servings of fruits per day	8.1	6.7
>2 servings of vegetables per day	5.7	5.2
>2 servings of fruits and >2 servings of vegetables per day	2	1.6
Daily nut consumption	1.7	4.3 ^b

Data are presented as percentage of patients.

a Parameter not addressed in the 2021 ESC guidelines, but present in the recommendations for the Polish population¹⁷

b Significant difference ($P < 0.05$) between women and men

Abbreviations: see TABLES 1 and 2

There are few large studies assessing the quality of the diet in the Polish population. The results of the National Study of Nutrition and Nutritional

Status of the Adult Polish Population 2017–2020 are not known yet.¹⁹ The most important point of reference are 2 large nationwide representative cross-sectional surveys WOBASZ (2003–2005) and WOBASZ II (2013–2014).^{10,12,20–22} More detailed dietary habits were assessed in a subgroup of 5690 participants (2554 men and 3136 women) with the 24-hour dietary recall method. According to this analysis, at least 400 g of fruits and vegetables per day were consumed by 49.8% of men and 51.1% of women.¹²

In our work, similarly to the WOBASZ study,¹⁰ in addition to the 24-hour dietary recall, FFQ-6 was used to better assess the frequency of fruits and vegetables consumption. The FFQ-6 method reliably evaluates habitual consumption of many food items in the last 12 months, and proved to be a valuable tool in the Polish population.¹⁶ Obviously, both these tools are not perfect. The FFQ-6 does not specify the exact amount of nutrients including fiber in grams, while the 24-hour recall is merely a screening test, and the 3-day interview is more accurate. In addition, the main disadvantage of these methods is their subjectivity. In the FFQ-6, as in the 24-hour dietary recall, the respondents can overestimate their consumption of foods considered healthy and underestimate the intake of those that are generally considered unhealthy. Therefore, our results, that is, only 2% to 7% of the respondents consuming the recommended amount of vegetables and fruits, should be considered reliable and highly worrying.

The differences in the frequency of consumption of vegetables and fruits in our study and in the study by Waśkiewicz et al¹² may be influenced by different age of the respondents. All our participants were over 50 years old, and one-third of the analyzed WOBASZ population was in the 20–40 years age range. Another reason for this discrepancy might be differences in the socioeconomic status, but unfortunately it was not assessed in our work. A recent Polish study found significant differences in the socioeconomic status between smokers and never-smokers.²³ Based on the example of the patients from the WOBASZ II study, it was shown that a lower socioeconomic status was associated with unhealthy food choices leading to a diet with low vegetable intake and high consumption of ultraprocessed products.²⁴ Similarly, Zujko et al²⁵ observed that dietary antioxidant intake in the WOBASZ II study was also related to the socioeconomic status. It should be mentioned that, according to the Social Surveys Department of Statistics Poland, the consumption of vegetables is decreasing. Between 2002 and 2012, the monthly consumption of vegetables, excluding potatoes, decreased from 5.5 kg to 5 kg, and in 2020 it was only 3.8 kg.^{26,27} The reasons for this may be more complex than the level of nutritional education and the financial situation.

Our results, however, are in line with another finding of the WOBASZ study that only about 2% of the participants followed a healthy lifestyle.¹⁰

A similar percentage of our respondents declared that they eat at least 2 portions of both vegetables and fruits, as well as nuts every day. Interestingly, analyzing the WOBASZ and WOBASZ II patients, Witkowska et al²⁸ concluded that nut consumption strongly correlated with healthier lifestyle choices. It can therefore be suspected that less than 1 in 50 of our respondents at high cardiovascular risk (ie, only 2% to 3% of them) may lead a healthy lifestyle.

We showed that sufficient consumption of fruits, vegetables, and nuts was the ESC recommendation that was practically not implemented in our study population. Eating these foods is very important for several reasons. Plant products, unlike animal products, contain the health-promoting dietary fiber. They are also a rich source of vitamins and minerals with antioxidant properties, and contain other anti-inflammatory phytochemicals. Therefore, the ESC mentions a more plant- and less animal-based food pattern as the first and most important feature of a healthy diet.^{6,29,30} Unfortunately, our participants consumed too little plant-based food, as evidenced by the consumption of fiber below the ESC recommendations, and the animal to vegetable protein ratio more than twice as high as advocated by the ESC. Moreover, when choosing meat, our respondents chose primarily highly processed products.

With the FFQ-6 we are not able to assess a portion size, but the most common answer for products such as sausages was 4, which means that our respondents ate such products several times a week. The respondents consumed higher-quality cured meats with the same frequency. Therefore, it can be assumed that they exceeded the weekly portion of 300–500 g of meat allowed by the ESC, and certainly, contrary to the ESC recommendations, it was mostly processed meat. Not only are these foods rich in saturated fat, but they are also high in sodium, nitrates, and other chemical ingredients that may increase cardiovascular risk, as compared with unprocessed red meat.³¹ These FFQ-6 findings are consistent with the results of the 24-hour dietary recall that revealed excessive total fat and SFA consumption. Only a quarter of the entire group met the SFA intake level recommended for many years by the ESC, that is, below 10% of the total energy supply. These results are similar to the findings of Waśkiewicz et al,¹² and they have not improved over the last 2 decades in Poland.^{10,21,32,33} Moreover, the consumption of dietary fiber in Poland remains consistently very low.^{10,34–36} Our respondents also reported relatively frequent consumption of low-nutrient, refined products and ultraprocessed carbohydrates like biscuits or cakes, which due to their trans-fat content should be minimized as much as possible according to the ESC. Furthermore, as many as 44% of the study population declared adding sugar to meals and drinks every day, which is also against the ESC recommendations. The results of

our study therefore confirm the urgent need for nutritional education in the patients at a risk of CVD. This is in line with the results of other studies in this group of patients.^{37,38}

To sum up, the study population did not follow the 2021 ESC dietary recommendations. Most of the participants had an abnormal BMI and their diet was animal-based, rich in ultraprocessed food with high content of saturated fats and simple sugars. Over 90% of the respondents ate too little fiber, vegetables, fruits, and nuts. Only 1 in 50 participants with AH, DM, or CAD declared eating at least 2 servings of both vegetables and fruits every day.

The limitation of our study is that its results cannot be generalized to the entire Polish population, since we did not study a sample from the general population. Our participants were considered as having increased cardiovascular risk because of smoking history and age, but they were not high-risk cases randomly selected from the general population. Cardiovascular risk assessment was not performed systematically and stroke and peripheral artery disease were not considered when diagnosing the participants with CVD. Secondly, the group of 1200 people is not large, yet our results certainly indicate that there is still a problem with the lack of the dietary prevention of CVD.

Concluding, the most common dietary mistake among our heavy smokers aged 50 years and older and considered being at an increased cardiovascular risk was inadequate consumption of plant products. Perhaps, given the low effectiveness of meat reduction strategies, it is worth considering putting more emphasis on promoting daily consumption of vegetables, fruits, and nuts. Whether such positive nutritional education would be more effective in reducing excessive cardiovascular mortality in Poland requires further research.

ARTICLE INFORMATION

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CONFLICT OF INTEREST None declared.

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