

The Role of Diet and Lifestyle Habits in Prevention of Cardiovascular Diseases in Moldavian and Transylvanian Population

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The role of diet is crucial in the development and prevention of cardiovascular disease. The purpose of the current study was to describe dietary intake and assess health scores of children and adults by using a survey questionnaire on moldavian and transylvanian population, in order to evaluate whether it is necessary to introduce a prevention program for cardiovascular diseases in Romania. In 2015, a questionnaire was sent to 347 children and 583 adults in two counties in Romania where the climatic and topographic conditions are different. Participation rate in the children group was 56.48% moldavian / 43.51% transylvanian, respectively 39.62% moldavian / 60.37% transylvanian participants in the adult group. The questionnaire included a 44-item semi-quantitative food frequency questionnaire and questions on lifestyle for children and a 21-item semi-quantitative food frequency questionnaire and a health score for adults. Results were evaluated against the WHO recommendations of healthy diet. In Mures county the number of former smokers is significantly higher compared to Bacau county, and considerably more subjects report active smoking and exposure to passive smoking. The incidence of overweight and obesity was similar in the two counties, 68.14% in Bacau and 70.67% in Mures. More subjects from Bacau (94.35%) have regular exercise compared to those from Mures (85.38%), the difference is not quite significant. The majority of the subjects from Bacau county have a significantly healthier diet compared to those from Mures, consuming regularly eggs, meat and dairy products. Based on our data, only 16% of Romanian children reach the WHO recommendation for healthy nutrition regarding fruit and vegetable intake. Dietary habits of children and adults in Romania warrant improvements. Public health actions should be taken to increase the consumption of fruits and vegetables, decrease the consumption of saturated fats and sweets and also to increase the frequency of physical activity. These actions may be helpful in reducing the risks for overweight and cardiovascular diseases.

Keywords: cardiovascular disease, diet, questionnaire, Romania

Simple and cost-effective steps such as a proper diet should be able to alleviate the obesity epidemic and the resultant cardiovascular disease burden as it is estimated that lifestyle choices can account for up to 40% of premature cardiovascular disease deaths [1]. Collective mechanisms were proposed to underlie the protective effect of foods against cardiovascular disease. Clearly, no single ingredient or mechanism can account for all the advantages of certain food groups, and it takes a calorically

sensible and balanced variety to derive the greatest benefit for patients [2].

According to the World Health Organization (WHO) [3], a healthy diet for adults contains:

- fruits, vegetables, legumes (e.g. lentils, beans), nuts and whole grains (e.g. unprocessed maize, millet, oats, wheat, brown rice);
- at least 400 g (5 portions) of fruits and vegetables a day [4]. Potatoes, sweet potatoes, cassava and other starch roots are not classified as fruits or vegetables;

Cardioprotective Effects of Food

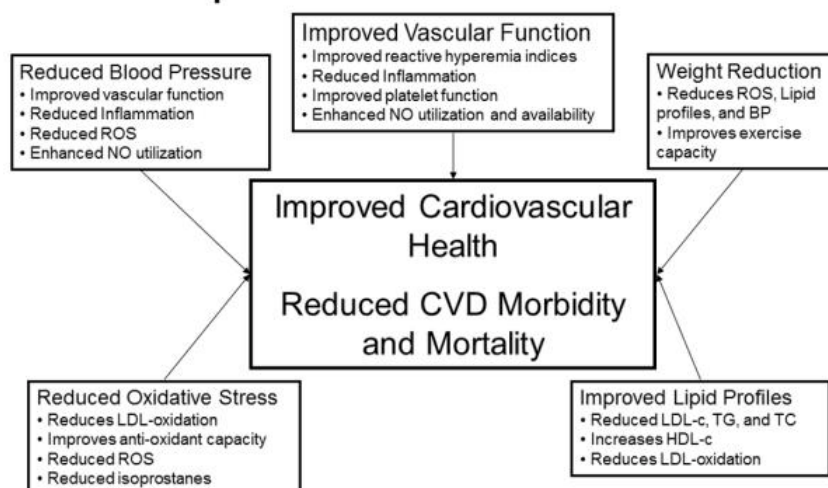


Fig.1. Relationship between food and cardiovascular diseases

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- less than 10% of total energy intake from free sugars [5] which is equivalent to 50 g (or around 12 level teaspoons) for a person of healthy body weight consuming approximately 2000 calories per day, but ideally less than 5% of total energy intake for additional health benefits. Most free sugars are added to foods or drinks by the manufacturer, cook or consumer, and can also be found in sugars naturally present in honey, syrups, fruit juices and fruit juice concentrates;

- less than 30% of total energy intake from fats [4, 6]. Unsaturated fats (e.g. found in fish, avocado, nuts, sunflower, canola and olive oils) are preferable to saturated fats (e.g. found in fatty meat, butter, palm and coconut oil, cream, cheese, ghee and lard) [7]. Industrial trans fats (found in processed food, fast food, snack food, fried food, frozen pizza, pies, cookies, margarines and spreads) are not part of a healthy diet;

- less than 5 g of salt (equivalent to approximately 1 teaspoon) per day [8] and use of iodized salt.

Fruits and vegetables are a high-value food group; they are rich in nutrients [9]. Consumption of fruits and vegetables can be regarded as an indicator for healthy eating in general (OECD, 2010). For the prevention of chronic diseases such as heart disease, cancer, diabetes and obesity, as well as for the prevention and alleviation of several micronutrient deficiencies, especially in less developed countries, WHO recommends to consume a minimum of 400g of fruits and vegetables per day (excluding potatoes and other starchy tubers) (WHO, 2003).

According to the FAOSTAT (Food and Agriculture Organization of the United Nations Statistics Division) food balance sheets, the Romanian (717.09 g/capita/day) fruit and vegetable consumption exceeds the recommended level (European Commission, 2012). However if we analyze the more detailed data of the household budget surveys it can be stated that the amount of fruit and vegetable consumption (without potatoes) of Romania (220 g/capita/day in Romania) are below the WHO recommendation (Report UN, 2011; KSH, 2015).

The present study intended to analyze the Romanian consumers' nutritional status. For this purpose, we selected two counties where the climatic and topographic conditions are different, one is Bacau and the other is Mures.

Experimental part

Participants

As a result of the data collection a total of 930 valid questionnaires were processed in case of the analyzed

counties. 583 valid questionnaires were processed for the adult group (231 in Bacau and 352 in Mures) and 347 valid questionnaires were processed for the children group (196 in Bacau and 151 in Mures).

Questionnaire

We have used a validated questionnaire [10].

Nutritional status was analyzed in children aged 7-11 years with the help of 44 statements and adults aged 18-84 years with the help of 21 items.

As the target population of this study speaks two native languages we had to use two equivalent questionnaires, one in Romanian and one in Hungarian. According to cross-cultural researches, inaccuracies in the translation process are common [11]. In order to achieve equivalence between the source version and the target version a back-translation and a pretest was performed in both Bacau and Mures counties [12]. As a first step a bilingual translator made an initial translation from the source version (Romanian) into the target version (Hungarian) (forward-translation). Then another bilingual translator – without access to the original source version – translated this material back into the source language (back-translation). To revise the conflicting meanings the back-translated version and the source version were compared and the differences were addressed. After the two versions were identical the final questionnaire was tested (pretest) with a small group of consumers [11].

Statistical methods

The data was analyzed with the assistance of IBM SPSS Statistics 17 and GraphPad InStat. For the better understanding of the data a number of statistical methods were used (mean, frequency, Chi-square test, Student-t, Mann Whitney).

Results and discussions

Study population

According to the Chi test the counties samples' socio-demographic distributions were significantly different. Among the Mures county participants the rate of males, young adults was higher than among the subjects from the Bacau county ($p=0.003$). The youngest respondent was 18 years old in Mures and in Bacau, too, while the oldest participant was 61 in Mures and 84 in Bacau. The age was equally distributed in both counties because the median of them were 45 in Mures and 46 in Bacau. The socio-demographic characteristics of the respondents are presented in table 1.

Table 1
SOCIO-DEMOGRAPHIC CHARACTERISTICS OF THE STUDY PARTICIPANTS, N=NUMBER

	<i>Bacau</i>		<i>Mures</i>		<i>Total</i>	
	<i>N</i>	<i>%</i>	<i>N</i>	<i>%</i>	<i>N</i>	<i>%</i>
Gender	231+196	100 + 100	352+ 151	100 +100	583 +347	100 + 100
Female 18-84 years	166	71.9	37	10.5	203	34.8
Male 18-84 years	65	28.1	315	89.5	380	65.2
Female 7-11 years	130	66.3	75	49.7	205	59.1
Male 7-11 years	66	33.7	76	50.3	142	40.9
Age 18- 84 years	231		352		583	
Mean \pm Std.deviation	48 \pm 14		45 \pm 9			
Age 7-11 years	196		151		347	
Mean \pm Std.deviation	9 \pm 1.5		10 \pm 1			

Smoking, sleep and optimism behaviors

According to WHO classification the non-smoker participants are divided in 2 groups, thereby in Bacau 30.73 % (71 persons) of the participants are *former daily smoker* and 69.26% (160 persons) of them are *never daily smoker* and in Mures 72.72% (256 persons) of the participants are *former daily smoker* and 27.3% (96 persons) of them are *never daily smoker*. Thus in Mures the percentage of never smokers is more than 2.5 times smaller than in Bacau ($p < 0.0001$).

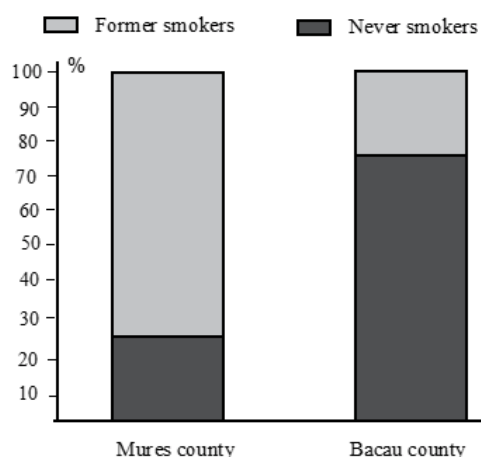


Fig. 1. Distribution of non-smoker participants in the two counties

In the group *former daily smoker* 36 persons in Bacau (15.6%) and 117 persons in Mures (33.2%) have smoked in the past but have stopped smoking for more than 1 year.

A number of 14 daily smokers in Bacau (6.1%) and 76 in Mures (21.6%) smoke more than 10 cigarettes a day. A number of 21 daily smokers in Bacau (9.1%) and 63 in Mures (17.9%) smoke less than 10 cigarettes a day. The number of daily cigarette smokers is greater in Mures county.

With regard to passive smoking, among the participants 35 (15.2%) in Bacau and 203 (57.7%) in Mures claimed that they are passive smokers. In this case also the rate of passive smokers is higher in Mures.

The National Sleep Foundation recommendations for appropriate sleep durations are 7-9 hours for 18-64 years adults and 7-8 hours for adults over 64 years [13]. About half of the participants in the study follow that recommendation, 51.9% in Bacau and 59.4% in Mures. Some of the other participants can keep that

recommendation 2-3 times a week (31.2% in Bacau and 34.4% in Mures), others never.

The optimism is present in 25.5% of Bacau participants and 44.6% of Mures participants, higher for Mures county ($p = 0.0078$).

Body mass index, a risk factor of cardiovascular disease

The WHO regards a BMI of less than 18.5 as underweight and may indicate malnutrition, an eating disorder or other health problems, while a BMI equal to or greater than 25 is considered overweight and above 30 is considered obesity [14]. The measures for indicating nutritional status of the respondents are presented in table 2. Self-reported weight (kg) and height (cm) were asked from the participants. Body mass index (BMI) was calculated as $\text{weight}/\text{height}^2$.

The BMI ranges are based on the effect excessive body fat has on disease and death and are reasonably well related to adiposity. BMI was developed as a risk indicator of disease; as BMI increases, so does the risk for some diseases. Some common conditions related to overweight and obesity include: premature death, cardiovascular diseases, high blood pressure, osteoarthritis, some cancers and diabetes mellitus.

BMI is also recommended for use in children and adolescents. In children, BMI is calculated as for adults and then compared with z-scores or percentiles. During childhood and adolescence the ratio between weight and height varies with sex and age, so the cut-off values that determine the nutritional status of those aged 0-19 years are gender- and age-specific. The cut-off points of the 2006 BMI-for-age reference for children aged 0-5 years for the diagnosis of overweight and obesity were set as the 97th and the 99th percentile, respectively. For those aged 5-19 years, overweight is defined as a BMI-for-age value over +1 SD and obesity as a BMI-for-age value over +2 SD [15].

Anthropometric and life style characteristics: In total, 43.39 % were categorized as overweight and 26.28 % as obese. Distribution of body mass index categories didn't differ significantly between Bacau and Mures ($p > 0.05$; table 3).

We used dietary surveys to measure food consumption and obtain information on what individuals eat. Tables 4 contains the nutritional status about vegetables and fruits.

In our study 43.9% of the participants in Bacau and 36.4% of the participants in Mures reported consuming vegetables less than one time daily, which is not according to the WHO recommendation. The average supply per person per day is 95.21g in Bacau and 87g in Mures.

	Bacau county	Mures county	Total
	N	N	N
	231	352	583
	Average \pm SD	Average \pm SD	Student t test result
Mass (kg) for age 18- 84 years	74.94 \pm 15.86	82.31 \pm 14.46	
Mass (kg) for age 7-11 years	28.38 \pm 7.51	32.96 \pm 6.94	
Height (m) for age 18-84 years	1.64 \pm 0.09	1.73 \pm 0.08	
Height (m) for age 7-11 years	1.34 \pm 0.1	1.4 \pm 0.09	
BMI=mass/height ²	27.53 \pm 5.13	27.45 \pm 4.08	p=0.8443

Table 2
NUTRITIONAL STATUS OF
THE STUDY PARTICIPANTS -
ADULTS

Table 3
ANTHROPOMETRIC AND LIFESTYLE CHARACTERISTICS OF 2 COUNTIES PARTICIPANTS IN HEALTH STUDY (n= 567)

Characteristics	Bacau	Mures	p-value
Based on body mass index (n%)			
Underweight	8 (3.54%)	10 (2.94%)	Comparing the distribution of obesity vs. other categories in the two counties: p=0.4258
Normal	64 (28.32%)	90 (26.39%)	
Overweight	86 (38.05%)	160 (46.92%)	
Obese	68 (30.09%)	81 (23.75%)	
Leisure exercise (n%)			
Daily	179 (77.83%)	228 (66.67%)	Comparing the two counties regarding the subjects having frequent physical activity (daily or 2-3/week) to those having rarely or once a week: p=0.0650, not quite significant (regular exercise more frequent in Bacau)
Regularly, 2-3/week	38 (16.52%)	64 (18.71%)	
Regularly, 1/week	8 (3.48%)	33 (9.65%)	
Rare	5 (2.17%)	17 (4.97%)	

Tabel 4
NUTRITIONAL STATUS IN THE ANALYZED COUNTIES (N_{Bacau} = 196, N_{Mures} = 151)

Bacau			Mures		
2-3 doses/day	1 dose/day	<1 time daily	2-3 doses/day	1 dose/day	< 1 time daily
vegetables					
11.7%	44.4%	43.9%	11.3%	52.3%	36.4%
fruit					
17.3%	52%	30.7%	23.8%	62.9%	13.3%

Furthermore, 30.7% of the participants in Bacau and 13.3% of the participants in Mures reported consuming fruits less than one time daily, which is less than the WHO recommendation. The average supply per person per day is 116 g in Bacau and 124.5 g in Mures.

By adding the daily intake of vegetables and fruits we obtain a consumption of 211.21 g in Bacau and 211.5 g in Mures, which much less than 440g of vegetables and fruits per person per day recommended in Europe, according to the WHO recommendation.

The study suggests that on average 16% of Romanian children reach the WHO recommendation. The average vegetable intake was estimated to be 91 g per day, the average fruit intake 120.25 g per day, less than 220 g per day vegetables and 220 per day fruits recommended.

Food choice

The questionnaire included a 20-item food frequency questionnaire. Frequency of intake of the food items are reported on a seven-level scale, from *none* to *two or three times a day*.

Intake of food items differed between participants from the two counties. Bacau participants exhibited a significantly more frequent intake of cheese, eggs, bacon, potatoes, rice, polenta, sweets, spices and salt than did Mures participants (table 5). Mures participants exhibited a significantly more frequent intake of meat than did Bacau participants. Bread was consumed daily by 88 % of two subjects from the two counties.

Daily consumption of milk was reported among almost 60% of Bacau and Mures participants. Over 33.8 % of the participants consumed bacon never or ≤ 3 times/month. Only a small proportion (2%) of Mures participants reported a daily intake of rice and polenta (table 5).

Obesity has numerous consequences on lipid, glucose and protein metabolism with hyperglycemia and insulin resistance, hyperlipidemia and hyperuricemia [16].

Proper nutrition is an essential factor related to overall physical and mental health. Nutrition counseling is necessary for encouraging patients to reduce the intake frequency of sugary foods and drinks and to eat a diet rich in vegetables and fruits and drink water and milk in order to ensure an adequate and balanced diet [17].

Intakes of fruit and vegetables

Epidemiological studies have shown that high intakes of fruit and vegetables are associated with a lower risk of chronic diseases; particularly, cardiovascular disease [18, 19], also type 2 diabetes [20, 21] and certain cancers i.e. of the mouth, pharynx, larynx, oesophageal, stomach and lungs [22].

Nearly every diet aimed at improving cardiovascular health encourages daily intake of multiple servings of both fruits and vegetables. Copious observational data shows a reduction in cardiovascular disease surrogates by individuals who report increased consumption of fruits and vegetables. A 2003 study showed a 3.0 mmHg drop in systolic blood pressure among women who consumed a

Tabel 5
FREQUENCY OF INTAKE OF COMMONLY CONSUMED FOOD ITEMS AMONG CHILDREN ($n_{\text{Bacau}} = 196$, $n_{\text{Mures}} = 151$)

Food item	Frequency of intake							Difference between the counties p-value ^a
	2-3/day	1/day	2-3/week	1/week	1/month	<1/month	never	
Milk (%)								
Bacau	18.4	37.2	15.3	12.2	1.5	13.8	1.5	0.09 ns
Mures	12.6	51.7	15.9	6.0	0.7	11.3	2.0	
Cheese (%)								
Bacau	10.2	20.4	19.4	13.3	6.1	16.8	13.8	0.001 s
Mures	10.6	16.6	21.2	8.6	7.9	31.1	4.0	
Eggs (%)								
Bacau	18.4	30.1	22.4	15.8	1.0	10.7	1.5	0.001 s
Mures	12.6	7.9	31.1	22.5	4.6	19.9	1.3	
Meat (%)								
Bacau	17.9	23.5	26.0	18.9	2.0	9.2	2.6	0.001 s
Mures	8.6	53.0	18.5	6.0	2.0	10.6	1.3	
Bacon (%)								
Bacau	7.7	11.7	9.2	7.1	6.6	18.9	38.8	0.001 s
Mures	3.3	5.3	2.0	4.6	7.3	33.8	43.7	
Potatoes (%)								
Bacau	13.3	18.4	23.5	16.8	6.1	14.3	7.7	0.001 s
Mures	4.6	6.6	16.6	15.9	12.6	41.1	2.6	
Bread (%)								
Bacau	25.0	62.2	3.1	3.1	1.5	2.6	2.6	0.30 ns
Mures	21.9	66.9	2.6	0.7	0.0	5.3	2.6	
Rice (%)								
Bacau	9.7	8.2	23.0	23.0	10.7	11.2	14.3	0.001 s
Mures	2.0	4.0	15.9	23.8	17.9	29.8	6.6	
Polenta (%)								
Bacau	10.7	27.6	22.4	17.9	3.6	11.2	6.6	0.001 s
Mures	2.0	2.0	14.6	26.5	11.9	31.8	11.3	
Sweets (%)								
Bacau	14.3	38.3	15.8	6.1	0.0	18.4	7.1	0.001 s
Mures	11.3	28.5	17.9	16.6	0.0	20.5	5.3	
Spices (%)								
Bacau	10.2	27.0	5.6	6.6	4.1	21.4	25.0	0.001 s
Mures	5.3	27.8	9.3	13.2	6.0	24.5	13.9	
Salt (%)								
Bacau	14.3	51.0	5.6	4.6	1.5	9.7	13.3	0.001 s
Mures	6.6	37.1	8.6	6.0	6.0	28.5	7.3	

^aChi-square test was used, s = significant, ns – not significant

higher amount of fruits, vegetables, or vitamin C with no difference in men [23]. A 2004 cross-sectional analysis of a prospective cohort study showed that fruit and vegetable consumption is inversely associated with blood pressure in a Mediterranean population with a high vegetable-fat intake [24]. Increased fruit and vegetable intake has also been linked with a lower body mass index in another cross-sectional study [25]. Finally, the prospective Chicago Western Electric Study showed a slight benefit on blood pressure compared to intake of red meat over a seven year period of time [26]. The potential benefit of fruits and vegetables could lie in reduced total caloric burden, and/or

in the numerous micronutrients that they provide. While solid evidence establishes the antioxidant properties of fruit and vegetables [27] and the health benefits of increased flavonol intake [28], alternative mechanisms have been proposed [29] and could include the effects of nitric oxide (NO) species or concomitant weight loss associated with diets high in fruits and vegetables.

Implementing programmes in schools gives the opportunity to combine different types of activities, such as traditional classroom-based learning, school gardening, cooking classes and feeding aimed at increasing fruit and vegetable consumption in children.

There are some consistent findings on consumption patterns in Romania:

- a majority of children do not reach WHO recommendations on vegetables and fruit consumption (≥ 400 g per day).

- no statistical significant difference is in vegetables and fruits intakes in the 2 regions of Romania ($p > 0.05$).

Fruit and vegetable consumption patterns are determined by a wide range of factors:

- age, gender and socio-economic status – the influence of these seems to be mediated by other factors, e.g. animal origin food preferences, knowledge, skills and attitudes towards fruit and vegetables;

- increasing fruit and vegetable consumption is a priority for international organizations as well as national governments, which has resulted in many initiatives. There are certain elements that have been shown to improve the results of intervention programmes. Among these are programme duration of at least 12 months.

Conclusions

Dietary habits of children and adult in Romanian warrant improvements. Public health actions should be taken to increase consumption of fruit and vegetables, and decrease consumption of saturated fats and sweets and also to increase frequency of physical activity. These actions may be helpful in reducing risks for overweight and cardiovascular disease. Active and passive smoking is major cardiovascular risk factors present in high percentage especially in Mures county, this situation could be improved by education of the population.

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