EATING PATTERNS, PHYSICAL ACTIVITY AND THEIR ASSOCIATION WITH DEMOGRAPHIC FACTORS IN THE POPULATION INCLUDED IN THE OBESITY STUDY IN ROMANIA (ORO STUDY)

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Abstract

Context. Four major modifiable behavioral risk factors are considered responsible for the current burden of the non-communicable diseases: tobacco use, physical inactivity, unhealthy diet and excessive alcohol consumption. Limited data on the lifestyle habits in Romanian population is currently available.

Objective. To assess the eating patterns and physical activity habits and other lifestyle components in various age groups in the population included in the ORO study.

Design. ORO was a cross-sectional, epidemiologic, multicenter non-interventional study conducted from January 2014 until August 2014 in 8 study centers spread in the main historical regions of Romania

Results. Eating 3 meals/day every day was more frequently reported in the 60-79 years and ≥ 80 years age groups (53.0% and 51.7%) than in the 18-39 years and 40-59 years age groups (26.8% and 35.8%), $p < 0.001$. The frequency of eating breakfast every day increased with age from 43.5% in the youngest age group to 79.3% in the oldest one ($p < 0.001$). Intense and moderate leisure-time physical activity was more frequent among participants in the 18-39 years age group. Leisure time physical activities were associated with younger age groups, male sex, rural area, higher educational level and non-smoking status. Regular breakfast and regular consumption of 3 meals/day was associated with older age group, male sex and non-smoking status.

Conclusions. Our analysis showed a high frequency of unhealthy lifestyle habits among the younger age groups as compared to the older ones, with the highest frequency of these unhealthy behavior reported in the 18-39 years age group.

Key words: lifestyle, eating habits, physical, activity.

INTRODUCTION

Non-communicable diseases are currently the most important cause of death worldwide (1). In 2012, of the total number of 56 million deaths that have been reported worldwide, 38 million were attributable to non-communicable diseases such as cardiovascular diseases, cancers, respiratory diseases and diabetes (1). The situation is more dramatic if we consider that of these deaths, it was estimated that 16 million were premature deaths that occurred in people < 70 years of age. Since 2000 when there were estimated 31 million deaths attributable to non-communicable diseases, the number continued to rise in all regions (1). As a consequence, in 2011 World Health Organization (WHO) issued a “Global action plan for the prevention and control of non-communicable diseases 2013-2020” with the aim to reduce the number of premature deaths from non-communicable disease with 25% by 2025 (2). Four major modifiable behavioral risk factors are considered responsible for the current burden of these diseases: tobacco use, physical inactivity, unhealthy diet and excessive alcohol consumption (2). WHO estimated that 6 million deaths every year can be attributed to tobacco use and 3.2 million to reduced physical activity (1). In a modelling exercise published in 2013 by Lee *et al.* (3) and aiming to assess the percentage of deaths from non-communicable diseases that can be prevented by increasing physical activity, the authors showed that the physical inactivity was responsible for 9% of premature deaths. Furthermore, the authors calculated that a 25% reduction of the physical inactivity is associated with prevention of > 1.3 million deaths each year.

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Regarding the nutrition, we have been facing a shift from the traditional diets rich in fruits and vegetables and therefore rich in complex carbohydrates to diets rich in animal fat, meat and processed food (4). All these have been shown to be followed by an increase in the incidence of non-communicable diseases (4). But not only were the nutrients considered to have an impact on the incidence of these diseases. An irregular schedule of meal consumption, with skipping breakfast or other meals during the day, eating while watching TV or late during nights have been also linked to an increased risk of obesity and indirectly to other non-communicable diseases such cancers, hypertension and diabetes (5-7).

Previous studies conducted in different world regions, aiming to evaluate the lifestyle patterns according to socio-demographic and regional factors, have conflicting results. In some regions, adopting an unhealthy lifestyle is more characteristic for male gender, younger age (< 44 years), low educational status, living in a rural area, low socio-economic status, while in other regions, those belonging to middle and high social position were more likely to adopt unhealthy eating pattern (8-11).

Prevention programs aiming to increase population awareness on the healthy lifestyle and on the consequences of the unhealthy behaviors have been designed and implemented worldwide. Although these programs were also implemented in Romania, the need was based mainly on the data showing the increasing incidence and prevalence of non-communicable diseases and not on the evaluation of the lifestyle behaviors in Romanian population. In the context of studies showing a high prevalence of metabolic syndrome in Romanian adults and children (12, 13), as well as increasing prevalence of childhood obesity in Romania (14, 15) we consider that evaluation of lifestyle habits may help shaping these interventions to address the identified problems.

Obesity in Romania Study - Study of the prevalence of obesity and related risk factors in Romanian general population (ORO study) was a cross-sectional study conducted in 2014 with the objective to assess the prevalence of overweight and obesity and to identify lifestyle habits in the Romanian population and their association with obesity (16).

The aim of the analysis presented here was to assess the eating patterns and physical activity habits and other lifestyle components in different age groups in the population included in the ORO study and their association with the sociodemographic characteristics.

METHODS

Study design and population

ORO was a cross-sectional, epidemiologic, multicenter non-interventional study conducted from January 2014 until August 2014 in 8 study centers spread in the main historical regions of Romania (16). The study design and study population were previously described elsewhere (16). Briefly, for eligible participants, using a standardized working sheet, the investigators were asked to collect the demographic, anthropometric, employment status, education, family history, and personal medical history data, as well as information on the lifestyle and eating behavior. Body height and body weight were measured by the investigators. The body mass index (BMI) was calculated with the formula $\text{weight (kg)}/[\text{height (m)}]^2$. Waist circumference was measured by the investigators using a non-stretchable tape at the midway between the tenth rib and the iliac crest at the end of a normal breath.

All participants provided written informed consent prior to any study-related procedures. The study was conducted in accordance with the Good Clinical Practice guidelines, the Declaration of Helsinki and local laws and regulations. All study-related documents were approved by the National Bioethics Committee for Medicine and Medical Devices.

Lifestyle and eating habits

Lifestyle and eating habits data were collected using a part of the Global Physical Activity Questionnaire (World Health Organization), a semiquantitative food frequency questionnaire comprising questions from the Nurses Health Questionnaire (17, 18), as well as additional questions developed for this study and aiming to better evaluate the lifestyle of the participants (16). In the analysis presented here was not included the semiquantitative food frequency questionnaire. The questions on lifestyle habits included in the present analysis assessed the smoking habits, and the questions on dietary patterns evaluate the number of meals/day, consumption of breakfast, snacks between meals, the most consistent meal, and eating during nights. The detailed list with questions used was provided in the article by Roman *et al.* (16). From the Global Physical Activity questionnaire we used 9 questions assessing the intensity (vigorous and moderate intensity) and frequency (number of days/weeks) of the professional and the leisure-time physical activities, as well as the amount of time spent sitting or reclining on a typical day.

Statistical analysis

As previously described, based on an estimated prevalence of obesity of 24% (19), considering a 95% confidence interval and a 5% precision level, it was estimated that a sample of 2100 participants will be required (16). Quantitative variables were described using the mean and standard deviation (SD). Frequency tables, contingency tables and graphics were used for the description of the qualitative variables. To compare the observed distribution of variables between different groups were applied the Chi² test, and the Chi² test with the Yates correction. Means were compared using the “t” test for independent samples or variance analysis ANOVA. Multivariate logistic regression was used to assess the association between lifestyle and eating habits and sociodemographic characteristics.

All descriptive and inferential analyses were performed using IBM SPSS Statistics for Windows, Version 22.0 (Armonk, NY: IBM Corp). For all tests p-value was considered statistically significant if <0.05 and the two tailed p value was calculated.

RESULTS

We received 2128 completed questionnaires. Of these, 25 had missing data on weight or height and 28 had missing data on age and were removed from the analysis presented here. Of the 2075 participants included in this analysis the majority (1054) were in the 18-39 years age group, 725 in the 40-59 years age group, 267 in the 60-79 years age group and 29 in the ≥80 years age group (Table 1). Mean BMI ranged between 23.6 kg/m² in the 18-39 years age group and 29.0 kg/m² in the 60-79 years age group. The

prevalence of overweight in the population included in this analysis was 22.4% (236), 40.1% (291), 40.8% (109) and 41.4% (12) in the 18-39 years, 40-59 years, 60-79 years and ≥80 years age groups, respectively (p<0.001). In these age groups, obesity was present in 23.6% (104), 30.1% (218), 25.2% (111) and 24.1% (7) of the participants, p<0.001. In all age categories the majority of participants was women (at least 59.6%) and was living in urban area (at least 51.7% in each age category) (Table 1).

The physical activity and meal pattern with intake of main meals are given in Table 2.

Eating 3 meals/day every day was more frequently reported in the 60-79 years and ≥80 years age groups (53.0% and 51.7%) than in the 18-39 years and 40-59 years age groups (26.8% and 35.8%), p <0.001. The frequency of eating breakfast every day increased with age from 43.5% in the youngest age group to 79.3% in the oldest one (p <0.001). A similar trend was observed for those who reported having snacks every day, the frequency increased from 21.3% in the 18-39 years age groups to 34.5% in the ≥80 years age group (p <0.001). In all age groups, 62.3% to 86.2% of participants reported that the most consistent meal is lunch. Dinner as the most consistent meal was reported by 28.6% of the participants in the 18-39 age group, 30.4% of those in the 40-59 years age group, 11.0% of those in the 60-79 age group and 3.4% of those in the ≥80 years age group (p <0.001). Those 18-49 years of age reported more frequently eating while watching TV, working on computer or reading: 59.6% in the 18-39 years, 37.0% in the 40-59 years, 24.3% in the 60-79 years and 27.6% in the ≥80 years age groups (p <0.001). Also, smoking was more frequently reported

Table 1. Sociodemographic and anthropometric characteristics of the study participants

	Age categories				p ^a
	18-39 years n=1054	40-59 years n=725	60-79 years n=267	≥80 years n=29	
Weight, kg	69.5±16.6	79.8±16.3	80.1±13.1	70.7±14.4	<0.001
BMI, kg/m ²	23.6±4.5	28.1±5.2	29.0±4.4	26.9±4.8	<0.001
Waist circumference, cm	90.0±15.8	92.8±17.7	96.3±15.2	92.8±14.6	<0.001
Women, n (%)	646 (61.3%)	458 (63.2%)	159 (59.6%)	20 (69.0%)	0.594
Living in urban area, n (%)	867 (82.3%)	486 (67.0%)	151 (56.6%)	15 (51.7%)	<0.001
Education, n (%)					
1-4 classes	2 (0.2%)	7 (1.0%)	11 (4.2%)	8 (27.6%)	
≤8 classes	17 (1.6%)	45 (32.4%)	71 (26.8%)	6 (20.7%)	
High school	195 (18.7%)	239 (33.3%)	48 (18.1%)	8 (27.6%)	<0.001
Professional education	65 (6.2%)	190 (26.5%)	81 (23.8%)	4 (13.8%)	
University	765 (73.3%)	236 (32.9%)	54 (20.4%)	29 (1.4%)	

The data are presented as mean ± standard deviation for continuous variables and as number (percentage) for categorical variables
a ANOVA was used for the comparison of means and Chi² test for the comparison of proportions (%), percentage of participants within a given category;
N, number of participants in each age group.

by the younger participants compared to the older ones (33.5% and 19.6% vs. 8.6% and 6.9%, $p < 0.001$).

Intense professional-related physical activity was more frequently reported by the participants in the 40-59 years age group (24.1%) compared to those in the 18-39 years age group (17.8%) and 60-79 years age group (11.6%), while moderate professional-related physical activity, intense and moderate leisure-time physical activity was more frequently reported by the participants in the 18-39 years age group (Table 2). The number of days/week with intense or moderate professional-related physical activity and intense or moderate leisure time physical activity was significantly higher among participants in the 40-79 years age groups compared to those in the 18-39 years age group ($p < 0.05$ for all; Table 2).

The sociodemographic and lifestyle variables

used in the multiple logistic regressions were age categories, gender, education, employment status, living area and smoking habits. The association between these factors and regular consumption of breakfast, 3 meals per day, snacks and leisure time physical activity is shown in Table 3. Regular breakfast and regular consumption of 3 meals/day was associated with increasing age category (OR: 1.55 and 1.46), male gender (OR: 1.21 and 1.34) and non-smoking status (OR: 2.38 and 1.87). Additionally, regular consumption of breakfast was associated with employment status, being more rarely consumed by those working full or part time (OR: 1.05). Consumption of snacks between meals was associated only with the employment status, being more rarely consumed by those working full or part time (OR: 1.08). Leisure time were physical activities associated with younger age categories (OR:

Table 2. Health-related lifestyle factors according the age categories

	Age categories				p^a
	18-39 years	40-59 years	60-79 years	≥ 80 years	
Intense professional physical activity, n (%)	69.5 $\pm$ 16.6	79.8 $\pm$ 16.3	80.1 $\pm$ 13.1	70.7 $\pm$ 14.4	<0.001
No. of days with intense professional physical activity/week	188 (17.8%)	28.1 $\pm$ 5.2	29.0 $\pm$ 4.4	26.9 $\pm$ 4.8	<0.001
3.4 $\pm$ 2.2	175 (24.1%)	92.8 $\pm$ 17.7	96.3 $\pm$ 15.2	92.8 $\pm$ 14.6	<0.001
4.3 $\pm$ 1.9	31 (11.6%)	458 (63.2%)	159 (59.6%)	20 (69.0%)	0.594
3.8 $\pm$ 2.3	NA	486 (67.0%)	151 (56.6%)	15 (51.7%)	<0.001
NA	<0.001				
<0.001	2 (0.2%)	7 (1.0%)	11 (4.2%)	8 (27.6%)	
Moderate professional physical activity	690 (65.5%)	446 (61.5%)	118 (44.2%)	NA	<0.001
No. of days with moderate professional physical activity/week	4.6 $\pm$ 1.6	4.9 $\pm$ 1.6	4.8 $\pm$ 1.8	NA	0.011
Intense leisure time physical activity	464 (44.0%)	149 (20.6%)	35 (13.1%)	2 (6.9%)	<0.001
No. of days with intense leisure time physical activity/week	2.9 $\pm$ 1.8	3.4 $\pm$ 2.1	3.7 $\pm$ 2.0	4.0 $\pm$ 1.4	0.002
Moderate leisure time physical activity	663 (62.9%)	348 (48.0%)	83 (31.1%)	3 (10.3%)	<0.001
No. of days with moderate leisure time physical activity/week	3.6 $\pm$ 1.9	4.3 $\pm$ 2.1	4.7 $\pm$ 2.0	3.3 $\pm$ 0.6	<0.001
No of hours being sedentary/day	5.6 $\pm$ 3.0	4.8 $\pm$ 3.0	4.8 $\pm$ 2.6	6.4 $\pm$ 2.9	<0.001
Eating 3 meals/day					
Every day	281 (26.8%)	258 (35.8%)	140 (53.0%)	15 (51.7%)	<0.001
Most of the times	453 (43.2%)	258 (35.8%)	90 (34.1%)	10 (34.5%)	
Rarely	315 (30.0%)	205 (28.4%)	34 (12.9%)	4 (13.8%)	
The most consistent meal					<0.001
Breakfast	95 (9.1%)	52 (7.2%)	23 (8.7%)	3 (10.3%)	
Lunch	651 (62.3%)	449 (62.4%)	211 (80.2%)	25 (86.2%)	
Dinner	299 (28.6%)	219 (30.4%)	29 (11.0%)	1 (3.4%)	
Eating breakfast every day	459 (43.5%)	387 (53.4%)	192 (71.9%)	23 (79.3%)	<0.0011
Snacks					
Every day	224 (21.3%)	170 (23.7%)	70 (26.6%)	10 (34.5%)	<0.001
Most of the times	490 (46.6%)	260 (36.2%)	100 (38.0%)	7 (0.8%)	
Rarely	337 (32.1%)	288 (40.1%)	93 (35.4%)	12 (41.4%)	
Eating the most consistent meal after 21:00 pm					
Every day	40 (3.8%)	20 (2.8%)	8 (3.1%)	2 (6.9%)	<0.001
Most of the times	207 (19.9%)	115 (16.3%)	20 (7.7%)	2 (6.9%)	
Eating during nights	90 (8.5%)	75 (10.3%)	28 (10.5%)	5 (17.2%)	0.642
No. of nights when eating/week	2.3 $\pm$ 1.2	2.7 $\pm$ 1.4	2.5 $\pm$ 1.6	3.8 $\pm$ 1.5	0.067
Eating large quantities of food less than 2 hours following another consumption of large quantity of food and although					
186 (17.6%)					
120 (16.6%)					
34 (12.7%)					
0					
0.014					
you are feeling satiated					
Eating while watching TV, working on computer or reading	628 (59.6%)	268 (37.0%)	65 (24.3%)	8 (27.6%)	<0.001
Smoking	353 (33.5%)	142 (19.6%)	23 (8.6%)	2 (6.9%)	<0.001

The data are presented as mean $\pm$ standard deviation for continuous variables and as number (percentage) for categorical variables a ANOVA was used for the comparison of means and Chi2 test for the comparison of proportions.

BMI, body mass index; n (%), percentage of participants within a given category; N, number of participants in each age group.

0.46), male gender (OR: 1.28), rural area (OR: 1.41), higher educational level (OR: 1.12) and non-smoking status (OR: 1.31).

For unhealthy lifestyle habits the ORs and 95%CI are given in Table 4. Eating during night was associated with male sex (OR: 1.81) and smoking status (OR for non-smokers: 0.44). Eating while watching TV and eating large quantity of foods less than 2 hours following another consumption of large quantity of food although feeling satiated were associated with younger age categories (OR: 0.52 and 0.70) and being smoker (ORs for non-smokers: 0.74 and 0.94). For living area, eating while watching TV was associated with urban area (OR for rural area: 0.71) and eating large quantities of food less than 2 hours following another consumption of large quantity of food although feeling satiated was associated with rural area (OR: 1.73).

DISCUSSION

A great body of evidence shows that lifestyle has a major impact on health outcomes at individual and population level (5-7, 22-25). To address the very

complex issue of chronic diseases prevention, a detailed picture of the current status in food and nutrient intakes, dietary patterns and physical activity is imperative. Previously we observed that the participants with a normal BMI and who were also younger than the ones with overweight and obesity had irregular meals (16). Starting from this observation, here we have assessed the lifestyle habits and eating behavior in different age groups and the associations between these habits and sociodemographic factors.

Our analysis showed a high frequency of unhealthy lifestyle habits among the younger age groups as compared to the older ones, with the highest frequency reported in the 18-39 years age group. Eating 3 meals/day every day, eating breakfast every day and having snacks every day was less frequently reported in the 18-39 years and 40-59 years age groups compared to the ≥ 60 years ones, $p < 0.001$. According to a review published in 2010 rates of breakfast skipping are high worldwide, ranging from 1.7% in Croatia to 43.9% in Malaysia (20, 21). A previous study aiming to evaluate the eating habits in a Romanian young population, 20 to 24 years of age, showed that only 65.15% of the enrolled participants

Table 3. Multiple logistic regression analysis exploring the association between healthy lifestyle habits - regular consumption of 3 meals, breakfast, snacks and regular leisure time physical activity - and lifestyle factors

	Breakfast		3 meals/day		Snacks		Leisure time moderate or intense physical activity	
	OR (95%CI)	p	OR (95%CI)	p	OR (95%CI)	p	OR (95%CI)	p
Age categories	1.55 (1.35; 1.79)	<0.001	1.46 (1.27; 1.68)	<0.001	1.08 (0.95; 1.29)	0.190	0.46 (0.40; 0.53)	<0.001
Gender*	1.21 (1.00; 1.46)	0.05	1.34 (1.10; 1.63)	0.004	0.82 (0.66; 1.02)	0.081	1.28 (1.05; 1.55)	0.013
Living area**	0.96 (0.77; 1.19)	0.684	1.03 (0.82; 1.29)	0.827	0.86 (0.67; 1.11)	0.241	1.41 (1.12; 1.77)	0.003
Education	1.02 (0.92; 1.13)	0.713	0.95 (0.86; 1.05)	0.37	1.01 (0.90; 1.13)	0.852	1.12 (1.02; 1.24)	0.025
Employment status	1.05 (1.00; 1.09)	0.043	1.03 (0.98; 1.08)	0.222	1.08 (1.03; 1.13)	0.003	0.97 (0.93; 1.02)	0.251
Non-smoker	2.38 (1.91; 2.97)	<0.001	1.87 (1.46; 2.38)	<0.001	1.21 (0.94; 1.57)	0.147	1.31 (1.05; 1.63)	0.017

* being male

** living in rural area

OR, odds ratio; CI, confidence interval; regular consumption was defined as daily consumption of breakfast, 3 meals/day and snacks.

Table 4. Multiple logistic regression analysis of unhealthy lifestyle habits related to lifestyle factors

	Eating during night		Eating while watching TV, working on computer or reading		Eating large quantities of food less than 2 hours following another consumption of large quantity of food and although you are feeling satiated	
	OR (95%CI)	p	OR (95%CI)	p	OR (95%CI)	p
Age categories	1.17 (0.93; 1.46)	0.181	0.52 (0.45; 0.60)	<0.001	0.70 (0.57; 0.84)	<0.001
Gender *	1.81 (1.33; 2.47)	<0.001	0.87 (0.72; 1.05)	0.150	1.12 (0.88; 1.44)	0.354
Living area**	1.20 (0.84; 1.71)	0.314	0.71 (0.56; 0.88)	0.002	1.73 (1.31; 2.28)	<0.001
Education	0.85 (0.73; 1.00)	0.055	1.08 (0.98; 1.20)	0.122	0.99 (0.87; 1.13)	0.877
Employment status	1.02 (0.94; 1.10)	0.678	1.01 (0.97; 1.06)	0.690	1.04 (0.98; 1.10)	0.186
Non-smoker	0.44 (0.32; 0.62)	<0.001	0.74 (0.59; 0.920)	0.006	0.94 (0.71; 1.24)	0.666

* being male

** living in rural area

OR, odds ratio; CI, confidence interval.

reported having breakfast daily (22). We have observed similar results, with 57% of the participants in the 18-39 years age group and 46% of the participants in the 40-59 years age group skipping breakfast at least 1 day/week. Clinical studies have shown that irregular meal consumption may be associated with the risk of obesity and metabolic diseases (5-7). A study on 26,902 male health professionals, ages 45-82 that analyzed food questionnaire data and health outcomes from 1992-2008, showed that men who regularly skipped breakfast had a 27% higher risk of heart attack or death from coronary heart disease (23).

The most recently published and the most robust one in terms of methodology was the Nurses' Health Study in which 46,289 women without type 2 diabetes were enrolled and followed for 6 years (7). This study showed that after adjustment for BMI, irregular consumption of breakfast was associated with 20% higher risk for developing type 2 diabetes (7). Similar results were reported in men from Health Professionals Follow-Up Study: irregular breakfast consumption was associated with 21% higher risk of type 2 diabetes as compared to the regular breakfast consumption (24). Skipping breakfast and irregular meal consumption seem to be associated with lower postprandial energy expenditure, increased insulin resistance and higher fasting lipid levels in lean persons (25). In obese persons regular meals consumptions has been shown to be associated with a lower energy intake, lower fasting total and LDL cholesterol and beneficial effect on the postprandial insulin response (26).

The observations on the low frequency of eating 3 meals/day every day together with the habit of eating while watching TV, working on computer or reading show that the Romanian population is moving to a style of living similar to the one observed in the Western populations (26). In the Western populations it was hypothesized that the tendency of eating more outside of homes and the alteration of the tradition of families dining together may partially represent the cause of these observations (26). Probably similar erosion of the traditional lifestyle habits may explain our observations too. Sourani M *et al.*, in their study on children and pre-adolescents from the Greek Tinos Island, concluded that the traditional and healthier Mediterranean lifestyle preserved in this island might be the explanation of a reduced prevalence of obesity among the studied population (27).

Regular breakfast and regular consumption of 3 meals/day was associated with older age group, male

sex and non-smoking status. The association between smoking and younger age and eating habits have been previously reported (22, 28). Although it is known that there is a correlation between socioeconomic status and eating behavior, with those with higher education and higher income having more healthy diets (28, 29), we did not find any association between the educational status and working full or part time and eating regular meals. Furthermore, the ones working full or part time consumed less frequently breakfast every day.

In our study non-smoker status was a strong predictor of healthy eating habits, being associated with regular consumption of breakfast, 3 meals/day every day, less frequent eating during night, less frequent eating while watching TV, and less frequent eating large quantities of food less than 2 hours following another consumption of large quantity of food and although you are feeling satiated. It has been previously shown that compared to non-smokers, smokers have unhealthy patterns of nutrient intake with a higher consumption of fat, alcohol, saturated fat, and cholesterol (30).

In addition to the eating patterns, regular physical activity is another important component of a healthy lifestyle (31). Based on evidences showing that compared to persons who exercise less frequently, persons who are more active have lower rates of all-cause mortality, coronary heart disease, high blood pressure, stroke, type 2 diabetes, metabolic syndrome, and certain types of cancer, World Health Organization recommends at least 150 minutes of moderate-intensity aerobic physical activity/week or at least 75 minutes of vigorous-intensity aerobic physical activity/week (31). In our study the frequency of intense or moderate leisure-time physical activity in the 18-39 years age groups (44% and 63% of the participants) was comparable to the one reported in Southern European countries (32), but lower than the one reported for the Northern European countries (33). In the 40-59 years age group the frequency was lower than in the younger age group (20.6% for intense leisure-time physical activity and 48.0% for moderate leisure-time physical activity for the 40-59 years age group vs. 44.0% for intense leisure-time physical activity and 62.9% for moderate leisure-time physical activity for the 18-39 years age group) but this age group exercised more days per week compared to the younger ones (3.4 vs. 2.9 days of intense leisure-time physical activity and 4.9 vs. 3.6 days of moderate leisure-time physical activity). In terms of sociodemographic factors, leisure time physical activities were associated with younger age categories, male gender, rural area, higher educational

level and non-smoking status. Previously a sociological investigation aiming to evaluate the frequency of practicing “recreational sport” in Romanian population showed that only 17% of the respondents practiced recreational sports systematically or occasionally (34). The relationship between male gender, educational level and the physical leisure time activity is consistent with the literature – similar observations have been previously reported: men and those with higher educational levels more frequently comply with the recommendations on leisure-time physical activities (32, 33, 35-37). Although the factors underlying these associations are not entirely understood it was reported that locus of control, neuroticism, emotional social support, active problem focusing, optimistic and palliative coping styles could play an important role. Although material factors, such as income and employment status, have also been reported to mediate the relationship between the educational level and the probability of adhering to leisure-time physical activities recommendations (38), we did not find any association between the physical activity and the employment status.

Although our study enrolled a large sample size, we must acknowledge that it has few limitations (16). The number of participants ≥ 60 years of age is low and therefore the sample and the lifestyle habits may not be representative for the entire Romanian population of this age. We also have to acknowledge the limitations related to the collection of self-reported patterns of eating and physical activity which may have influenced the participants’ ability to correctly report lifestyle habits and may be associated with an unintentional under-reporting of unhealthy habits.

In conclusion, this analysis showed a high frequency of unhealthy lifestyle habits in Romanian general population. The higher frequency of these unhealthy habits among the younger age groups is of special concern. Without the implementation of long term efficient educational programs targeting this age group and also children and adolescence in the future Romania may face a major increase in the incidence of obesity and other non-communicable diseases in the future years.

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Conflict of interest

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