ASSESSMENT OF HEALTH STATUS AND CARDIOVASCULAR RISK FACTORS IN A ROMA POPULATION SAMPLE FROM SOUTH BULGARIA

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SUMMARY

Objectives: Roma population is one of the major ethnic groups in the Central and Eastern Europe, having high rates of chronic diseases and associated risk factors related to their poor social conditions, unhealthy lifestyle and low educational level. The purpose of our study was to assess the health status of Roma from South Bulgaria by means of blood indicators and determine the prevalence of some cardiovascular (CV) risk factors in the Roma population sample.

Methods: The study group consisted of 60 Roma (23 men and 37 women), mean age 53.7 ± 15.9 years, and the control group consisted of 68 non-Roma from the majority population (29 men and 38 women), mean age 45.8 ± 12.2 years. The data were collected via questionnaire, anthropometric measures, and venous blood samples analyses after an overnight fasting.

Results: The Roma population subjects were slightly but significantly older compared to the non-Roma group and both study groups included more women. The fasting glucose, body mass index (BMI), triglycerides (TG), total cholesterol (TC), and LDL-cholesterol (LDL-C) levels were significantly higher, and HDL-cholesterol (HDL-C) levels were significantly lower in Roma compared to the control non-Roma group. The values of cardiovascular risk markers such as TC/HDL-C and TG/HDL-C ratios, atherogenic index of plasma (AIP) and lipoprotein combine index (LCI) were significantly higher in Roma compared to non-Roma subjects. The prevalence of obesity in Roma was 35%, diabetes mellitus was recorded in 16.7% of the entire Roma sample, and hyperglycaemia in non-diabetics was recorded in 32%. Hypercholesterolaemia was found in 90% and hypertriglyceridaemia was found in 88.3%. The prevalence of cardiovascular diseases (CVD) was high and was encountered in 71.7% of the Roma participants and most of the subjects (96.7%) reported family history of CVD. The studied population showed high smoking rates with 33.3% active smokers.

Conclusions: Our study confirmed high prevalence of CV risk factors among Roma population, such as abnormal lipid profile parameters, obesity and heavy smoking and very high cardiovascular morbidity rate. Therefore, adequate measures and healthcare programmes aiming at the early identification, treatment and prevention of CVD risks among Roma are necessary.

Key words: Roma population, Bulgaria, health status, cardiovascular risk factors, dyslipidaemia

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https://doi.org/10.21101/cejph.a7071

INTRODUCTION

Roma population is one of the major ethnic groups, 8–12 million of Roma people live in Europe, with approximately 4.2 million living in Central and Eastern Europe (1). The Roma ethnic group in Bulgaria accounts approximately 325,000 people representing 4.9% of the country population according to census results in 2011 (2) but an expert assessment suggests that the number of Roma is significantly higher and is between 640,000 and 800,000 (3). In comparison to the majority population, the Roma have reduced access to health care as well as lower rates of education and higher rates of unemployment and poverty and therefore the health status of this ethnic group should be studied carefully and should not be neglected (4–11). Recently, research of Roma health has focused on chronic illnesses and risk factors as determinants of mortality (4, 12, 13). Results report that Roma experience high rates of chronic diseases and associated risk factors. The higher risk of cardiovascular diseases (CVD) and metabolic disorders among Roma were related to poor social conditions, unhealthy lifestyle and low educational level (14, 15). According to the 2016 European Guidelines on cardiovascular disease prevention in clinical practice, CVD is a leading cause of morbidity and mortality and Bulgaria is considered as one of the very-high-risk countries with CVD mortality rates > 450/100,000 for men and > 350/100,000 for women (16). Urgent and adequate measures are necessary for the early identification and treatment of CVD and studies on the health status among risk groups of Bulgarian population will provide more information and will help to the development of effective strategies for CVD prevention.

Therefore, the aim of the present study was to assess the health status of Roma from South Bulgaria using blood indicators such as blood glucose, total cholesterol (TC), LDL-cholesterol (LDL-C), HDL-cholesterol (HDL-C), triglycerides (TG), and markers of dyslipidaemia and atherosclerosis such as the lipoprotein ratios TC/HDL-C, TG/HDL-C, atherogenic index of plasma (AIP), and lipoprotein combine index (LCI); to compare the results

from Roma with data from the majority non-Roma population; and to determine the prevalence of some cardiovascular (CV) risk factors in the Roma population such as unhealthy lifestyle (smoking, lack of physical activity), obesity, diabetes mellitus, and family history of CVD.

MATERIALS AND METHODS

Study Design and Participants

The study group consisted of 60 Roma (23 men and 37 women), mean age 53.7 ± 15.9 years, and the control group consisted of 68 non-Roma from the majority population (29 men and 38 women), mean age 45.8 ± 12.2 years. Respondents from the Roma population living in Roma neighbourhoods and the participants from the majority population were randomly selected from a list of patients from general practitioners (GP). The data were collected via questionnaire, anthropometric measures, and venous blood samples analyses after an overnight fasting. The medical history data were taken from the participants' records in the GP's office.

All the enrolled participants met the following inclusion criteria: women and men aged between 18 and 85 years, residing in the city of Plovdiv, Bulgaria, individuals that are able to read and understand the informed consent. Exclusion criteria were: acute or chronic infections, immunologic diseases, malignancies, and pregnancy.

The study was conducted in accordance with the Helsinki Declaration and the protocol was approved by the Human Ethics Committee of Medical University of Plovdiv (No 4/21.09.2017). Participation in the study was fully voluntary and all subjects gave their informed consent for inclusion.

Laboratory Analysis

Serum fasting glucose, TG and TC were determined using standard enzymatic laboratory methods. HDL-C was measured using a direct method with polyethylene glycol-modified enzymes and alpha-cyclodextrin. All concentrations are given in mmol/L. For body mass index (BMI) classification, we used the definitions of the World Health Organization and obesity was defined as a BMI over 30 kg/m^2 (17). Body mass index was calculated as the body weight (BW) in kg divided by squared body height (BH^2) in square meters:

$$BMI\ (kg/m^2) = BW/BH^2$$

LDL-C was calculated using the Friedewald's equation:

$$[LDL\text{-}C] = [TC] - [HDL\text{-}C] - [TG]/2.2$$

The TC/HDL-C ratio and the TG/HDL-C ratio were also determined as indicators of dyslipidaemia and cardiovascular risk (18). Atherogenic index of plasma is a new blood lipid indicator composed of triglycerides and high-density lipoprotein cholesterol (19–22). AIP was calculated as logarithmically transformed ratio of molar concentrations of TG to HDL-C:

$$AIP = \log_{10}(TG/HDL\text{-}C)$$

Another comprehensive lipid index and predictor of cardiovascular risk is the lipoprotein combine index. LCI was calculated using the following equation (20):

$$LCI = [TC]*TG*[LDL\text{-}C]/[HDL\text{-}C]$$

Hyperglycaemia, hypertriglyceridaemia and hypercholesterolaemia were defined as follows: fasting glucose >6.1 mmol/L, TG >1.7 mmol/L, TC >5.2 mmol/L. Type 2 diabetes mellitus (T2DM) was defined using the American Diabetes Associations 2010 criteria (23).

Statistical Analysis

Statistical analysis was performed using SPSS software, version 17.0 (SPSS Inc., Chicago, IL, USA). The Kolmogorov-Smirnov test was used to evaluate whether the distribution of continuous variables was normal. Continuous variables were expressed as mean ± SD or as median and 25th–75th percentile. The difference between means of two independent groups with Gaussian distribution was evaluated with a Student t-test, and

Table 1. *Demographic and clinical characteristics of the Roma and non-Roma population in the study (N=128)*

	Roma (n = 60)	Non-Roma (n = 68)	p-value
Age (years)	53.7 (15.9)	45.8 (12.2)	0.002
Male, n (%)	23 (38.3)	29 (43.3)	
Female, n (%)	37 (61.7)	38 (56.7)	
Fasting glucose (mmol/L)	6.05 (5.80–6.55)	4.93 (4.42–5.50)	0.001
BMI (kg/m^2)	28.0 (24.80–31.0)	24.5 (21.60–33.40)	0.582
Triglycerides (mmol/L)	2.10 (2.00–2.20)	1.11 (0.84–1.53)	<0.001
Total cholesterol (mmol/L)	6.02 (0.63)	4.46 (1.06)	<0.001
LDL cholesterol (mmol/L)	3.07 (0.60)	2.69 (0.96)	0.095
HDL cholesterol (mmol/L)	1.08 (0.99–1.24)	1.18 (1.07–1.26)	0.041
TC/HDL-C	4.48 (1.52)	3.91 (1.45)	0.007
TG/HDL-C	1.91 (1.28–2.17)	0.93 (0.70–1.40)	<0.001
AIP	0.244 (0.173)	0.005 (0.218)	<0.001
LCI	32.5 (21.40–47.50)	12.1 (4.70–22.50)	<0.001

Data are presented as mean (SD) or median (25th–75th percentile). P-values were calculated by the general linear model univariate procedure after adjustment for age as a covariate.

TC – total cholesterol; TG – triglycerides; AIP – atherogenic index of plasma; LCI – lipoprotein combine index

for comparison of non-Gaussian distributed variables the Mann-Whitney U test was used. The general linear model univariate procedure was performed for analysis of variance for one dependent variable by one or more factors. Statistical significance was defined as $p < 0.05$.

RESULTS

The present study included a total of 60 Roma participants and 68 non-Roma participants. Demographic and clinical characteristics of the two study groups are summarized in Table 1. The Roma population subjects were slightly but significantly older and both groups included more women. The fasting glucose, BMI, TG, TC, and LDL-C levels were significantly higher, and HDL-C levels were significantly lower in Roma compared to the control non-Roma group. The values of cardiovascular risk markers such as TC/HDL-C and TG/HDL-C ratios, AIP and LCI were significantly higher in Roma compared to non-Roma subjects.

The study parameters broken down into four groups based on gender and ethnicity are presented in Table 2. Roma males and females had statistically significant higher levels of fasting glucose, TG, TC, TC/HDL-C and TG/HDL-C ratios, AIP and LCI compared to non-Roma males and females. Roma females had significantly higher LDL-C and significantly lower HDL-C compared to non-Roma females. The difference in LDL-C and HDL-C levels between Roma and non-Roma males was not statistically significant.

Socio-demographic characteristics of the Roma participants are summarized in Table 3. According to questionnaire results, 91.5% of Roma subjects had finished primary school and only 8.5% had finished secondary school. The studied population showed high smoking rates with 33.3% active smokers and an average number of cigarettes per day 12.8 ± 7.8. A statistical analysis in the Roma group was performed comparing smokers versus non-smokers. There was no statistically significant difference in any of the study parameters between smokers and non-smokers.

All 60 Roma participants reported sedentary lifestyle and lack of physical activity (sport less than once per week) and only 35% reported intake of vitamins and minerals.

The prevalence of obesity, defined as BMI > 30 in Roma was 35% (21 subjects). Diabetes mellitus was recorded in 16.7% of the Roma population (10 subjects), and hyperglycaemia in non-diabetics was recorded in 32% (16 subjects). Hypercholesterolaemia was found in 90.0% (54 subjects) and hypertriglyceridaemia was found in 88.3% (53 subjects). The prevalence of CVD was high and was encountered in 71.7% of the Roma participants (43 subjects) and most of the subjects (96.7%) reported family his-

Table 3. *Socio-demographic characteristics of the Roma participants (N=128)*

Variables	%
Age (years), mean (SD)	53.7 (15.9)
Educational level	
Primary education	91.5
Secondary education	8.5
Smoking	
Active smokers	33.3
Average no. cigarettes/day, mean (SD)	12.8 (7.8)
Passive smokers	88.3
Sedentary lifestyle and physical activity	
Sport less than once per week	100.0
Intake of vitamins and minerals	
Yes	35.0
No	65.0
Obesity (BMI > 30)	35.0
Diabetes mellitus	16.7
CVD	71.7
Family history of established CVD	96.7

Table 2. *Summary of the study parameters by gender and ethnicity (N=128)*

	Roma males (n = 23)	Non-Roma males (n = 29)	p-value	Roma females (n = 37)	Non-Roma females (n = 38)	p-value
Age (years)	52.2 (17.2)	45.7 (14.2)	0.138	54.6 (15.3)	45.8 (10.7)	0.006
Fasting glucose (mmol/L)	6.10 (5.90–6.80)	5.14 (4.59–5.95)	0.001	6.00 (5.70–6.55)	4.72 (4.40–5.33)	< 0.001
BMI (kg/m^2)	27.1 (3.9)	27.0 (6.07)	0.519	28.3 (4.9)	26.1 (6.84)	0.277
Triglycerides (mmol/L)	2.10 (2.10–2.20)	1.26 (0.88–1.49)	< 0.001	2.20 (1.92–2.22)	1.10 (0.79–1.68)	< 0.001
Total cholesterol (mmol/L)	6.12 (0.69)	4.43 (1.07)	< 0.001	5.96 (0.58)	4.48 (1.06)	< 0.001
LDL cholesterol (mmol/L)	3.01 (0.58)	2.65 (0.97)	0.118	3.11 (0.61)	2.73 (0.97)	0.151
HDL cholesterol (mmol/L)	1.10 (0.99–1.29)	1.18 (1.08–1.26)	0.311	1.08 (0.97–1.24)	1.20 (1.07–1.26)	0.486
TC/HDL-C	4.83 (1.73)	3.76 (1.02)	0.015	4.94 (1.72)	4.02 (1.72)	0.027
TG/HDL-C	1.79 (0.71)	1.12 (0.59)	0.001	1.80 (0.97)	1.18 (0.71)	0.005
AIP	0.245 (0.171)	0.004 (0.196)	< 0.001	0.244 (0.177)	0.006 (0.236)	< 0.001
LCI	35.55 (16.15)	15.32 (12.19)	< 0.001	32.34 (20.42–49.08)	10.20 (4.65–26.51)	0.004

Data are presented as mean (SD) or median (25th–75th percentile). P-values for Roma and non-Roma females were calculated by the general linear model univariate procedure after adjustment for age as a covariate.
TC – total cholesterol; TG – triglycerides; AIP – atherogenic index of plasma; LCI – lipoprotein combine index

tory of CVD (hypertension, heart failure, myocardial infarction, stroke or death due to CVD in at least one first-degree relative). In the non-Roma group, the prevalence of obesity was 29.9% (20 subjects), diabetes mellitus was recorded in 10.5% (7 subjects), and hyperglycaemia in non-diabetics was 9.8% (6 subjects). Hypercholesterolaemia was found in 23.5% (16 subjects) and hypertriglyceridaemia was found in 20.6% (14 subjects).

DISCUSSION

Recently, research of Roma health has focused on chronic illness and risk factors as determinants of mortality. Recent evidence suggests that the Roma population is at increased cardiovascular and metabolic risk and highlights the need for further investigations on the prevalence of cardiovascular risk factors among Roma people that would facilitate the diagnosis and would help to the development of effective strategies for CVD prevention among Roma population (6, 24).

Our results suggest higher prevalence of CVD risk factors in Roma compared to the control non-Roma group. The fasting glucose, BMI, TC, TG and LDL-C levels were significantly higher, and HDL-C levels were significantly lower in Roma compared to the control non-Roma group. These results are in agreement with other authors who report higher levels of LDL-C, TC and TG with lower levels of HDL-C in Roma vs. non-Roma. An observational study among Roma from Romania reports high rates of dyslipidaemia, obesity and diabetes mellitus and high LDL levels as the most frequent lipid abnormality and CV risk factor (6, 12, 25). A growing body of evidence indicates that increases in total cholesterol, LDL-C and TG and decreases in HDL-C are strong markers of cardiovascular risk and may contribute to the progression of atherosclerosis (20, 26). Our results revealed very high prevalence of obesity, hypercholesterolaemia and hypertriglyceridaemia in Roma which can be explained by a lack of physical activity, smoking and detrimental dietary patterns (14, 27).

Several lipoprotein ratios have been established and widely used in recent years. The balance constructed between atherogenic and protective lipoproteins makes the lipoprotein ratios having greater cardiovascular risk compared to conventional lipid components used alone. Atherogenic index of plasma is a new blood lipid marker composed of triglycerides and high-density lipoprotein cholesterol. It has been used to quantify blood lipid levels, and commonly used as an optimal indicator of dyslipidaemia and as a significant predictor of cardiovascular risk, which might comprehensively reflect the balance between atherogenic and anti-atherogenic factors. AIP values of −0.3 to 0.1 are associated with low, 0.1 to 0.24 with medium and above 0.24 with high CV risk (19–22). The values of nontraditional lipid profiles, atherosclerosis and cardiovascular risk markers such as TC/HDL-C and TG/HDL-C ratios, AIP and LCI were significantly higher in Roma compared to non-Roma subjects. The TG/HDL-C ratio of 1.49 can be used as the critical value for a higher risk of metabolic syndrome (28). In Roma males and females this ratio was higher than the critical value which indicates abnormal lipid metabolism and suggests high CV risk. The average AIP in Roma was above 0.24, which suggests dyslipidaemia and high CV risk. The same value of AIP was observed in the subgroups of Roma males and females. The present study is the first to explore AIP as an indicator of dyslipidaemia and cardiovascular risk among Roma population.

The higher risk of cardiovascular diseases and metabolic disorders among Roma were related with their unhealthy lifestyle and low educational level. The majority of Roma participants involved in our study (91.5%) had finished primary school and the rest (8.5%) had finished secondary school. According to the latest census in Bulgaria in 2011, 11.8% of Roma are illiterate, 64.4% had finished primary school and only 6.9% had finished secondary school (2).

It is well known that smoking is common among Roma and it is part of their traditional lifestyle. Higher prevalence of smoking and CVD is reported for Roma compared to the general population (13, 25). In the present study, we confirm the high prevalence of smoking as one of the major cardiovascular risk factor among Roma since 33.3% of the study Roma participants were active smokers and 71.7% of them were diagnosed with CVD. Our results confirm the fact that smoking cessation strategies were less effective in Roma, who, in the context of their culture, lifestyle and low educational level, do not see smoking as deleterious for their health (29).

Another characteristic of the unhealthy lifestyle and cardiovascular risk factor is the physical inactivity. All Roma participants involved in our study reported sedentary lifestyle and a lack of daily sport activity. These observations are in agreement with other authors who examined the level of physical activity among Roma from Romania (30).

The major limitation of our study is the relatively small sample size of the Roma group because a lot of the individuals from the Roma population who filled the questionnaire were excluded from the study due to the exclusion criteria. Therefore, the Roma group cannot be interpreted as a representative sample for the whole Bulgarian Roma population. Despite the relatively small size of the study groups, the number of subjects was still sufficient to perform a statistical analysis with adequate power. In addition, the Roma and the control groups included almost identical number of subjects and had equal sex distribution. Another limitation of the study is the age difference between Roma and control non-Roma group that may be the reason for some of the differences between the study groups.

CONCLUSION

Our study confirmed high prevalence of CV risk factors among Roma population, such as abnormal lipid profile parameters, obesity and heavy smoking and very high cardiovascular morbidity rate. These findings may provide a better understanding for Bulgarian health professionals about the need of adequate measures and healthcare programmes aiming at the early identification, treatment and prevention of CVD risks among Roma population.

Acknowledgements

This study was supported by the Bulgarian Ministry of Education and Science under the National Research Programme "Young Scientists and Postdoctoral Students".

Conflicts of Interest

None declared

Funding

Part of this study was financed by a grant number 08/2017 for PhD thesis from Medical University of Plovdiv.

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Received August 23, 2021
Accepted in revised form April 20, 2023