„CAROL DAVILA" UNIVERSITY OF MEDICINE AND PHARMACY, BUCHAREST

DOCTORAL SCHOOL

MEDICINE

CLINICAL AND METABOLIC CHARACTERISTICS OF METABOLIC SYNDROME, OBESITY AND TYPE 2 DIABETES IN THE ROMA POPULATION IN CALARASI COUNTY

ABSTRACT

DOCTORAL COORDINATOR:

Prof. Univ. Dr. Gabriela RADULIAN

<div align="right">

PhD STUDENT:

Georgiana Mihaela ENACHE

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2. **Enache G**, Rusu E, Ilinca A, Rusu F, Costache A, Jinga M, Pănuș C, Radulian G. Prevalence of overweight and obesity in a Roma population from southern Romania - Călărași County. Acta Endo (Buc). 2018;14(2):122. doi: 10.4183/aeb.2018.122. (Capitolul 4 Studiul I. Prevalența excesului ponderal și a obezității la o populație de romi din județul Călărași)
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3. Rusu E, **Enache GM**, Rusu F, Cosoreanu A, Cirstea C, Baleanu MC, Radulian G. Prevalence of glucose intolerance in the Roma population from a rural area in the south part of Romania: Călărași County. Diabetes. 2020;69(Supplement_1):1466-P. (Capitolul 6. Studiul III. Evaluarea tulburărilor de glicoreglare într-o populație de etnie romă din județul Călărași)

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5. Cosoreanu A, Rusu E, Rusu F, Stanciu S, **Enache G**, Radulian G. Progression of chronic kidney disease to dialysis in the Roma population with type 2 diabetes mellitus in comparison with Caucasian patients. Cureus. 2024;16(6). (Capitolul 7 Studiul IV.

Particularități clinico-metabolice ale pacienților de etnie romă diagnosticați cu diabet zaharat tip 2)

List of abbreviations and symbols

eRFG, estimated glomerular filtration rate

iSGLT-2, sodium-glucose co-transporter-2 inhibitor

m^2, suare meter

mmol/L, milimol per litru

mmol/mol, milimol per mol

mg/dl, miligram per decilitru

mmhg, millimeters of mercury

ADA, American Diabetes Association

AGL, frea fatty acids

AHC, hereditary-collateral antecedents

AVC, stroke

BAP, peripheral arterial disease

BCI, ischemic coronary disease

BCR, cronic kidney disease

BCV, cardiovascular disease

BIA, body adiposity index

BF, excessive body fat

BMI, body mass index

CA, abdominal circumference

CS, hip circumference

EP, overweight

FPG, fasting plasma glucose

FCG, fasting capillary glucose

FR, risc factors

G, gram/grame

GBM, altered basal blood glucose

GGT, gammaglutamyltransferase

HbA1c, glicated hemoglobin

HDL-C, high density lipoproteins

HTA, hypertension

IDF, International Diabetes Federation

IL-2, interleukin 2

IL-6, interleukin 6

IMA, myocardial infarction

IR, insulinresistance

LDL-C, low density lipoproteins

MARE, Metabolic Syndrome and Artery REsearch

MRG, Minority Rights Group

OMS, World Health Organisation

NP, normal weight

PD= diabetic polyneuropathy

RD, diabetic retinopathy

SMet, metabolic syndrome

TA, arterial tension

TAG, altered glucose tolerance

TG, triglycerides

TGO, aspartataminotransferase

TGP, alaninaminotransferase

TNF-α, tumor necrosis factor

TTGO, glucose tolerance oral test

UNDP, United Nation Development Programme

VLDL, very low density lipoproteins

WHR, abdominal circumference/hip circumference

WHtR, waist/hip ratio

Introduction

Despite Romania's significant socioeconomic progress over the past two decades since joining the European Union, the Roma population in the country remains one of the most vulnerable groups. Their quality of life indicators are well below those of the general population, and they continue to be disproportionately affected by poverty, material deprivation, and limited access to basic services[1].

Ethnic minority groups generally have poorer health compared to the general population, although the patterns of ethnic health inequalities are highly diverse [2]. Ethnic inequalities affecting health arise from many interconnected factors, with socioeconomic inequalities likely being the most significant [2].

Undertaking a doctoral thesis on the issues of obesity, diabetes mellitus, and metabolic syndrome among the Roma in Romania was motivated by several factors, addressing which could contribute to better management of these pathologies in the Roma population.

Socioeconomic and cultural factors, social stigma, and inadequate medical education significantly limit access to healthcare services. Given the important role that lifestyle, dietary habits, and socioeconomic factors can play in the prevalence of obesity, diabetes mellitus (DM), and metabolic syndrome (MetS), studying these specific factors within the Roma community can provide valuable insights for developing personalized interventions.

A doctoral thesis focused on health issues in the Roma community could bring forth new, important data, considering the lack of studies in the scientific literature, and could stimulate interest in further research.

The results of this research could assist in formulating more effective health policies and implementing prevention and treatment programs tailored to the specific needs of the Roma community.

I. The general part

1. Current state of knowledge

1.1 Roma Population – General information

The Roma are the largest ethnic minority in Europe, with a population of approximately 10-12 million people spread across the continent, particularly concentrated in Central and Southeastern Europe. [3]. In Romania, the Roma represent a substantial minority, the second largest after the Hungarian minority. They are present in all regions of the country, but their exact number remains unknown [4].

According to the data obtained at the 2021 census, out of the total population registered at national level of 19,053,815 people, the Roma population registered a number of 569,477 people (2.95%), of which 290,760 men and 278,717 women, predominantly residing in rural areas, 386,038, and 183,439 living in urban areas. The counties with the largest Roma population reported in 2021 were Mures, with 8.66%, Bihor, with 6.68%, Ialomita, with 6.40%, Calarasi, with 6.18%, Dolj, with 4, 99% and Brasov, with 4.29%. Calarasi County registered a number of 17,546 Roma people, 8789 men and 8757 women. At the level of Calarasi Municipality, the Roma population was registered with a number of 2142 people [5].

1.2 Socioeconomic Characteristics

In most European countries where the Roma ethnic group is present, data from the literature is consistent with their marginalization, with poor performance in all socioeconomic aspects of life. Roma people typically have lower incomes, higher poverty and unemployment rates, face a higher incidence of malnutrition, have a lower life expectancy, higher infant mortality, and reduced access to drinking water, sanitation and electricity compared to the Romanian Caucasian population.[6].

Regarding the socioeconomic status of the Roma on the territory of Romania, the existing data outline a rather dark picture of the conditions they live in [7]. With a lower educational level than the general population, the Roma's chances of inclusion in the labor market are limited, especially recently, with the increase in demand for skilled labor. A percentage of 14.1% of the

population aged over 10 years is illiterate, 11.3% being male, 17% female, a situation also found at the level of Calarasi County, where illiteracy affects 12.6% of the population aged over 10 years, 8.1% male and 17% female[8].

1.3 Features of health state

Precarious socioeconomic conditions and low educational levels, along with limited access to health services, have an undeniable impact on the health status of the Roma people.

Regarding the morbidity and mortality of Roma in Europe, Green et al found that they have a life expectancy up to 10 years lower than the general population[9]. These results are also applicable to Roma groups in Romania, considering that only 52% of ethnic Roma have health insurance, and 73% of them do not have access to essential medicines [10].

Roma in Romania suffer disproportionately compared to the general population from multiple morbidities or from the coexistence of two or more chronic pathologies, but also from the development of some chronic diseases at younger ages. These differences in health status led to an average life expectancy 10 years lower than that of the general population in Romania.

2. Cardiometabolic risk factors

2.1. Obesity

Obesity, defined as the excess of adipose tissue developed following the chronic accumulation and storage of excess energy, represents one of the most important problems for public health systems, being a complex, multifactorial, and preventable pathology [11].

The severity of obesity varies between countries, but it affects the population of any age, gender or social class. Overweight and obesity have been identified as a major determinant of mortality and morbidity worldwide, being a more common cause of death than underweight or malnutrition [12].

In many European countries, inequalities in the prevalence of obesity by ethnicity have been observed. A study of childhood obesity in immigrant groups in Germany found that socioeconomic and environmental factors explained almost all of the ethnic differences in obesity—especially maternal education and excessive television viewing [13].

2.2 Obesity in Roma population

Although they represent one of the largest ethnic minorities on the territory of Europe, with approximately 10-11 million representatives, the existing data in the literature regarding the prevalence of obesity among the Roma are few and inconsistent. The Roma, as a consequence of their precarious socioeconomic status and the recent rapid nutritional transition they have experienced, are considered a high-risk group to develop obesity and related pathologies.

Studies conducted over time to monitor the health status of the Roma ethnic group have shown that, despite government efforts in Europe, they suffer from poor access to health services, have less healthy eating habits and higher rates of obesity , hypertension and type 2 diabetes compared to the Caucasian population [14,15,16,17].

A potential link between the high prevalence of obesity and unhealthy lifestyle and poor eating habits has been confirmed in this ethnic group. There are data showing that the Roma population suffers from extreme obesity much more often than the rest of the population, which underlines the genetic predisposition of the Roma to be overweight [18].

2.3 The metabolic syndrome

The metabolic syndrome (MetS), an entity still considered controversial, represents a constellation of cardiovascular risk factors whose concurrent presence leads to an increased risk of type 2 diabetes, cardiovascular disease, and consequently a significant risk of premature mortality [19].

Despite scientific advances in understanding the pathophysiology and clearly identifying the risk factors that predispose to the onset of metabolic syndrome, many key aspects are currently unclear. The large variation in susceptibility and age of onset of this syndrome in patients with a similar risk profile suggests an important interaction between various environmental and genetic factors [20].

Prospective observational studies have demonstrated a strong association between MetS and the risk of DM [21,22]. In a meta-analysis of 16 multiethnic cohort studies, the relative risk of developing type 2 diabetes ranged from 3.53 to 5.17 in the study population [23]. In certain populations, this risk has been shown to increase with a greater number of MetS defining components [24].

2.3.1 Prevalence of the Metabolic Syndrome

Despite accessible tools for the diagnosis of MetS, its exact worldwide prevalence remains unknown [25], estimates suggesting, based on an assumed prevalence 3 times higher than that of DM, that between 20-25% of the world's population suffer from MetS.

At the European level, the MARE Consortium conducted a study that included 34,821 subjects from 11 European countries, the results of which showed a 24.3% prevalence of MetS, a prevalence that increases with age and that presents a small but important difference between the genders (23.9% in men and 24.6% in women)[26]. In Romania, according to the PREDATORR study, the total sex- and age-adjusted prevalence of MetS among the adult population was 38.5% ,higher in men, and that of abdominal obesity was 73.9% with a significant predominance in among women[27].

2.4 Type 2 Diabetes Mellitus

According to the report published in 2021 by the International Diabetes Federation [28], there are 537 million adults with DM worldwide, representing 10% of the world's adult population. The same report estimates that 44% of adults with diabetes are still undiagnosed, meaning that worldwide, 240 million adults with diabetes do not know they have the condition. Almost 90% of them live in middle- or low-income countries.

Considering the large number of patients with DM who are unaware that they have the disease, being undiagnosed, and due to the severe complications associated with this condition, a global effort aimed at early screening, diagnosis and treatment is required.

2.4.1 Risk factors associated with diabetes

The risk of developing DM increases with age, overweight and obesity, with the presence of SMet, reduced physical activity, smoking, but also with the presence of gestational diabetes in the antecedents.

DM evolves asymptomatically for a long period of time, during which, in the absence of adequate treatment, patients are exposed to chronic hyperglycemia and develop multiple complications. A large proportion of cases are diagnosed incidentally during routine investigations, which underlines the importance of population-based screening activities.

2.5 Cardiovascular risk factors in Roma patients

CVD is the leading cause of death in most developed countries, with a prevalence that is also rapidly increasing in developing countries. Many of the cardiovascular risk factors can be influenced with the help of specific prevention measures.

The international INTERHEART study, carried out at population level in 52 countries, showed that there are at least 9 modifiable risk factors, factors responsible for 90% of the total risk factors for a first acute cardiovascular event: smoking, dyslipidemia, HTA , DM, abdominal obesity, psychosocial factors, daily fruit and vegetable consumption, regular alcohol consumption and regular physical activity[29]. Of these, the 5 most frequent risk factors (hypercholesterolemia, DM, HTA, obesity and smoking) are estimated to be responsible for more than half of all cardiovascular deaths.

Compared to resident populations, ethnic minorities in Europe appear to be disproportionately affected by cardiovascular risk factors. This higher incidence among them is the result of complex interactions between genetic elements and environmental factors that influence the pathophysiology of cardiovascular diseases.

Regarding Roma in Romania, the study led by Emma Weiss and collaborators estimates a percentage of 42.5% active smokers and 20% ex-smokers, with an average of 20 packs/year, starting from the age of 18[30]. This significant number of tobacco users can be attributed to the fact that smoking is part of the traditional lifestyle of ethnic Roma [31].

Regarding the risk factors for DM (smoking, alcohol consumption, sedentary lifestyle, inappropriate eating behavior and low socioeconomic status), studies support the hypothesis that they are more frequently present among the Roma population[32].

Although there are studies that have evaluated the prevalence of glycoregulatory disorders in the Roma population, attributing to this ethnic group a higher risk of developing DM compared to the Caucasian population, the small number of articles published on this topic, as well as the limitations given by the small number of participants or the lack of homogeneity in the design, makes it impossible to draw conclusions [33].

II. Personal contributions

3 Research methodology

3.1 Research hypothesis

The research hypothesis starts from the premise that conducting a cross-sectional analysis at the level of the adult Roma population, with the objective of determining the prevalence of overweight and glycoregulatory disorders in the Roma population and identifying lifestyle-related risk factors, represents a first step towards the development and implementation of prevention strategies.

3.2 The motivation of the study

The data available so far in Romania regarding the prevalence of overweight, MetS and glycoregulatory disorders in the Roma population are limited. There is little data on the phenotypic characteristics and health determinants specific to this population group. Last but not least, we aim to evaluate the particularities of cardiovascular damage, dyslipidemia and metabolic control in two distinct groups of DM patients, Roma and Caucasian Romanians.

3.3 The purpose and objectives of the study

The aim of the present study is to determine the prevalence of undernutrition, overweight and glycoregulatory disorders in the Roma population of Calarasi County and to identify the risk factors associated with lifestyle as a first step for the development and implementation of prevention strategies at the level of this ethnic group.

3.4 Study design

The research activity consists of an epidemiological, observational, population study, carried out between March 2014 and May 2017, with individual data registration, in the adult population of Calarasi County, in communities with a significant Roma population. Inclusion of individuals was done randomly in the community. The study will also contain a cross-sectional

(baseline) assessment by measuring the prevalence of glycoregulation disorders in the Roma population, compared to the Caucasian Romanian population.

In stage II, we conducted an epidemiological, observational study, carried out over a period of 12 months, between January 2019 and December 2019, in the "Diabetes, Nutrition and Metabolic Diseases" Department of Dr. Pompei Samarian Calarasi Emergency County Hospital. All patients have signed the informed consent document beforehand.

3.5 Study population and sampling method

Stage I: The epidemiological, observational study, which also contains a cross-sectional (baseline) assessment by measuring the prevalence of obesity and glycoregulatory disorders in the Roma population compared to the Caucasian Romanian population, carried out between March 2014 and May 2017 in several localities and cities from Calarasi county.

1120 subjects were included in the present study, of which 735 Roma (242 men/493 women) and 385 Caucasian Romanians (156 men/229 women), aged between 18 and 88 years.

Study I, Batch cross-sectional evaluation: Among the 1120 subjects, 679 subjects, aged between 18 and 88 years, presented themselves for biochemical analyses: 492 Roma (153 males, 339 females) and 187 Caucasian Romanians (73 male, 114 female). Data from these participants were analyzed separately for assessment of glycoregulatory disorders.

Stage II: Observational, epidemiological, cross-sectional study, which included men and women over the age of 18 from Calarasi County, previously diagnosed with DMM, who presented for admission to the Department of Diabetes, Nutrition and Metabolic Diseases of SJU Dr. Pompei Samarian Calarasi and reached a number of 462 subjects, aged between 26 and 89 years. Among them, 222 patients were Roma and 240 Caucasian patients.

3.6 Methods and measurements performed in the study

Study I, II, III - Monitored parameters

The clinical examination recorded the following anthropometric indicators: height, weight, abdominal circumference (CA), hip circumference (CS), neck circumference (CG). Body mass index (BMI), body adiposity index (BIA), waist-to-hip ratio (WHR), waist-to-height ratio (WHtR)[34], and body fat percentage (BF%) were also calculated [35],[36]. BIA was calculated

using hip circumference and height (BIA= ((HC)/((H) (1,5))-18)). Blood pressure was measured three times at the end of the physical examination with the subject in a sitting position.

Data were collected on physical activity (min/day, min/week), family history of diabetes, use of blood pressure medication, history of hyperglycemia, and daily fruit and vegetable consumption using the Finnish Diabetes Risk Score (FINDRISC), questionnaire completed by the research team [37].

To evaluate the educational level, we referred to the last institution graduated. Employee status was determined based on participant responses. We categorized marital status as single, married or cohabiting, divorced, and widowed. For the smoking assessment, participants were categorized as follows: never smokers, former smokers (people who smoked more than 100 cigarettes in their lifetime and had not smoked a cigarette in the past 28 days), and smokers.

Amount and frequency of alcohol consumption were estimated using questions about the proportion and frequency of drinking. Participants were classified as non-drinkers (lifetime abstainers or former drinkers), light drinkers with 1-4 servings per day, or moderate/heavy drinkers consuming more than four servings per day on average.

Study IV - Monitored parameters

In study IV, we followed the clinical-metabolic characteristics of Roma patients diagnosed with type 2 diabetes.

The patients included in the study were fully medically evaluated, the data on addictive behaviors, demographic parameters such as the environment of origin and age), hereditary diabetes mellitus and personal pathological antecedents were extracted from the anamnesis.

The clinical examination included measurement of anthropometric parameters, measurement of systolic and diastolic blood pressure, determination of ankle-brachial index (ABI), fundus examination and peripheral sensitivity tests. Paraclinical investigations included glycemic profile determined by glycated hemoglobin and fasting glycemia, renal profile evaluated by the value of serum creatinine, estimated glomerular filtration rate and albuminuria, lipid profile assessed by total cholesterol, HDL -C, LDL-C and TG, liver profile assessed by measuring TGO and TGP).

4 Study I. Prevalence of overweight and obesity in a Roma population from Calarasi County

4.1 Introduction

Obesity, a chronic non-communicable disease, affects more than 1 billion people worldwide, 890 million adults, 160 million children and adolescents and 37 million children under 5 years of age [38]. The global prevalence of overweight in adults (>18 years), reported by the WHO in 2022 was 43%, with more than 2.5 billion adults being overweight, and obesity was 16% [39].

In many countries, obesity among Roma children and adults is more common than among the non-Roma population [40,18].

4.2 Purpose and objectives of the study

The aim of this study was to assess the prevalence of overweight and obesity among the Roma population compared to ethnic Caucasian Romanians in Calarasi County.

4.3 Material and methods

They were detailed in Chapter 3.

4.4 Results

The socio-demographic characteristics of the groups

Data from 1120 participants were analyzed in the study; the gender distribution in the Roma population group was 33.9% (n=242) men and 67.1% (n=493) women; in the group of Caucasian Romanians, 41.5% (n=156) were men. The mean age was lower in the Roma population (50.21±14.28 versus 56.2±14.28 years, p<0.001). Most of the participants came from rural localities (n=660, 89.8% Roma versus n=318, 82.6% Caucasian Romanians).

The majority of Roma participants 83.67% (n=615) reported a primary educational level (below eight grades); among Caucasian Romanians 40.8% (n=157) also reported a primary educational level (below 8 grades). Roma women had less access to education compared to Roma men (92.1% (n=454) versus 66.5% (n = 161)) and Caucasian Romanian women (92.1% (n = 454) versus 49.3% (n=113)). Almost half of the Roma subjects had no sources of income. Smoking and alcohol consumption were reported by 39.9% (n=293) and 40.4% (n=152) of Roma participants as well as by 22.1% (n=85) and 40.6% (n=295) among Caucasians. The prevalence

of smoking was twice as high in Roma men compared to Caucasian Romanians. In both groups there was a higher prevalence of smoking in men.

In the Roma population, the prevalence of central obesity after CA was 78.6% (n=578), after WHR was 70.1% (n=515) and after WHtR was 82.6% (n=607). Moreover, 83.6% (n=322) of Romanian Caucasians showed central obesity using CA.

The prevalence of obesity in Caucasian Romanians was 8.7% (n=2) in the 18-29 age group, 23.5% (n=8) in the 30-39 age group, 50% (n=24) in the age group 40-49 years, 36.7% (n=36) in the age group 50-59 years, 51.7% (n=62) in the age group 60-69 years and 59.7% (n=37) in the over 70 age group (p<0.001). In the Roma population, the highest prevalence of obesity was in the 40-49 age group (59.7%, n=83); in the 18-29 age group the prevalence of obesity was 26.9% (n=28), 24.3% (n=25) in the 30-39 age group, 50.6% (n=78) in the age group 50-59 years, 53.4% (n=71) in the age group 60-69 years and 46.1% (n=47) in the age group over 70 years (p<0.001).

Health risk factors according to anthropometric characteristics

Regarding anthropometric parameters, the Roma population group had a significantly lower height and higher BMI (both in women and men). In the group of Roma women, WHtR and WHR were significantly higher compared to Caucasian Romanian women.

BIA values were higher in Roma women and in Caucasian men, without statistical significance. Neck circumference was smaller in Roma compared to Caucasian Romanians, both in women and men, statistically significant only in the case of men.

In the Roma population, significant differences in height, weight, hip circumference, neck circumference, WHR, WHtR, BAI and BF (%) were revealed between genders, but there were no significant differences for BMI and WC.

An examination of BMI by age group revealed an increase in BMI with age group, an aspect found both in Caucasian Romanians and in the Roma group, women or men; the highest BMI peak was found for the 40-49 age group in Roma, in both women and men.

Roma men presented higher BMI values for all age groups. Roma women presented lower BMI values compared to Caucasian Romanian women only for the age categories 30-39 years and over 70 years.

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Risk factors for obesity

To assess factors associated with obesity in the two ethnic groups, we used multivariate logistic regression. Variables that were significantly associated with obesity in bivariate analysis were included in the models.

For Caucasian Romanians, these variables were: sedentary lifestyle (<150 min/week), age over 40 and smoking; for Roma, the variables were family history of obesity, age over 40 years, smoking, gender distribution, low educational level (below eight classes), rural area, sedentary lifestyle. In the Caucasian Romanian group, in multivariate adjustment for all covariates by logistic regression, the significant predictors of obesity were sedentary lifestyle and smoking (Table 4.1).

Table 0.1 Factors associated with obesity for the Romanian Caucasian group

Variable	B	SE	p	OR	95% IC	
					Inferior	Superior
Sedentarism (<150 min/week) (yes/no)	1,866	0,151	**<0,001**	6,462	4,802	8,695
Age (over 40 years)	-0,236	0,181	0,193	0,79	0,554	1,127
Smoking (yes/no)	-0,527	0,149	**<0,001**	0,59	0,441	0,791

Odds ratio (95% IC); Significant for p <0,05
SE, standard error; OR, odds ratio; IC, confidence interval.

In the ethnic Roma group, in multivariate adjustment for all covariates by logistic regression, the significant predictors of obesity were sedentary lifestyle and smoking.

Table 0.2 Factors associated with obesity for the Roma population

Variable	B	SE	p	OR	95% CI	
					Inferior	Superior
Sedentarism (<150 min/week) (yes/no)	2,08	0,2	**<0,001**	8,01	5,44	11,81
Family history of obesity (yes/no)	1,41	0,18	**<0,001**	4,12	2,87	5,9
Smoking (yes/no)	-0,83839	0,19	**<0,001**	0,43	0,3	0,63
Primary educational level (yes/no)	-0,44042	0,23	0,06	0,64	0,41	1,02
Residence (rural/urban)	-0,67003	0,3	**0,03**	0,51	0,28	0,92

Odds ratio (95% IC); Significant for p <0,05
SE, standard error; OR, odds ratio; IC, confidence interval.

The risk for obesity in the Roma population was higher in people with a sedentary lifestyle and lower in the group of Roma smokers, with primary educational level, coming from rural areas (Table 4.2). Family history of obesity had a significant positive association with obesity only in the Roma population.

4.5 Discussions

The aim of this study was to assess the prevalence of overweight and obesity in the Roma population of Calarasi County and the associated risk factors.

This study brings new data on the prevalence of underweight, overweight and obesity in the Roma population, as well as in the Caucasian population in Calarasi County. Of the adult population included in this study, more than half had obesity (44.7%) and overweight (28.2%). These data are in agreement with the World Health Organization (WHO), which predicted that more than two thirds of adults in Romania (69%) would be either overweight or obese by 2025, compared to 66% in 2015 [41].

4.6 Conclusions

Similar to other published data on the Roma population, we found a higher prevalence of obesity and abdominal obesity compared to Caucasian Romanians. The odds of being obese in the Roma population were higher in people with a sedentary lifestyle, with primary education, also in the Roma population living in rural settlements, and lower in smokers. Family history of obesity had a significant positive association with obesity only in the Roma population.

5 Study II. Malnutrition and determinants in the Roma community

5.1 Introduction

„The double burden of malnutrition" affects developing countries and minority populations [42]. Among the ethnic Roma in Europe, the prevalence of malnutrition remains high 4,11% [43,44]; at the same time, the prevalence of overweight and obesity in all age groups is increasing [39,45,46].

5.2 Study purpose

The aim of the study was to assess the prevalence of malnutrition and the associated risk factors in a Roma population from Calarasi County.

5.3 Results

We evaluated 735 people of Roma ethnicity, 493 women/242 men, with an average age of 50.21±16.49 years (48.14±16.43 years in men and 51.22±16.49 in women, p=0.017). Most included patients came from rural areas (83.9% men (n=203) and 92.7% women (n=457)). Regarding marital status, most patients were married or cohabiting (439 women, 89% and 209 men, 86.4%). Roma men have a higher educational level than Roma women (over 12 classes 10.7% (n=26) in men versus 1.2% (n=6) in women); however, 66.5% (n=161) of men and 92.1% (n=454) of women have a low educational level (below 8 grades). In this context, more than 50% of the participants were without stable income (52.1% (n=257) in men and 52.1% (n=126) in women.

5.4 Anthropometric parameters

Malnutrition was present in 4.5% (n=33) of respondents (4.5% of men (n=11) and 4.5% of women (n=22)). Most patients included in the study had obesity (n=332, 45.2%; n=94, 38.8% men and 238, 48.3% women). Overweight was present in 25.3% (n=186) of respondents (30.6% (n=74) in women and 22.7% (n=112) in men). Only a quarter of the included population had a normal BMI (n=184) (26% men (n=63) and 24.5% women (n=121)).

For the entire population, there were statistically significant differences between Roma men and women in terms of height, weight, hip circumference, waist/hip ratio, neck circumference; there were no differences for BMI and abdominal circumference.

There were statistically significant differences in age, height, BMI, abdominal circumference, waist-to-hip ratio, waist-to-height ratio by body mass index. The average age of undernourished people was 48.21±22.33 years versus 52.25±15.88 years for those with overweight or 53.02±14.36 years for those with obesity (p=0.001).

5.5 Risk factors for malnutrition

To assess the risk factors associated with undernutrition we used multivariate logistic regression. Variables that were significantly associated with malnutrition in bivariate analysis

were included in the models; these variables were: age under 40, active smoking, alcohol consumption, low fruit and vegetable intake, low meat consumption; other tested variables for which no statistical significance was obtained were: age over 60 years, age over 70 years, the environment of origin, educational level, marital status.

The risk of malnutrition was higher in those with inadequate meat consumption, smokers, under 40 years of age and with high alcohol consumption (Table 5.1).

Table 5.1 Factors associated with malnutrition among the Roma population

Variable	B	S.E.	p	OR	IC 95%	
					Inferior	Superior
Reduced meat consumption	-2,036	0,525	**<0,001**	0,131	0,047	0,365
Smoking	1,212	0,395	**0,02**	3,362	1,549	7,298
Age under 40 years	-784	0,380	**0,039**	0,457	0,217	0,961
Alcohol consumption	-1,588	0,756	**0,036**	0,204	0,046	0,898

5.6 Discussions

The present study brings new data related to the prevalence of undernutrition, overweight and obesity among the Roma population in Calarasi County; global prevalence of undernutrition was 4.5%, overweight 25.3% and obesity 45.2%.

Within the Roma population, we found that malnutrition among the population under the age of 40 was correlated with inadequate food intake, with reduced consumption of meat, fruits and vegetables, and also with addictive behaviors, respectively with increased alcohol consumption and smoking.

6   Study III. Evaluation of glycoregulation disorders in a Roma population from Calarasi county

6.1 Introduction

The increasing prevalence of diabetes occurs as a consequence of an unhealthy lifestyle parallel to the increase in obesity and sedentary lifestyle. Recent data have revealed an increased prevalence of obesity and overweight in this community [47].

6.2 Study purpose and objectives

The objectives of the study were to evaluate the prevalence of glycoregulatory disorders and the associated risk factors in a Roma population from Calarasi County.

6.3 Material and methods

The group of participants that have performed biochemical tests included 679 subjects, aged between 18 and 88 years: 492 subjects of Roma ethnicity (153 male, 339 female) and 187 Caucasian Romanian subjects (73 male, 114 female). Data from these participants were analyzed separately for assessment of glycoregulatory disorders.

6.4 Results

The age of the participants ranged between 18 and 88 years (mean age 51.7±16.19 years). Roma ethnics were younger compared to Caucasian Romanians (50.29±16.63 years versus 55.42±16.63 years, p<0.001).

In both groups, more participants came from rural areas (p< 0.001). Ethnic Roma had a lower educational level compared to Caucasian Romanians (p< 0.001). Among the Roma women included in the study, over 90% reported an educational level below 8 grades (n=308) (p=0.017, respectively p< 0.001).

Higher values of BMI, CT, waist/hip ratio, waist/height ratio and fat mass were revealed in the ethnic Roma group, the differences not being statistically significant between the two groups.

Significantly smaller differences were identified in systolic blood pressure (136.7 ± 28.44 mmHg in Roma versus 142.58± 25.23 mmHg in Romanian Caucasians, p=0.013) and glycated hemoglobin (5.7 ± 1.46% in Roma versus 6.026 ± 1.69% in Romanian Caucasians, p=0.016) between the Roma and Romanian Caucasian groups.

Regarding the anthropometric characterization of the groups according to gender, women were more numerous in both ethnic groups, 61% (n=114) in the group of Caucasian Romanians, respectively 68.9% (n=339) in the group ethnic Roma. In both groups, women showed a higher proportion of underweight (5.26% (n=6) among Romanian Caucasian women and 5.3% (n=18) among Roma women.

Men were more overweight in both studied groups (41.1% of Caucasian Romanians and 24.8% of ethnic Roma). Caucasian Romanian men and Roma women showed a higher proportion of obesity, but the difference was not statistically significant.

Both Roma men and women presented in a significantly higher proportion II and III degree of obesity (Table 6.1).

Table 6.1 Anthropometric characterization of cohorts and comorbidities stratified by gender

	Romanian Caucasians (n=187)		Romas (n= 492)		p*	p#
Gender distribution	**Men** (n=73, 39%)	**Women** (n= 114, 61%)	**Men** (n=153, 31,1%)	**Women** (n=339, 68,9%)		
BMI (kg/m²) (n,%)						
<18,5	1 (1,4%)	6 (5,26%)	6 (3,9%)	18 (5,3%)		
18,5-24,9	11 (15,1%)	29 (25,4%)	46 (30,1%)	86 (25,4%)	0,510	0,057
25-29	30 (41,1%)	32 (28,1%)	38 (24,8%)	76 (22,4%)		
>30	31 (42,5%)	47 (41,2%)	63 (41,2%)	159 (46,9%)		
Obesity (n,%)	31 (42,5%)	47 (41,2%)	63 (41,2%)	159 (46,9%)	0,242	0,437
Obesity degree						
Gr I	30 (41,1%)	40 (35,1%)	34 (22,2%)	87 (25,7%)		
Gr II	1 (1,4%)	7 (6,1%)	17 (11,1%)	51 (15%)	0,433	**<0,001**
Gr III	0	0	12 (7,8%)	21 (6,2%)		
Metabolic Waist (>80 cm in women, >94 cm in men) (n,%)						
	59 (80,8%)	93 (81,6%)	100 (65,4%)	278 (82%)	**<0,001**	0,12
WHR (>0,85 in women, >0,95 in men) (n,%)						
	49 (67,1%)	82 (71,9%)	85 (55,6%)	261 (77%)	**<0,001**	0,25
WhtR >0,5						
	65 (89%)	96 (84,2%)	117 (76,5%)	280 (82,6%)	0,138	0,116
Sedentarism (<150 min/week) (n,%)						
	41 (56,2%)	49 (43,4%)	80 (52,3%)	211 (62,2%)	**0,047**	**0,015**
Self-reported dyslipidemia (n,%)						
	25 (34,2%)	28 (52,8%)	26 (17%)	73 (21,5%)	0,275	0,24
HTA previously diagnosed (n,%)						
	41 (56,2%)	55 (48,2%)	49 (32%)	160 (47,2%)	**0,002**	**0,047**
Total HTA (n,%)						
	58 (79,5%)	68 (59,6%)	88 (57,5%)	194 (57,2%)	1	**0,018**

Impaired glucose tolerance and diabetes mellitus

Regarding the diagnosis of glycoregulatory disorders, 12.2% (n=83) of the participants reported the diagnosis of diabetes mellitus at the time of the visit (18.7% of Romanian Caucasians (n=35) and 9.8% Roma (n= 48)); the diagnosis of newly discovered diabetes was present in 15.3% of the participants (14.4% Caucasian Romanians (n=27) and 15.7% Roma

(n=77); impaired glucose tolerance was diagnosed in 13% of participants (n=88) (13.9% Caucasian (n=26) and 12.6% Roma (n=62) (Table 6.2).

Table 6.2 Cohort-wide distribution of glucoregulatory disorders for Romanian Caucasians and Roma

Glycoregulatory disorders	Total	Romanian Caucasians	Romas
known DM	83 (12,2%)	35 (18,7%)	48 (9,8%)
unknown DM	104 (15,3%)	27 (14,4%)	77 (15,7%)
IGT	88 (13%)	26 (13,9%)	62 (12,6%)
NGT	404 (59,5%)	99 (52,9%)	305 (62%)

There is a significant increase in the prevalence of glucoregulatory disorders with age, both in the case of ethnic Roma (p=0.004) and Caucasian Romanians (p=0.001), these being present starting at younger ages in Roma subjects.

Table 6.3 Comparative table of the distribution of glycoregulation disorders by age group, for Romanian Caucasians and Roma

Age group	Romanian Caucasians				Romas			
	Known DM	Unknown DM	IGT	NGT	Known DM	Unknown DM	IGT	NGT
18-29 years N, (%)	0 (0,00%)	1 (7,69%)	0 (0,00%)	12 (92,31%)	2 (2,86%)	6 (8,57%)	7 (10,00%)	55 (78,57%)
30-39 years N, (%)	0 (0,00%)	1 (5,88%)	2 (11,76%)	14 (82,35%)	2 (2,60%)	9 (11,69%)	9 (11,69%)	57 (74,03%)
40-49 years N, (%)	2 (8,70%)	3 (13,04%)	5 (21,74%)	13 (56,62%)	7 (8,97%)	17 (21,79%)	11 (14,10%)	43 (55,13%)
50-59 years N, (%)	8 (16,67%)	12 (25,00%)	3 (6,25%)	25 (52,08%)	12 (11,65%)	21 (20,39%)	19 (18,45%)	51 (49,51%)
60-70 years N, (%)	16 (26,67%)	8 (13,33%)	14 (23,33%)	22 (36,67%)	13 (13,83%)	12 (12,77%)	10 (10,64%)	59 (62,77%)
over 70 years N, (%)	9 (34,62%)	2 (7,69%)	2 (7,69%)	13 (50,00%)	12 (17,14%)	12 (17,14%)	6 (62,77%)	40 (57,14%)

In Caucasian Romanians, most cases of known diabetes were in the 60-70 years and over 70 years category and most newly diagnosed cases were in the 50-59 years category. Most patients with IGT were in the 60-70 years category.

Among the ethnic Roma, the prevalence of known diabetes increased in parallel with age; most patients with newly diagnosed diabetes were at a younger age group (40-49, respectively 50-59 years) (Table 6.3).

The distribution of glycoregulatory disorders stratified by study group according to gender is detailed in Table 6.4.

Table 6.4 Distribution of glycoregulatory disorders stratified by study groups

Glucose Tolerance	Caucasian Romanians (n=187)		Romas (n=492)	
	Men (n= 73)	Women (n=114)	Men (n=153)	Women (n=339)
NGT	31 (42,5%)	68 (59,6%)	89 (58,2%)	216 (63,7%)
Known DM	18 (24,65%)	17 (14,91%)	15 (9,8%)	33 (9,73%)
Unknown DM	11 (15,06%)	16 (14,03%)	33 (21,56%)	44 (12,97%)
IGT	13 (17,8%)	13 (11,4%)	16 (10,5%)	46 (13,6%)
Total cases DM	29 (39,7%)	33 (28,9%)	48 (31,4%)	77 (22,7%)

In the group of Roma men there were 48 cases of diabetes (31.4%), of which 33 participants with newly diagnosed diabetes (9.73%) and 16 cases of impaired glucose tolerance (10.5%), 89 of the participants not having a glycoregulatory disorder (58.2%).

Regarding Caucasian Romanian men, there were 29 cases of diabetes mellitus (39.7%), with 11 newly diagnosed cases (15.06%) and 13 cases of impaired glucose tolerance (17.8%), 31 of the participants not having a glycoregulatory disorder (42.5%).

There was a higher prevalence of both diabetes and impaired glucose tolerance among Caucasian Romanian men, compared to Roma men, 39.7% versus 17.8% for DM and 17.8% versus 10.5% for IGT.

In the group of Roma women, 77 cases of diabetes were registered (22.7%), of which 44 cases of newly diagnosed diabetes (12.97%) and 46 cases of impaired glucose tolerance (13.6%), 216 of them not having a glycoregulation disorder (63.7%).

In the group of Caucasian women, there were 33 cases of diabetes (28.9%), of which 16 newly diagnosed cases (14.03%) and 13 cases of impaired glucose tolerance (11.4%), 68 of the participants not having a glycoregulation disorder (59.6%).

It is observed a higher prevalence of diabetes among Caucasian women compared to Roma women (28.9% versus 22.7%), respectively of impaired glucose tolerance among Roma women compared to Caucasian women (13.6% versus 11 ,4%).

Risk factors associated with diabetes mellitus

Family history of diabetes mellitus

We identified a significantly higher prevalence of glycoregulatory disorders in participants who reported a family history of diabetes mellitus (p<0.001). The prevalence of known diabetes mellitus was significantly higher in those with a family history of diabetes, at 24.40% (n=40) versus 8.30% (n=43). The prevalence of newly diagnosed diabetes mellitus was also significantly higher in the group with a family history of diabetes, at 18.30% (n=30) versus 14.40% (n=74). Additionally, the difference was significant in terms of the prevalence of impaired glucose tolerance, at 12.20% (n=20) versus 13.20% (n=68). The prevalence of normal glucose tolerance was significantly higher in those without a family history of diabetes mellitus, at 45.1% (n=74) versus 64.1% (n=330).

In the group of Caucasian Romanians, a positive family history of diabetes mellitus was found in 35.60% of those with known diabetes mellitus (n=16), without a significant influence on newly diagnosed diabetes mellitus (8.90%, n=4) or impaired glucose tolerance (13.30%, n=6). A total of 42.20% had normal glucose tolerance (n=19). Thus, it can be observed that family history of diabetes mellitus influenced the prevalence of glycoregulatory disorders in the group of Caucasian Romanians.

In the Roma group, a positive family history of diabetes mellitus was identified in 20.20% of those with known diabetes mellitus (n=24), 21.80% of those with newly diagnosed diabetes mellitus (n=26), and 11.80% of those with impaired glucose tolerance (n=14), while 46.2% had normal glucose tolerance (n=55). Therefore, it can be observed that a family history of diabetes mellitus significantly influenced the prevalence of glycoregulatory disorders in the Roma group (p<0.001).

Independent risk factors for diabetes

In univariate analysis, the risk factors for the presence of DM (newly discovered DM and pre-existing DM) in Caucasians were sedentary lifestyle, diabetes AHC, metabolic waist, age over 40 years, presence of obesity, modified WHR and WHhtR, smoking.

After multivariate adjustment for all covariates by logistic regression, in the whole group, significant predictors for diabetes were Roma ethnicity, low physical activity (<150 min/week), family history of diabetes and metabolic waist (Table 6.10).

The risk of having diabetes in the Roma population was higher in those with a sedentary lifestyle, with a family history of diabetes and in those with a metabolic waistline.

In the Caucasian population, sedentary lifestyle and abnormal WHR showed a significant positive association with diabetes.

The prevalence of diabetes mellitus was 25.40% among Roma and 33.20% among Caucasian Romanians, respectively of TAG of 12.60% among Roma and 13.90% among Caucasian Romanians.

6.5 Discussions

The prevalence of DM was 25.40% among Roma and 33.20% among Caucasian Romanians, respectively of TAG of 12.60% among Roma and 13.90% among Caucasian Romanians. However, in the studied group, for the young age groups (18-29, 30-39, respectively 40-49 years old), the percentage of subjects identified with glycoregulation disorders was significantly higher in the Roma group compared to Caucasian Romanians, which supports the hypothesis that glycoregulatory disorders in this ethnic group begin at a younger age.

From the analysis of the gender distribution of glycoregulation disorders, a significantly higher prevalence of diabetes among Roma men compared to Roma women (31.4% versus 22.70%) resulted. Roma women showed a higher prevalence of impaired glucose tolerance compared to Roma men (13.60% versus 10.50%).

In the entire studied group, a higher prevalence of glycoregulation disorders was found in the case of participants with a family history of diabetes. In the case of Roma, the family history of diabetes was significantly associated with the higher prevalence of both known and newly diagnosed diabetes (20.20% and 21.80% respectively versus 6.40% and 13.70%). The presence of impaired glucose tolerance was not significantly influenced by the presence of a family history of diabetes, while the absence of glycoregulatory disorders was significantly associated with the absence of a family history of diabetes.

In the case of Romanian Caucasians, positive family history of diabetes was significantly correlated with known diabetes, 35.60% (n=16), without significant correlations with newly diagnosed diabetes (8.90%, n=4) and with impaired glucose tolerance (13.30%, n=6).

In the comparative ethnic analysis, both Roma and Romanian Caucasians showed an approximately 3-fold higher prevalence of known diabetes in the setting of a positive family history of diabetes (OR 2.75, 95% CI). In addition, the prevalence of newly diagnosed diabetes was significantly higher in the Roma group with a positive family history for diabetes.

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7 Study IV. Clinical and metabolic characteristics of Roma patients diagnosed with diabetes type 2

7.1 Introduction

Diabetes mellitus (DM) is the 4th leading cause of death globally, with over 6.7 million people between the ages of 20 and 79 dying annually from diabetes-related problems [48]. Early diagnosis is important to prevent complications associated with diabetes.

7.2 Study purpose and objectives

The aim of this study was to evaluate the clinical-metabolic characteristics of Roma patients diagnosed with type 2 diabetes admitted to the Department of Diabetes, Nutrition and Metabolic Diseases of SJU Dr. Pompei Samarian Calarasi.

7.3 Material and methods

In the second stage, an observational, epidemiological, transversal study was carried out, which included men and women over 18 years of age from Calarasi County, previously diagnosed with DM, who presented themselves for hospitalization in the Diabetes Department, Nutrition and Metabolic Diseases of SJU Dr. Pompei Samarian Calarasi. A total of 462 subjects, aged between 26 and 89 years, were included. Among them, 222 patients (48.1%) were of Roma ethnicity and 240 Caucasian Romanian patients (51.9%).

7.4 Results

Characteristics of the studied population

462 participants were included in the study, of which 222 (48.1%) were Roma patients. Male patients were present in greater proportion in both groups (62.5%, n=150 Caucasians and 52.7%, n=117 Roma) (p=0.03). 59.5% of Roma patients came from urban areas. Similarly, a higher proportion of Caucasian Romanian patients came from the urban environment (61.2%).

The study included patients aged between 26 and 89 years, with an average age of 59.26±10.75 years, the Roma patients having a lower average age of 56.33±10.26 years, respectively 61.96±10.4 years (p<0.001).

Regarding the distribution by age category, the majority of Roma patients were concentrated in the 50-59 age range, representing 38.7% (n=86) of this group. In contrast, the

majority of Caucasian Romanian patients were found in the 60-69 age group, with a percentage of 35% (n=84).

The median duration of development of diabetes was 9 years (IQR=12, CI 95% 8.99-10.4, minimum=0, maximum=42 years), significantly lower in the Roma population (p<0.001); in Caucasian Romanians the average duration of evolution was 11 years (IQR=10, CI 95% 11.01-13.11, IQR=9, minimum=0, maximum=42 years), and in Roma 6 years (IQR= 9, CI95% 6.3-7.96, IQR=9, minimum=0, maximum=32 years).

Cohort characterization

Roma patients were younger (56.33±10.26 years versus 61.96±10.49 years), with a shorter history of diabetes, with a higher body mass index (36.53±6, 31kg/m2 versus 32.05±4.74kg/m2), with higher values of SBP and DBP, with significantly higher HbA1c, significantly higher values of total cholesterol and triglycerides, significantly lower estimated glomerular filtration rate.

Regarding the average height, there were significant differences between the 2 analyzed groups (167.77±10.11 cm for Caucasian Romanian patients versus 164.44±8.73 cm for Roma patients, p<0.001). The average weight at the time of examination was higher among Roma patients (92.39±18.82 kg), compared to Caucasian Romanian patients (85.9±17.31 kg) (p<0.001). Also, the mean value of BMI was higher among Roma subjects, 36.53±6.31 kg/m2, compared to 30.05±4.73 kg/m2 (p<0.001).

Statistically significant differences for height, weight, and BMI were maintained and stratified by gender; height of Roma men was lower (169.44±7.26 cm versus 174.13±6.48, p<0.001), weight and BMI higher (35.45±5.71 kg/m2 versus 31.65 ±5.71 kg/m², p<0.001). Roma women had lower height (158.77±6.37 cm versus 160.39±6.52 cm, p=0.013) and higher BMI (37.73±6.75 cm versus 32.72±5, 22 cm, p<0.001).

In the analyzed group, the proportion of hospitalized patients with obesity was 72.1% (n=173) in the Caucasian Romanian group and 88.3% (n=196) in the Roma group. Most patients presented obesity degree I in the group of Caucasian Romanians 45% (n=108).

In ethnic Roma, one-third had grade II obesity (34.2%, n=76), and one-fourth had grade III obesity (n=56, 25.2%). A significantly higher number of ethnic Roma presented obesity degree II and III compared to Caucasian Romanians (p<0.001) (Table 7.1).

Table 7.1 Cohort stratification by degree of obesity and ethnicity

		Romanian Caucasians (n=240)	Romas (n=222)
Obesity			
	Obesity gr I	108 (45%)	64 (28,8%)
	Obesity gr II	54 (22,5%)	76 (34,2%)
	Obesity gr III	11 (4,6%)	56 (25,2%)
Total		**173 (72,1%)**	**196 (88,3%)**

Characteristics of the metabolic syndrome

Metabolic syndrome had a very high prevalence in both groups of patients with type 2 diabetes. In the group of Caucasian Romanian patients, metabolic syndrome was identified in 205 participants (85.4%), while in the group of Roma patients it was identified in 216 patients (97.3%). The difference between the two groups was statistically significant (p<0.001).

Roma patients with metabolic syndrome were younger (56.36±10.16 years versus 61.62±9.99 years), with a shorter history of diabetes, with a higher BMI (36.81±6, 08 kg/m2 versus 32.69±4.48 kg/m2), with higher values of SBP and DBP, with an HbA1c above the therapeutic target in both groups, significantly higher values of total cholesterol and triglycerides, significantly lower estimated glomerular filtration rate.

There were no statistically significant differences in the mentioned parameters in patients without metabolic syndrome (data not shown).

Within the group of Caucasian Romanians diagnosed with MetS, a significantly higher prevalence of three components of the metabolic syndrome was observed compared to Roma patients, 35% (n=84) versus 16.7% (n=37).

In contrast, Roma patients presented a higher proportion of four and five components of metabolic syndrome, respectively 48.2% (n=107) versus 31.7% (n=76) with four components of SMet and 32.4% (n=72) versus 18.8% (n=45) with five components of MetS.

Dyslipidemia

Total cholesterol, LDL-C and TG values were significantly higher among Roma patients compared to Caucasian Romanians and the average value of HDL-C was insignificantly higher

in Caucasian Romanian patients (Table 7.3.). The same tendency is preserved by analyzing the mean values of the parameters according to sex. The prevalence of hypercholesterolemia was significantly higher in Roma patients, 63.8% (n=141) versus 45% (n=108) (p<0.001). LDL-C over 100 mg/dl was found in 75.6% of Roma patients (n=127) and in 54.4% of Romanian Caucasians (n=124) (p<0.001). Roma patients had a higher frequency of hypertriglyceridemia above 150 mg/dl, 78.8% (n=175) versus 46.7% (n=112) (p<0.001).

Prevalence of arterial hypertension

Hypertension (HT) was present in 80.3% (n=371) of hospitalized type 2 diabetes patients. The prevalence of hypertension was similar in the 2 groups, respectively 79.2% (n=190) among Caucasian patients and 81.5% (n=181) among Roma patients (p=0.55).

In multiple logistic regression, the independent risk factors associated with the metabolic syndrome were represented by ethnicity and the presence of hepatic steatosis and HbA1c above 7%. The environment of origin, smoking status, alcohol consumption, hereditary history of diabetes, were not predictors for the occurrence of MetS.

Chronic complications of type 2 diabetes

The most common microvascular complication of diabetes was distal symmetric peripheral polyneuropathy (PNSD) (78.8% in the group of Romanian Caucasian patients and 80.2% in the group of Roma patients). Chronic kidney disease was present in 45.5% of the Roma participants (n=101); in the control group, the prevalence of BCR was similar (47.1%, n=113, p=0.78). Diabetic retinopathy was present in one third of the participants in both groups (36% in Roma and 30.4% in Romanian Caucasians). Autonomic neuropathy (orthostatic hypotension, fixed tachycardia) was more frequent in the Roma population (19.4% versus 9.2%).

Regarding the presence of albuminuria, 37.8% (n=84) of the Roma patients included in the study had albuminuria at the time of evaluation. This was objectified in a significantly higher proportion among Caucasian Romanians 54.2%% (n=130) (p<0.001).

Among macrovascular complications, atherosclerotic cardiovascular disease (CVD) (chronic coronary syndrome, angina pectoris, personal history of myocardial infarction, carotid atheromatosis) was present in more than two-thirds of ethnic Roma (n=167) and 58.3% (n =140) in the control group (p<0.01).

Approximately one-third of the patients included in the study had associated peripheral arterial disease (PAD) (45% in the Caucasian group and 19% in the Roma ethnic group, p<0.001). Ethnic Roma had twice as many previous strokes (17.6% versus 7.9%, p=0.02).

7.5 Discussions

The results of the current study are consistent with other studies published in Romania [168,169]. The Mentor study included 1093 patients with type 2 DM, with an average age of 50-70 years, with an average duration of DM evolution of 9.9 years. In this study the prevalence of obesity was 53.84% in men and 64.94% in women. The prevalence of overweight was 37.85% in men and 27.87% in women [49].

The prevalence of obesity in our study was higher both among Roma patients and in the control group, in both women and men. The proportion of hospitalized patients with obesity was 72.1% (n=173) in the Caucasian group and 88.3% (n=196) in the Roma group.

III. Conclusions and personal contributions

The research hypothesis was based on the premise that conducting a cross-sectional analysis at the level of the adult Roma population with the aim of determining the prevalence of overweight, obesity, metabolic syndrome, and glycoregulatory disorders and identifying lifestyle-related risk factors is a first step towards developing and implementing effective prevention strategies. The studies conducted as part of this doctoral research provide new data on the prevalence of metabolic syndrome, obesity, and diabetes mellitus in a Roma population compared to Caucasian Romanians in Calarasi County.

An important indicator of social inclusion for the Roma, addressed by this research, is health status, which has a decisive influence on individual and family well-being and includes the analysis of socioeconomic status, nutritional status, dietary habits, and lifestyle.

The study focused on the Roma population in Calarasi County, the second county with the highest proportion of Roma in Romania (7.49%), with a poverty risk for the southeast region of Romania at 41% [50]. The nutritional status of the majority population in Calarasi County is relatively well documented, but little is known about the Roma population.

Among the adult population included in this study, more than half presented with obesity (44.7%) and overweight (28.2%). Similar to other published data on the Roma population, we found a higher prevalence of obesity and abdominal obesity compared to Caucasian Romanians, which can largely be explained by dietary habits, lifestyle, and high levels of poverty. The risk of obesity in the Roma population was higher among individuals with a sedentary lifestyle and smokers, those with primary education, and Roma living in rural settlements. Significant height deficit was noted among the Roma population of both genders, a fact documented in other European studies. The current study identified 78.6% of respondents with abdominal obesity (83.6% in women and 68.6% in men).

In our study, we observed an increase in obesity prevalence with advancing age; for each decade of age, the average BMI increase was 1 kg/m² for Caucasian Romanians and 0.6 kg/m²

for the Roma population. The risk of obesity in the Roma population was higher among sedentary and non-smoking individuals, those with primary education, and those from rural areas. A family history of obesity had a significant positive association with obesity only in the Roma population.

Most Roma participants included had only primary education; our results confirmed that Roma women are an even more vulnerable group, as they had less access to education compared to Roma men and Caucasian women. A large percentage of participants were married or living together without legal documents. Almost half of the Roma subjects had no sources of income. Smoking and alcohol consumption had high prevalence among Roma participants. Approximately 40% of Roma were smokers (53.3% of men and 33.3% of women), reinforcing that smoking appears to be an important part of the cultural and ethnic identity of the Roma ethnicity.

According to our study's results on malnutrition among adult Roma, underweight was present in 2.3% (n=9) of the Caucasian Romanian population (1.3% of men (n=2) and 3.1% of women (n=7)) and 4.5% (n=33) of Roma (4.5% of men (n=11) and 4.5% of women (n=22)). The vulnerable age groups identified were the 30-39 age group with 7.8% (n=8) of participants, and the 18-29 age group with a similar proportion (7.7%, n=8). The risk of malnutrition was higher among those with low meat consumption, smokers, those under 40 years old, and those with high alcohol consumption.

Our study confirms the involvement of genetic factors in the obesity phenotype and the occurrence of glycoregulatory disorders. The positive relationship of obesity with family history of obesity only in the Roma population supports the involvement of genetic factors, confirming that the Roma population is one of the ethnic groups facing the double burden of malnutrition.

In our study, the prevalence of Metabolic Syndrome (MetS) was high (91.1%) and increased with age. Similar data were reported by Coșoreanu A, with the prevalence of MetS in the Roma population reaching 94.3% and 89.1% in Caucasians [51].

Diabetes mellitus was identified in 25.40% of the Roma and 33.20% of the Caucasian Romanians. Impaired glucose tolerance was present in 12.60% of the Roma and 13.90% of the Caucasian Romanians.

In multivariate analysis, across the entire group, significant predictors for diabetes mellitus were Roma ethnicity, low physical activity (<150 min/week), family history of diabetes mellitus, and metabolic waist circumference. Determinants of health among the Roma population identified by our study are genetic, socioeconomic, including lack of stable income, low educational level, poor diet, poor housing conditions, lack of medical education, limited access to primary and specialty medical services due to financial difficulties or discrimination, and dependency behaviors such as smoking and alcohol consumption.

The data published in the specialized literature are sparse and insufficient; thus, the present studies bring new, valuable data regarding diabetes mellitus, metabolic syndrome, obesity, and other cardiometabolic risk factors in the Roma population of Calarasi County. Screening programs should include younger Roma adults.

Our results confirm and reinforce the need for the implementation of prevention programs for vulnerable populations, such as the Roma, who face the double burden of malnutrition, low access to the health system, lack of medical education and preventive services, limited access to education, and low socioeconomic status. The study results have contributed to a better understanding of the nutritional status of the Roma population and have helped improve the health of Roma patients. Finally, it is imperative that health services adjust their interventions to integrate and understand the risk profiles of different ethnic and social groups.

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