"CAROL DAVILA" UNIVERSITY OF MEDICINE AND PHARMACY, BUCHAREST

DOCTORAL SCHOOL

FIELD OF MEDICINE

THE IMPACT OF SOCIO-ECONOMIC AND DEMOGRAPHIC PROFILE ON THE CLINICAL AND THERAPEUTIC PARTICULARITIES OF DIABETES MELLITUS IN A ROMA POPULATION

SUMMARY OF THE PHD THESIS

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INTRODUCTION

Currently, diabetes mellitus is considered a significant pathology not only due to its increasing prevalence and incidence but also due to the ongoing medical education and self-management measures associated with it, as well as the impact of socio-economic, demographic, and emotional factors.

A current issue in the medical literature is the health status of the Roma population, one of the largest minorities globally and in our country. According to the latest national census in 2021, the Roma population exceeds 569,000, representing approximately 3% of Romania's population, with no more than 10,740 members residing in Bucharest [1].

However, due to the lack of official documents and fear of stigmatization, there is no exact data regarding the health status of the Roma population. The existing literature on the prevalence of diabetes mellitus remains insufficient. Studies conducted in Romania by Enache and colleagues reported a prevalence of 10.3% and 15.13%, respectively, while Weiss and colleagues identified a percentage of 11.3% [2],[3],[4].

The socio-economic status of the Roma minority has been the subject of many scientific research papers, highlighting poorer health compared to the general population. Socio-economic status reflects the educational, economic, occupational, and environmental characteristics of a population and is considered a clear predictor of health, disease onset, and progression [5].

Regarding access to healthcare services, 11% reported being discriminated against by healthcare personnel, and 20% of Roma who needed necessary medical care reported unjustified refusals. In the case of non-communicable chronic diseases, 13.7% of Roma adults have cardiovascular diseases (CVD), 3.3% have asthma, 5.2% have gastric ulcers, 6.9% have diabetes mellitus, and 17.5% have hypertension.

Regarding the emotional aspect of diabetes mellitus and its management, these have received considerable attention in recent years. Central to most of these efforts is the concept of "diabetes-related distress," a generic term encompassing the intensity of emotional suffering associated with the progression of diabetes over time [6].

Diabetes distress refers to the worries, fears, and potential threats posed by the presence of complications associated with living over time with a demanding chronic disease like

diabetes. This includes its management, whether pharmacological or lifestyle-related, and concerns about access to care [6]. The difficulties related to diabetes can manifest in many forms and can be influenced by age, sex, cultural values, type of diabetes, associated treatment (e.g., the necessity of insulin therapy), the presence of complications, and the duration of diabetes.

Although the DDS (Diabetes Distress Scale), a standardized assessment measure, has been validated in Romania, there are currently no data in the medical literature regarding the level of diabetes distress among the Roma population.

Therefore, based on these findings from the specialized literature, understanding the clinical-metabolic and therapeutic particularities of diabetes mellitus, the influence of socio-economic and demographic factors, and the impact of diabetes distress among a Roma population, as included in this study, could lead to a comprehensive overview. This would form the basis for developing health programs specifically dedicated to this population, aimed at improving therapeutic approaches and quality of life.

Study objectives

The primary objective of this study was to evaluate the clinical and metabolic characteristics of a Roma population compared to a corresponding group of non-Roma patients at baseline. This was done by characterizing the groups in terms of socio-economic and demographic factors, evaluating anthropometric and paraclinical parameters, and assessing associated comorbidities and chronic complications of diabetes.

The secondary objectives were to reassess the clinical-metabolic characteristics of the studied populations one year after the initial evaluation and to evaluate diabetes-related distress using the DDS-RO questionnaire.

Materials and Methods

Study group

The study included 808 patients with diabetes hospitalized in the diabetes department of the "Nicolae Malaxa" Clinical Hospital in Bucharest from September 2022 to September 2023.

Study design

This research involves two components: an observational, population-based, retrospective part and a prospective component. The study was conducted in accordance with the STROBE (Strengthening the Reporting of Observational Studies in Epidemiology)

guidelines for observational studies . All data were collected in compliance with the hospital's standard protocols for managing patients with diabetes. All participants provided informed consent for data collection and the subsequent use of their medical information for research purposes. The study was approved by the Ethics Committee for Clinical Studies of the "Nicolae Malaxa" Clinical Hospital, with approval number 75/2022.

Data collection

Data collection included family history of diabetes, diabetes duration, personal medical history of obesity, hypertension, heart failure, myocardial infarction, stable angina, stroke, hepatic steatosis, dyslipidemia, metabolic syndrome, lower limb amputations, health-related behaviors (smoking and alcohol consumption), the presence of diabetes-related microvascular complications (chronic kidney disease, peripheral neuropathy, orthostatic hypotension, retinopathy), socio-economic and demographic factors (age, gender, place of residence), DDS-RO questionnaire results for distress evaluation, clinical measurements (anthropometric indicators), as well as paraclinical assessment.

Place of residence was classified as urban or rural.

Regarding health-related behaviors, for smoking assessment, patients were classified as smokers (active or former smokers) and non-smokers based on their self-evaluation responses. For alcohol consumption evaluation, participants were categorized as drinkers or non-drinkers based on their self-assessment of drinking habits.

The assessment of diabetes-related distress was conducted using the DDS-RO questionnaire. The DDS involves 17 items to evaluate psychological concerns related to this disease, providing not only a total score but also four additional subscales to assess emotional burden, physician-related stress, regimen-related stress, and interpersonal stress. Each item is rated on a six-point scale, ranging from 1 (no problem) to 6 (severe problem). To calculate the scores, the numbers indicated by the patient corresponding to each item must be summed and divided by the number of items in that scale. A score of 2 or lower indicates no stress, moderate stress is described by a score greater than 2 but less than or equal to 2.9, and severe stress is considered if the score is 3 or higher.

Additionally, since the study covered the period of the COVID-19 pandemic, we created a questionnaire in Google Forms that included questions regarding how the pandemic was perceived by the diabetes patients. Thus, questions included: "How has your income changed

due to the COVID-19 pandemic?", "How has your work activity changed due to the pandemic?", "How have you felt emotionally during the pandemic?", "To what extent have you adhered to the measures imposed by authorities?", "How has access to medical services changed?", "How has your diet changed during the pandemic?", "Regarding smoking, how has this habit changed during the pandemic?", "Have you been diagnosed with COVID-19 infection?", "Have you been vaccinated against COVID-19?"

Clinical measurements

The following anthropometric indicators were evaluated for each participant, including height (cm), weight (kg), Wbdominal circumference (WC, cm), hip circumference (HC, cm), body mass index (BMI, kg/m^2), and A Body Shape Index (ABSI). WC and HC were determined using a measuring tape, according to standard procedures. ABSI was calculated using the following formula: WC (m) / [BMI$^{2/3}$ (kg/m^2) × height$^{1/2}$ (m)].

Paraclinical evaluation

The laboratory parameters analyzed included fasting plasma glucose (FPG), glycated hemoglobin (HbA1c), serum creatinine, estimated glomerular filtration rate (eGFR), urine albumin-creatinine ratio (UACR), uric acid, serum urea, aspartate aminotransferase (AST), alanine aminotransferase (ALT), gamma-glutamyl transferase (GGT), total cholesterol (TC), high-density lipoprotein cholesterol (HDL-c), low-density lipoprotein cholesterol (LDL-c), triglycerides (TG), and the triglyceride-glucose index (TyG), a surrogate marker for assessing insulin resistance.

Ethical considerations

The study was approved by the Clinical Studies Ethics Committee of the "Nicolae Malaxa" Clinical Hospital, approval number 75/2022.

Clinical and Metabolic Characteristics of a Roma Population with Diabetes - Considering Ethnic Disparities in Healthcare Management

Study design

We conducted an observational, cross-sectional study from October 2022 to March 2024, evaluating 808 adult diabetic patients, aged between 18 and 89 years, who were admitted to the "Nicolae Malaxa" Clinical Hospital in Bucharest, Romania. The study was conducted in

accordance with the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines for observational studies. All data were collected following the hospital's standard protocol for managing diabetic patients. The study received approval from the Clinical Studies Ethics Committee of the "Nicolae Malaxa" Clinical Hospital, approval number 75/2022. All participants provided informed consent for data collection and the subsequent use of medical information for research purposes.

Study population

The study included adult patients diagnosed with type 1 diabetes (T1D) or type 2 diabetes (T2D), who were evaluated in the hospital's diabetes department during the study period and agreed to participate and sign an Informed Consent. Exclusion criteria were age under 18 years, absence of diabetes, pregnancy, and refusal to sign the Informed Consent.

Results

The study included 458 Roma patients and 350 non-Roma participants, with the majority being men (54.6% and 51.5%, respectively). In both groups, most patients had type 2 diabetes, accounting for 95.1% in the non-Roma group and 87.8% among Roma patients. More than half of the participants in both groups had no family history of diabetes. Regarding place of residence, regardless of ethnicity, the majority of patients lived in urban areas (65.1% of non-Roma patients and 52.2% of Roma patients).

General characteristics of the patients

A large proportion of non-Roma patients were non-smokers (73.7%), while in the corresponding Roma group, the majority were smokers (former or current, 50.4%). Alcohol consumption was reported by 26.9% of the Roma group, whereas fewer patients (25.1%) in the corresponding group were alcohol consumers.

General characteristics of the patients

Variables		**Non-Roma patients (n=350)**	**Roma patients (n=458)**	**p-value**
Gender	Men	54.6% (n=191)	51.5% (n=236)	0.391
	Women	45.4%(n=159)	48.5% (n=222)	
Place of residence	Urban area	65.1% (n=228)	52.2% (n=239)	0.0001
	Rural area	34.9% (n=122)	47.8% (n=219)	
Type of diabetes	T1DM	4.9% (n=17)	12.2% (n=56)	0.0001

	T2DM	95.1% (n=333)	87.8% (n=402)	
Family history of diabetes	Yes	47.1% (n=165)	45.4% (n=208)	0.625
Smoking (former or active smokers)	Yes	26.3% (n=92)	50.4% (n=231)	0.0001
Alcohol consumption	Yes	25.1% (n=88)	26.9% (n=123)	0.583

Regarding associated diseases, a significant percentage of non-Roma patients had hypertension (81.1%), approximately 15% more than the Roma group (67.7%). There were minor differences in terms of dyslipidemia, with 78.5% among Caucasians and 76.7% among Roma. Additionally, obesity predominated, with more than half of the patients in both groups (62.2% in the Roma group and 50.3% in the non-Roma group). The prevalence of metabolic syndrome was significantly higher in both groups, reaching 94.3% among Roma patients and 89.1% among non-Roma patients (p=0.008). Hepatic steatosis was present in 55.3% of non-Roma participants and 48.5% of Roma subjects.

Analyzing the prevalence of cardiovascular diseases, there were no differences in terms of personal history of myocardial infarction, with approximately 12% of patients in each group reporting it; however, the number of patients with a history of stroke was 2.1 times higher in the Roma group compared to non-Roma (42 versus 20 patients, p=0.067). The prevalence of stable angina and heart failure was significantly lower in the non-Roma group (p=0.0001). Peripheral arterial disease was significantly more frequent in the non-Roma group compared to Roma (21.7% versus 9.6%). A modest percentage of patients had lower limb amputations, with no observed differences between the two groups.

Prevalence of comorbidities in patients stratified by ethnicity

Comorbidities	**Non-Roma patients (n=350)**	**Roma patients (n=458)**	**p-value**
Hypertension	81.1% (n=287)	67.7% (n=310)	0.0001
Dyslipidemia	78.5% (n=275)	76.7% (n=351)	0.0001
Obesity	50.3% (n=176)	62.2% (n=285)	0.003
Metabolic syndrome	89.1% (n=312)	94.3% (n=432)	0.008
Hepatic steatosis	55.3% (n=83)	48.5% (n=214)	0.150

Myocardial infarction	12.6% (n=44)	12.0% (n=55)	0.809
Stroke	5.7% (n=20)	9.2% (n=42)	0.067
Stable angina	13.4% (n=47)	29.5% (n=135)	0.0001
Heart failure	5.1% (n=18)	19.0% (n=87)	0.0001
Peripheral artery disease	21.7% (n=76)	9.6% (n=44)	0.0001
Lower limb amputation	3.4% (n=12)	3.5% (n=16)	0.960

The most prevalent microvascular complication was peripheral polyneuropathy, exceeding 70% in both groups. In the Roma population, chronic kidney disease was present in 22.1% of patients, while in the non-Roma group, nearly 35% had this complication. Additionally, almost a third of participants in both groups had diabetic retinopathy, with a slightly higher percentage observed among non-Roma patients (38.3% versus 33.25%). Orthostatic hypotension was more prevalent in the Roma population compared to the corresponding group, representing 14.6%.

Statistically significant associations were observed for chronic kidney disease, peripheral polyneuropathy, and orthostatic hypotension.

Prevalence of diabetic complications according to ethnicity

Diabetic complications	Non-Roma patients (n=350)	Roma patients (n=458)	p-value
Diabetic chronic kidney disease	34.9% (n=122)	22.1% (n=101)	0.0001
Diabetic peripheral polyneuropathy	78.9% (n=276)	72.7% (n=333)	0.044
Orthostatic hypotension	9.4% (n=33)	14.6% (n=67)	0.026
Diabetic retinopathy	38.3% (n=134)	33.2% (n=152)	0.133

Comparing the Roma population with the non-Roma group, the average age was younger in the Roma group (55.62 ± 11.55 versus 62.06 ± 10.6 years); additionally, the median duration of diabetes was significantly shorter (6.00 versus 11.00 years, p=0.0001).

Analyzing anthropometric measurements, the average height of non-Roma patients was slightly higher compared to the opposite group (166.83 ± 9.68 cm versus 164.54 ± 9.27 cm), but the average weight, waist circumference, and hip circumference were higher among Roma

patients (87.51 ± 20.12 kg versus 84.81 ± 17.82 kg, 110 ± 15.87 cm versus 103.73 ± 14.70 cm, and 108.61 ± 14.40 cm versus 104.82 ± 14.02 cm, respectively); concerning BMI average, the same trend was observed (32.28 ± 7.03 kg/m^2 versus 30.41 ± 5.06 kg/m^2).

Regarding paraclinical evaluations, Roma patients had a slightly higher mean HbA1c level compared to non-Roma patients (9.91 ± 2.45% versus 9.07 ± 2.09%); besides this, mean values of the lipid profile were also significantly higher in this ethnic group, except for the mean HDL-c level, which was higher among non-Roma patients. Regarding insulin resistance measured by the TyG index, a slightly higher mean value was observed among the Roma group (10.07 ± 0.71 versus 9.71 ± 0.82). Mean values of renal profile parameters (creatinine level and uric acid level) were higher among Roma patients, but there were no differences in mean urea level. However, the median value of eGFR was lower among Roma patients (80.00 ± 41.00 ml/min/1.73m^2 versus 83.00 ± 45.00 ml/min/1.73m^2), while the median value of the urine albumin/creatinine ratio was similar (25.00 ± 31.28 mg/g versus 25.13 ± 104.27 mg/g). Mean values of liver enzymes were higher in the Roma population compared to the corresponding group. Regarding statistical significance, correlations were observed for most parameters, except for weight, TyG index, eGFR, urea, uric acid, AST, and GGT.

Mean values of the analysed parameters according to ethnicity

Parameters	**Non-Roma patients (n=350)**	**Roma patients (n=458)**	**Total (n=808)**	**p-value**
	Mean±SD	Mean±SD	Mean±SD	
Age (years)	62.06±10.6	55.62±11.55	58.41±11.59	0.0001
Duration of diabetes (years)	11.00±8.18*	6.00±6.89*	9.00±7.77*	0.0001
Height (cm)	166.83±9.68	164.54±9.27	165.67±9.54	0.001
Weight (kg)	84.81±17.82	87.51±20.12	86.19±19.06	0.059
WC (cm)	103.73±14.70	110.00±15.87	107.08±15.64	0.0001
HC (cm)	104.82±14.02	108.61±14.40	107.20±14.36	0.011
BMI (kg/m^2)	30.41±5.60	32.28±7.03	31.36±6.43	0.0001
HbA1c (%)	9.07±2.09	9.91±2.45	9.53±2.33	0.0001
FPG (mg/dl)	226.35±87.96	232.00±117.42*	243.59±106.46	0.0001
TC (mg/dl)	192.66±65.29	217.12±63.41	205.67±65.40	0.0001
HDL-c (mg/dl)	49.40±14.09	45.57±9.91	47.38±12.20	0.0001
TG (mg/dl)	192.06±138.62	234.39±123.45	214.54±132.39	0.0001

LDL-c (mg/dl)	103.64±48.67	123.11±52.59	113.79±51.64	0.0001
TyG index	9.71±0.82	10.07±0.71	9.90±0.78	0.36
Creatinine (mg/dl)	0.96±0.37	1.04±0.43	1.00±0.40	0.010
eGFR (ml/min/1.73m^2)	83.00±45.00*	80.00±41.00*	83.00±41.00*	0.255
Urea (mg/dl)	44.56±20.08	44.34±18.49	44.43±19.16	0.904
Uric acid (mg/dl)	5.99±1.98	6.16±2.36	6.06±2.15	0.578
UACR (mg/g)	25.13±104.27*	25.00±31.28*	24.14±65.7*	0.003
AST (UI/l)	20.00±22.66*	23.00±25.88*	22.00±13.18*	0.086
ALT (UI/l)	24.00±27.31*	29.00±28.75*	27.00±23.00*	0.002
GGT (UI/l)	33.35±102.97*	44.00±47.58*	42.00±38.00*	0.081

Abbreviations: WC (cm)- waist circumference, HC (cm)- hip circumference, BMI (kg/m^2)- body mass index, HbA1c (%)- glycated hemoglobin, FPG (mg/dl)- fasting plasmatic glycemia, TC (mg/dl)- total cholesterol, HDL-c (mg/dl)- high-density lipoprotein-cholesterol, LDL-c (mg/dl)- low-density lipoprotein-cholesterol, TG (mg/dl)- triglycerides, TyG index- triglyceride-glucose index, eGFR (ml/min/1.73m^2)- estimated glomerular filtration rate, UACR (mg/g)- urinary albumin to creatinine ratio, AST (UI/l)- aspartate aminotransferase, ALT (UI/l)- alanine aminotransferase, GGT (UI/l)- gamma-glutamyl transferase

The data has been represented as mean±SD (standard deviation) and median±IQR (marked with "*", IQR- interquartile range). The statistical significance was considered at a p-value<0.05.

Discussion

The data used in our study come from a sample of adults, predominantly with type 2 diabetes (DZ2). We analyzed the clinical and metabolic characteristics of a Roma population compared to a corresponding non-Roma group, including the prevalence of cardiovascular risk factors, cardiovascular diseases, health behaviors, anthropometric measurements, and paraclinical evaluations.

Regarding the prevalence of cardiovascular risk factors, the most frequently identified factors in our study were hypertension, obesity, dyslipidemia, smoking, and alcohol consumption. Our findings are comparable to those of Enache et al., who analyzed a group of Roma patients from Călărași County, Romania, with obesity prevalence in our study also higher among Roma patients, approximately 60% in the Roma group and 50% in the non-Roma group, compared to 45.2% and 43.9%, respectively [9]. Hypertension and dyslipidemia were also significantly prevalent in both groups, but the rates were correspondingly higher among non-Roma participants. However, data from another study comparing Roma patients from Călărași

County with the general population showed higher percentages regarding obesity prevalence, but even so, lower rates than our findings, which showed obesity present in 43.2% of non-Roma and 43.3% of Roma patients. It is noteworthy that diabetes (known and newly diagnosed) was present in only 10% and 13.6% of Roma patients, respectively [4].

Weiss et al. identified obesity prevalence of 33%, hypertension of 33.62%, dyslipidemia of 26.92%, and smoking of 42.55% among the analyzed Roma patients, suggesting lower rates compared to our study; however, only 15.13% of patients had diabetes [3].

Although the high frequency of communicable diseases among Roma people is well established in current medical literature, data on the prevalence of non-communicable diseases, including cardiovascular diseases, are still limited. The prevalence of cardiac diseases among the adult Roma population is considered to be around 10% [10]. Nevertheless, it remains the leading cause of premature mortality among this ethnic group, according to a study from Slovakia [11]. Our study reported corresponding results, with 12% of Roma participants having had a myocardial infarction and 9.2% having a history of stroke. However, higher rates were observed regarding stable angina and heart failure, with 29.5% of Roma patients and 19% of them, respectively.

Regarding the prevalence of metabolic syndrome among Roma people, our study revealed a significant percentage of 94.3%. However, medical literature data have identified a prevalence of 36.38% among Roma people in Hungary and 29.28% in Slovakia [12], [13].

Regarding the prevalence of diabetic microvascular complications among the Roma population, data from medical literature are limited. From the general population with DZ2, it is considered that chronic kidney disease affects 25% of patients, retinopathy is considered to be present in 21% of patients, while more than 50% of patients associate with polyneuropathy [14]. Our study showed corresponding data regarding the prevalence of chronic kidney disease among Roma people, but with higher rates observed regarding polyneuropathy and retinopathy. A study by Weiss et al. identified that retinopathy was present in 12.5% of Roma diabetic patients [3].

Diabetes Distress Among the Roma Population in a Center in Romania

Study design

We conducted an observational, cross-sectional study from October 2022 to December 2023.

Participants

We evaluated 310 adult patients with diabetes mellitus, aged between 18 and 85 years, who were admitted to the "Nicolae Malaxa" Clinical Hospital in Bucharest, Romania.

Data collection

Data collection consisted of a questionnaire with three distinct sections, including the Romanian version of the DDS (Diabetes Distress Scale), socioeconomic and demographic data, as well as laboratory results.

Before completing the questionnaire, patients were informed about the study objectives and their right to withdraw at any time. If necessary, they were provided assistance from a trained person to complete the questionnaire. Respondents were hospitalized patients, either with continuous hospitalization (minimum three days of hospital stay) or with one-day hospitalization. Patients received the questionnaire containing the DDS-RO questions and information about their socioeconomic and demographic status. Laboratory parameters were collected from their medical records.

Results

The study included 165 Roma patients, among whom a significant percentage (63%) were women. Regarding diabetes type, 72.6% had type 2 diabetes, with a significant number being female (128 subjects).

Regarding the background of the patients included, the majority come from urban areas (58.1%). A percentage of 12.25% of patients live alone, significantly more women compared to men (84.2% versus 15.8%). A small percentage of patients live in cohabitation (0.5% among women versus 0.8% among men).

Most of the included patients are retirees (52.9%), while only 30% of them are employed. A proportion of 13.9% have no occupation.

Regarding the level of education, a higher proportion of male patients have not completed any schooling (3.3%) compared to women (2.1%). Additionally, in terms of higher

education, a higher proportion of women (24.5%) have graduated from college compared to men.

General characteristics of the patients included stratified by gender

Parameters		**Total**	**Women**	**Men**
Ethnicity	**Roma**	53,2% (n=165)	63% (n=104)	37% (n=61)
	Non-Roma	46,8% (n=145)	58,6% (n=85)	41,4% (n=60)
Type of diabetes	**T1DM**	27,4% (n=85)	71,8% (n=61)	28,2% (n=24)
	T2DM	72.6% (n=225)	56,7% (n=128)	43,3% (n=97)
Place of residence	**Rural area**	41,9% (n=130)	59,2% (n=77)	40,8% (n=53)
	Urban area	58,1% (n=180)	62,2% (n=112)	37,8% (n=68)
Living conditions	**Alone**	12,25% (n=38)	84,2% (n=32)	15,8% (n=6)
	With spouse	41,93% (n=130)	38,3% (n=72)	47,9% (n=58)
	With family	44,83% (n=139)	44,1% (n=83)	46,3% (n=56)
	Concubinage	0,64% (n=2)	0,5% (n=1)	0,8% (n=1)
Employment status	**Unemployed**	13,9% (n=43)	53,5% (n=23)	46,5% (n=20)
	Employed	30% (n=93)	61,3% (n=57)	38,7% (n=36)
	Retired	52,9% (n=164)	61,6% (n=101)	38,4% (n=63)
	Student	3,2% (n=10)	80% (n=8)	20% (n=2)
Level of education	**No education**	2,6% (n=8)	2,1% (n=4)	3,3% (n=4)
	8 classes	38,5% (n=119)	36,7% (n=69)	41,3% (n=50)
	12 classes	27,8% (n=86)	29,3% (n=55)	25,6% (n=31)
	College	21,7% (n=67)	24,5% (n=46)	17,4% (n=21)
	Post-secondary school	9,4% (n=29)	7,4% (n=14)	12,4% (n=15)

In the studied population, a large proportion of patients experienced diabetes-related distress, with 24.8% (n=82) having moderate distress and 29.7% (n=121) experiencing severe distress. Regarding the total DDS score, there was a predominance of patients without distress in the non-Roma group (61.7%, n=66 compared to 38.3%, n=41 in the Roma population), while more Roma patients experienced severe distress compared to the opposite group (64.5%, n=78

compared to 35.5%, n=43). The same trend was observed for emotional burden, physician-related distress, diet-related distress, and interpersonal distress. Overall, approximately one-third of the patients included in the study reported severe distress observed in the DDS subscales of emotional burden, physician-related distress, and interpersonal stress, with 38.1% (n=118), 38.7% (n=120), and 29.7% (n=92), respectively, while nearly half of them (48.4%, n=150) described severe distress related to diet. Statistically significant associations were noted across all DDS questionnaire scales.

Proportion of patients with severe distress stratified by ethnicity

	Total	**Non-Roma patients**	**Roma patients**	**p-value**
Total DDS score	39% (n=121)	35,5% (n=43)	64,5% (n=78)	**0,002**
Emotional burden	38,1% (n=118)	37,3% (n=44)	62,7% (n=74)	**0,009**
Physician-related distress	38,7% (n=120)	35% (n=42)	65% (n=78)	**0,001**
Regimen-related distress	48,4% (n=150)	34% (n=51)	66% (n=99)	**0,0001**
Interpersonal distress	29,7% (n=92)	35,9% (n=33)	64,1% (n=59)	**0,012**
The data were represented as absolute numbers ("n") and percentages ("%"). Statistical significance was considered at a p-value < 0.05.				

Risk factors of distress

Multivariate analysis of factors contributing to diabetes-related distress

It has been demonstrated that lack of education, longer duration of diabetes, and higher levels of HbA1c (over 8%) influenced the risk of severe DDS in the non-Roma group, whereas in Roma patients, employment status (unemployed) represents a risk factor for severe DDS.

Factors contributing to Diabetes Distress

Variables	B	SE	*p*	OR	95% CI	
					Lower	Upper
In Caucasian patients						
A1c level (above 8%)	0.302	0.139	0.030	1.35	1.029	1.77
Level of education (No education)	1.067	0.493	0.030	2.90	1.106	7.645
Diabetes duration (above 10 years)	-1.123	0.465	0.016	0.325	0.131	0.809
In Roma patients						
Employment status (Unemployed)	-0.954	0.446	0.032	0.385	0.161	0.924
Logistic regression coefficient and odds ratio (95% CI); statistical significance, $p<0.05$; Abbreviations: SE- standard error, OR- odds ratio, CI- confidence interval						

Discussion

In our study, we included a sample of adults from Romania, predominantly with type 2 diabetes (DZ2), and analyzed the distress associated with diabetes and potential influencing factors by comparing Roma patients with a control group of non-Roma patients.

Regarding socio-economic and demographic characteristics, unlike the control group, the Roma population predominantly resides in rural areas, lives with family, and has no occupation. Data from the medical literature suggest similar characteristics, with lower employment rates and more frequent overcrowded living conditions observed among Roma populations in Hungary, Greece, or Serbia [15], [16], [17], [18]. In our study, a significant portion of the Roma population has completed 8 grades of education. These findings are consistent with other studies that have shown that nearly 85% of them have only completed primary school [3], [19].

Regarding diabetes-related distress, our study's findings are significant for the Roma minority, as this topic is underrepresented in the medical literature. Our work highlighted a higher prevalence of distress among the Roma minority compared to the non-Roma patient group, with most of them experiencing severe distress scores. To date, there are no data in Romania regarding diabetes-related distress among the Roma population.

Comparatively, in previous studies that predominantly included ethnic minorities, ethnicity was statistically associated with higher total distress scores [20]. In Caucasian patients, the odds of having severe distress scores were higher in patients without education, as highlighted in a study by Ratnesh and colleagues [21].

As concluded by Kokoszka et al., in a study from Poland involving type 2 diabetes patients, women had higher distress scores assessed using the PAID questionnaire [21], which is consistent with our study findings. Furthermore, a study from Italy reported that in a study population with type 2 diabetes, high distress scores assessed with the same aforementioned questionnaire were significantly associated with living conditions (living alone) and low education levels [22]. Similarly, in our study, lack of education influenced the risk of severe DDS in the non-Roma patient group.

Access to medical services during the pandemic

Given that the study was conducted during the pandemic, we also included data on access to healthcare services during that period, as well as the frequency of health monitoring, comparing the cohort of Roma patients with the corresponding cohort of non-Roma patients.

In response to the question "How has your income changed as a result of the COVID-19 pandemic?", comparing the group of non-Roma patients with the group of Roma patients, the vast majority reported that their income had not changed, with no differences between the two groups (78.2%, n=129 among Roma patients versus 78.8%, n=112 among non-Roma patients). Only a small percentage of patients reported a loss of income (2.1%, n=3 among non-Roma and 0.6%, n=1 among Roma patients). 7.6% (n=11) of non-Roma patients reported an increase in their income, while among Roma patients, there was only a percentage of 3% (n=5).

Regarding the question "Have you been diagnosed with COVID-19 infection?", the majority of patients in both groups were not diagnosed (56.7%, n=82 among non-Roma patients and 57%, n=176 among Roma patients). Similarly, in terms of vaccination rate, 40.6% (n=95) of Roma patients and 66% (n=67) of non-Roma patients stated that they have been vaccinated against COVID-19 infection.

Progression of chronic kidney disease to dialysis in a Roma population with type 2 diabetes mellitus in comparison with Caucasian patients

Study design and setting

We conducted an observational, cross-sectional study from October 2022 to March 2024, evaluating 735 adult patients with T2DM, of which 402 were Roma, aged 18 to 89 years, following the hospital's standard protocols for diabetes management, at the "Nicolae Malaxa"

Clinical Hospital in Bucharest, Romania, a tertiary care center for diabetes. The study adhered to the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines [9]. The Ethics Committee for Clinical Studies of the "Nicolae Malaxa" Clinical Hospital approved the study (approval number 75/2022). All participants provided informed consent for data collection and the use of their medical information for research purposes.

Study population

The study included adult patients diagnosed with T2DM who attended consultations at the hospital's inpatient department during the study period and provided informed consent to participate. Conversely, exclusion criteria comprised patients younger than 18 years, those without diabetes, pregnant women, and those who declined to sign the informed consent form.

Results

The prevalence of chronic kidney disease (CKD) was higher among Roma patients, reaching 56.50% (n=203), compared to the non-Roma group (43.50%, n=156).

The average age of Roma patients with CKD is lower compared to non-Roma patients (55.53±10.56 versus 63.32±10.04 years). The same trend was observed regarding the duration of diabetes, with Roma patients with CKD having a significantly shorter median duration of the disease (5.00±8.80 versus 11.50±12.00 years). Glycemic parameters showed not only a higher mean of HbA1c but also GAJ among Roma patients with CKD (10.04±2.46% versus 9.13±1.94%, and 233.00±146.00 mg/dl versus 229.50±125.25 mg/dl, respectively). Mean values of TyG index and ABSI were also higher among Roma participants. Regarding renal profile, among patients with CKD, mean values of creatinine and uric acid were higher among Roma patients, but there were no differences in median level of UACR (133.07±0.0001 mg/g versus 133.07±173.79 mg/g). Variables with statistically significant differences ($p<0.05$) between non-Roma and Roma participants with CKD are: age, duration of diabetes, height, weight, WC, HC, SBP, DBP, HbA1c, TC, HDL-c, TG, LDL-c, TyG index, ABSI, UACR, and ALT.

Anthropometric measurements and laboratory parameters stratified by ethnicity and presence of diabetic CKD

Parameters	**Caucasian patients**		**Roma patients**		**p-value ****	**p-value *****
	With CKD (n=156)	**Without CKD (n=177)**	**With CKD (n=203)**	**Without CKD (n=199)**		
Age (years)	63.32±10.04	61.75±10.48	55.53±10.56	58.90±	**0.006**	**<0.001**

				9.66		
Duration of diabetes (years)	11.50±12.00*	12.00±10.50 *	5.00±8.80*	7.00± 10.00*	**<0.001**	**<0.001**
Height (cm)	166.99±9.18	167.07±10.12	164.75±8.65	164.27± 8.59	**0.004**	**0.019**
Weight (kg)	85.59±17.66	85.58±17.77	92.11±19.33	89.82± 17.31	**0.028**	**0.002**
WC (cm)	105.67±12.19	105.03±11.37	110.17±11.17	110.39± 10.00	**<0.001**	**<0.001**
HC (cm)	104.83±16.94	104.94±11.21	111.07±13.41	110.85± 13.51	**0.002**	**0.008**
BMI (kg/m^2)	32.61±6.60	31.57±5.41	33.19±6.15	33.48± 5.90	**0.001**	0.391
SBP (mmHg)	136.47±22.52	135.07±18.63	145.63±22.91	146.86± 23.16	**<0.001**	**0.002**
DBP (mmHg)	78.71±12.15	80.10±11.14	84.92±12.50	84.07± 13.43	**0.012**	**<0.001**
HbA1c (%)	9.13±1.94	9.03±2.32	10.04±2.46	9.99± 2.49	**<0.001**	**<0.001**
FPG (mg/dl)	229.50± 125.25*	210.00± 119.50*	233.00± 146.00*	226.50± 158.75*	**0.011**	0.218
TC (mg/dl)	187.08±59.94	199.07±70.78	221.60±62.84	214.01± 57.78	**0.032**	**<0.001**
HDL-c (mg/dl)	47.66±12.17	50.00±14.97	45.29±9.45	45.56± 8.54	**<0.001**	**0.039**
TG (mg/dl)	153.50± 130.90*	150.00± 117.01*	214.54± 140.00*	214.54± 93.00*	**0.003**	**<0.001**
LDL-c (mg/dl)	94.36±42.29	109.66±38.63	113.65±38.38	114.51± 36.61	0.323	**<0.001**
TyG index	9.81±0.74	9.68±0.81	10.10±0.68	10.05± 0.61	**<0.001**	**<0.001**
ABSI	0.81±0.10	0.82±0.09	0.84±0.087	0.83± 0.09	0.099	**0.003**
Creatinine (mg/dl)	1.06±0.43	0.88±0.29	1.01±0.37	1.04± 0.49	**<0.001**	0.343
eGFR (ml/min/ $1.73m^2$)	66.96±21.06	92.86±17.70	63.05±19.16	97.74± 15.60	**0.005**	0.067
Urea (mg/dl)	49.27±22.45	40.07±16.48	44.13±17.59	43.78± 17.52	0.104	0.067
Uric acid (mg/dl)	6.05±2.11	5.92±1.85	6.62±2.65	5.83± 2.04	0.823	0.248
UACR (mg/g)	133.07± 173.79*	21.52±70.05*	133.07± 0.0001*	133.07± 109.07*	**<0.001**	**<0.001**
AST (UI/l)	20.00±11.96*	20.43±11.08*	23.00±15.75*	24.00±	0.352	0.060

				15.00*		
ALT (UI/l)	23.00±19.21*	25.00±16.44*	27.00±23.25*	29.00± 26.00*	**0.035**	**0.006**
GGT (UI/l)	33.45±66.26*	30.77±49.83*	40.00±38.25*	46.00± 32.00*	0.643	0.053

Abbreviations: WC (cm)- waist circumference, HC (cm)- hip circumference, BMI (kg/m^2)- body mass index, SBP (mmHg)- systolic blood pressure, DBP (mmHg)- diastolic blood pressure, HbA1c (%)- glycated hemoglobin, FPG (mg/dl)- fasting plasmatic glycemia, TC (mg/dl)- total cholesterol, HDL-c (mg/dl)- high-density lipoprotein-cholesterol, LDL-c (mg/dl)- low-density lipoprotein-cholesterol, TG (mg/dl)- triglycerides, TyG index- triglyceride-glucose index, ABSI- A Body Shape Index, eGFR (ml/min/1.73m^2)- estimated glomerular filtration rate, UACR (mg/g)- urinary albumin to creatinine ratio, AST (UI/l)- aspartate aminotransferase, ALT (UI/l)- alanine aminotransferase, GGT (UI/l)- gamma-glutamyl transferase

The data has been represented as mean± SD (standard deviation) and median± IQR (marked with "*", IQR- interquartile range). The statistical significance was considered at a p-value<0.05.

** between Caucasians and Roma patients with CKD

*** between Caucasians and Roma patients without CKD

Roma patients at very high risk had a lower average age and a shorter median duration of diabetes compared to non-Roma (56.37±10.79 versus 59.92±7.48 years, and 4.00±2.00 versus 10.00±10.30 years, respectively). Regarding anthropometric parameters, Roma patients at very high risk of progressing to dialysis had a higher mean value of abdominal circumference and BMI compared to non-Roma patients. Concerning lipid profile, the mean levels of TC and LDL-c were also higher in the former group. Furthermore, patients at high risk of progressing to dialysis in both groups showed the highest level of insulin resistance measured by the TyG index, with an average value of 10.13±0.60 in the Roma group and 10.09±0.82 in the corresponding group.

Anthropometric measurements and laboratory parameters in Caucasians and risk of progression to dialysis

Risk of progression to dialysis	**Caucasian patients**				**p-value**
	Low	**Moderately increased**	**High**	**Very high**	
Age (years)	61.90±10.81	62.85±9.99	64.09± 11.22	59.92± 7.48	0.365
Duration of diabetes (years)	12.00±10.00*	12.78±11.00*	10.50± 10.80*	10.00± 10.30*	0.853
Height (cm)	166.58±10.84	167.66±9.59	167.89±	163.54±	0.238

			7.02	8.25	
Weight (kg)	85.36±17.84	86.40±17.31	85.84± 20.27	80.96± 14.43	0.576
WC (cm)	105.99±11.22	105.07±10.11	107.05± 15.74	100.82± 14.74	0.126
HC (cm)	105.74±11.95	105.63±10.17	103.04± 23.95	98.57±9.58	0.533
BMI (kg/m^2)	30.64±4.56	32.80±6.28	31.61±6.63	34.64±7.53	**0.004**
SBP (mmHg)	133.66±16.86	135.45±22.44	138.94± 21.51	141.67± 26.31	0.455
DBP (mmHg)	79.10±10.57	79.79±12.49	80.15±12.3 3	77.50± 11.38	0.899
HbA1c (%)	8.93±2.24	9.11±2.17	9.34±2.02	8.99±1.92	0.763
FPG (mg/dl)	215.00± 125.00*	218.50±125.75*	250.00± 126.75*	231.50± 141.00*	0.174
TC (mg/dl)	198.13±66.24	191.43±66.98	196.04± 68.29	179.92± 56.38	0.633
HDL-c (mg/dl)	47.99±14.22	50.66±14.47	44.58± 10.60	49.83± 10.04	0.058
TG (mg/dl)	155.12± 105.51*	150.41±133.69*	209.00± 175.94*	134.10± 74.75*	**0.022**
LDL-c (mg/dl)	112.82±38.10	97.92±42.74	95.37± 38.97	82.54± 42.83	**0.031**
TyG index	9.65±0.79	9.73±0.77	10.09±0.82	9.57±0.53	**0.011**
ABSI	0.84±0.08	0.80±0.10	0.83±0.09	0.75±0.12	**<0.001**
Creatinine (mg/dl)	0.84±0.27	1.00±0.38	1.18±0.51	0.91±0.22	**<0.001**
eGFR (ml/min/ $1.73m^2$)	88.66±19.01	85.44±18.57	68.72± 21.75	35.84±8.43	**<0.001**
Urea (mg/dl)	38.85±16.60	47.25±22.62	49.72± 20.13	46.81± 13.93	**0.020**
Uric acid (mg/dl)	5.69±1.84	6.44±2.34	5.84±1.50	5.42±1.31	0.283
UACR (mg/g)	11.00±15.79*	133.07±79.83*	431.56± 827.23*	133.07± 299.90*	**<0.001**
AST (UI/l)	20.40±13.32*	20.00±10.00*	19.46± 7.60*	24.00± 23.95*	0.394
ALT (UI/l)	24.00±18.96*	24.00±16.00*	22.00± 15.02*	31.00± 25.75*	0.480
GGT (UI/l)	34.27±79.34*	41.50±65.57*	24.27± 15.46*	282.60± 556.19*	**<0.001**
Abbreviations: WC (cm)- waist circumference, HC (cm)- hip circumference, BMI (kg/m^2)- body mass index, SBP (mmHg)- systolic blood pressure, DBP (mmHg)- diastolic blood pressure, HbA1c (%)- glycated hemoglobin, FPG (mg/dl)- fasting plasmatic glycemia, TC					

(mg/dl)- total cholesterol, HDL-c (mg/dl)- high-density lipoprotein-cholesterol, LDL-c (mg/dl)- low-density lipoprotein-cholesterol, TG (mg/dl)- triglycerides, TyG index- triglyceride-glucose index, ABSI- A Body Shape Index, eGFR (ml/min/1.73m^2)- estimated glomerular filtration rate, UACR (mg/g)- urinary albumin to creatinine ratio, AST (UI/l)- aspartate aminotransferase, ALT (UI/l)- alanine aminotransferase, GGT (UI/l)- gamma-glutamyl transferase

The data has been represented as mean±SD (standard deviation) and median±IQR (marked with "*", IQR- interquartile range). The statistical significance was considered at a p-value<0.05.

Anthropometric measurements and laboratory parameters in Roma and risk of progression to dialysis

Risk of progression to dialysis	**Roma patients**				**p-value**
	Low	**Moderately increased**	**High**	**Very high**	
Age (years)	57.23± 8.39	57.86±10.25	54.74±11.59	56.37±10.79	0.248
Duration of diabetes (years)	4.00± 9.00*	7.00±10.00*	5.00±10.00*	4.00± 2.00*	0.618
Height (cm)	165.34± 7.78	164.00±8.62	165.17±9.15	165.83±8.02	0.811
Weight (kg)	89.82± 16.33	90.42±18.73	90.17±17.47	96.74±16.52	0.460
WC (cm)	110.27± 10.71	110.49± 10.62	109.40±9.13	112.97± 11.36	0.190
HC (cm)	110.34± 13.80	111.21± 14.04	107.96±8.22	117.25± 13.57	0.250
BMI (kg/m^2)	33.02± 5.51	33.43±6.12	31.84±5.17	35.66±6.42	0.053
SBP (mmHg)	145.85± 21.08	146.59± 23.72	144.84±21.24	147.25± 26.63	0.964
DBP (mmHg)	85.27± 14.24	84.00±12.53	85.20±12.96	85.65±14.52	0.849
HbA1c (%)	9.47± 2.29	10.11±2.50	10.09±2.57	10.12±2.43	0.518
FPG (mg/dl)	210.00± 125.50*	230.00± 165.50*	239.00±90.50*	254.00± 198.50*	0.104
TC (mg/dl)	217.21± 65.74	217.77± 59.66	212.38±53.98	231.24± 67.41	0.657
HDL-c (mg/dl)	44.69± 9.10	45.47±8.65	45.40±9.82	47.05±10.76	0.735
TG (mg/dl)	214.54± 121.00*	214.54± 113.00*	214.54±131.50*	170.00± 231.00*	0.641
LDL-c (mg/dl)	116.28± 38.06	114.14± 37.14	110.07±37.02	116.03± 41.93	0.888

TyG index	9.93± 0.58	10.10±0.62	10.13±0.60	10.02±0.99	0.269
ABSI	0.84± 0.08	0.84±0.09	0.85±0.09	0.81± 0.07	0.306
Creatinine (mg/dl)	0.87± 0.23	1.06±0.45	1.12±0.50	0.92± 0.23	**0.012**
eGFR (ml/min/1.73m^2)	89.06± 16.63	88.25±18.95	54.66±17.96	33.97±9.94	**<0.001**
Urea (mg/dl)	42.25± 16.26	44.01±18.42	46.00±16.47	43.90±17.83	0.799
Uric acid (mg/dl)	6.01± 2.51	6.03±2.23	5.89±1.82	8.42± 3.12	0.086
UACR (mg/g)	20.00± 11.00*	133.07± 0.0001*	133.07±0.0001*	133.07± 0.0001	**<0.001**
AST (UI/l)	24.00± 15.75*	24.00± 16.00*	24.00±14.50*	22.00± 17.00*	0.917
ALT (UI/l)	35.00± 24.00*	29.00± 27.00*	32.50±23.50*	28.00± 31.50*	0.610
GGT (UI/l)	40.00± 26.00*	45.00± 32.00*	56.00±36.00*	48.00± 44.00*	0.935

Abbreviations: WC (cm)- waist circumference, HC (cm)- hip circumference, BMI (kg/m^2)- body mass index, SBP (mmHg)- systolic blood pressure, DBP (mmHg)- diastolic blood pressure, HbA1c (%)- glycated hemoglobin, FPG (mg/dl)- fasting plasmatic glycemia, TC (mg/dl)- total cholesterol, HDL-c (mg/dl)- high-density lipoprotein-cholesterol, LDL-c (mg/dl)- low-density lipoprotein-cholesterol, TG (mg/dl)- triglycerides, TyG index- triglyceride-glucose index, ABSI- A Body Shape Index, eGFR (ml/min/1.73m^2)- estimated glomerular filtration rate, UACR (mg/g)- urinary albumin to creatinine ratio, AST (UI/l)- aspartate aminotransferase, ALT (UI/l)- alanine aminotransferase, GGT (UI/l)- gamma-glutamyl transferase

The data has been represented as mean±SD (standard deviation) and median±IQR (marked with "*", IQR- interquartile range). The statistical significance was considered at a p-value<0.05.

Discussion

Current medical knowledge recognizes a prevalence of CKD among diabetic patients ranging between 20% and 40% [23]. Our study identified a prevalence of 43.50% among non-Roma patients; however, in the Roma patient group, a higher percentage had CKD (56.50%).

In the Predatorr study, a representative study in Romania, the prevalence of CKD was 9.08%, although only 11.6% of the included patients had diabetes. Furthermore, concerning paraclinical and anthropometric measurements such as BMI, abdominal circumference, GAJ, HbA1c, triglyceride levels, uric acid, systolic blood pressure (TAs), and insulin resistance measured by the HOMA-IR index, these were higher among participants with CKD.

Additionally, 0.52% of participants had an eGFR below 29 ml/min/1.73m^2, and 0.48% had macroalbuminuria [24]. In our study, in both patient groups, indicators such as BMI, abdominal circumference, GAJ, HbA1c, uric acid, TAs, and the TyG index were also higher among patients with CKD. Regarding the proportion of patients based on eGFR and UACR, our results showed higher percentages, with 2.6% of participants having an eGFR between 15-29 ml/min/1.73m^2, while 4.9% of patients had macroalbuminuria; however, there were no patients with an eGFR below 15 ml/min/1.73m^2.

Ethnic differences in the occurrence of CKD have been documented in the literature, with individuals from the Roma population being more frequently diagnosed, although existing data mostly refer to end-stage renal disease (ESRD). Roma patients in Slovakia have a 34% higher risk of being diagnosed with ESRD [25]. Kolvek et al. also reported that the Roma population has a 2-3 times increased risk of developing ESRD compared to the general population [26]. Regarding the causes of ESRD, diabetic nephropathy was more common among the Roma population (24.10%) compared to the general population (19.50%) [26]. Furthermore, another study from the medical literature on dialyzed Roma patients in Slovakia identified that the prevalence of diabetic nephropathy represents 34% of the causes [27].

Comparing various parameters between patients with CKD and those without CKD, Chen et al. identified no differences in terms of age, TAs, BMI, eGFR, prevalence of cardiovascular disease, and hypertension [28]. In our study, there were differences not only regarding the presence of CKD but also between the two ethnic groups. Roma patients, regardless of the CKD diagnosis, had a lower average age and a higher mean value of TAs and BMI compared to non-Roma. However, the mean eGFR was lower in the Roma group with CKD but higher among those without CKD compared to the corresponding group. Cardiovascular disease, represented by myocardial infarction, stroke, stable angina, peripheral arterial disease, and heart failure, was more frequently encountered among Roma patients, regardless of the presence of CKD, while more Roma patients suffered from hypertension compared to non-Roma individuals.

The evolution of anthropometric and paraclinical parameters 1 year after inclusion in the study and particularities of the treatment of Roma patients

Regarding the evolution of the anthropometric parameters of Roma patients 1 year after inclusion in the study, an increase in the average weight was observed, but with the maintenance of the average value of BMI (88.87 kg versus 87.51 kg), respectively 32.78 versus 32.28 kg/m^2), with a reduction in the average values of WC and HC (105.14 cm versus 110.00 cm, respectively 103.91 cm versus 108.61 cm). Also, analyzing the glycemic profile, it is also noted median values, and respectively lower mean values of GAJ and HbA1c (202.90 mg/dl versus 232.00 mg/dl, and respectively 8.81% versus 9.91%). The same trend was observed in the lipid profile. In the renal profile, there were minimal differences in mean creatinine, eGFR, urea and uric acid, and median ACR, with a slight reduction of them at 1 year post-entry. In addition, regarding the liver profile, the median values of AST and ALT remained constant, but with a reduction in GGT.

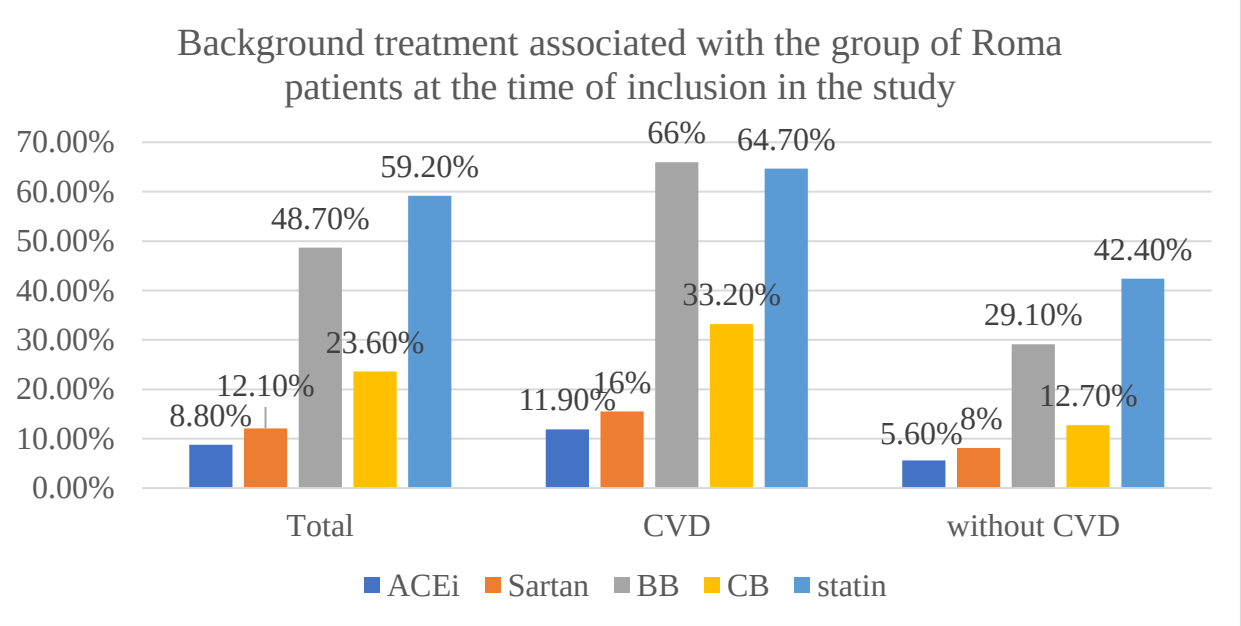
Evolution of anthropometric parameters and paraclinical measurements of Roma patients 1 year after inclusion in the study compared to the moment of inclusion in the study

Parameters	**Roma patients (n=458)**	
	At the moment of inclusion	**After 1 year**
	Mean±SD	**Mean±SD**
Weight (kg)	87,51±20,12	88,87±18,84
WC (cm)	110,00±15,87	105,14±13,21
HC (cm)	108,61±14,40	103,91±11,13
BMI (kg/m^2)	32,28±7,03	32,78±6,80
FPG (mg/dl)	232,00±117,42*	202,90±87,42*
HbA1c (%)	9,91±2,45	8,81±2,01
TC (mg/dl)	217,12±63,41	203,48±59,29
HDL-c (mg/dl)	45,57±9,91	48,79±12,51
LDL-c (mg/dl)	123,11±52,59	106,56±37,98
TG (mg/dl)	234,39±123,45	189,00±139,00*
Creatinine (mg/dl)	1,04±0,43	1,00±0,45
eGFR (ml/min/1.73m^2)	80,00±41,00*	82,10±25,43*

Urea (mg/dl)	44,34±18,49	42,86±17,29
Uric acid (mg/dl)	6,16±2,36	6,01±1,83
UACR (mg/g)	25,00±31,28*	20,00±22,85*
AST (UI/l)	23,00±25,88*	23,00±11,00*
ALT (UI/l)	29,00±28,75*	31,00±21,00*
GGT (UI/l)	44,00±47,58*	40,00±87,00*

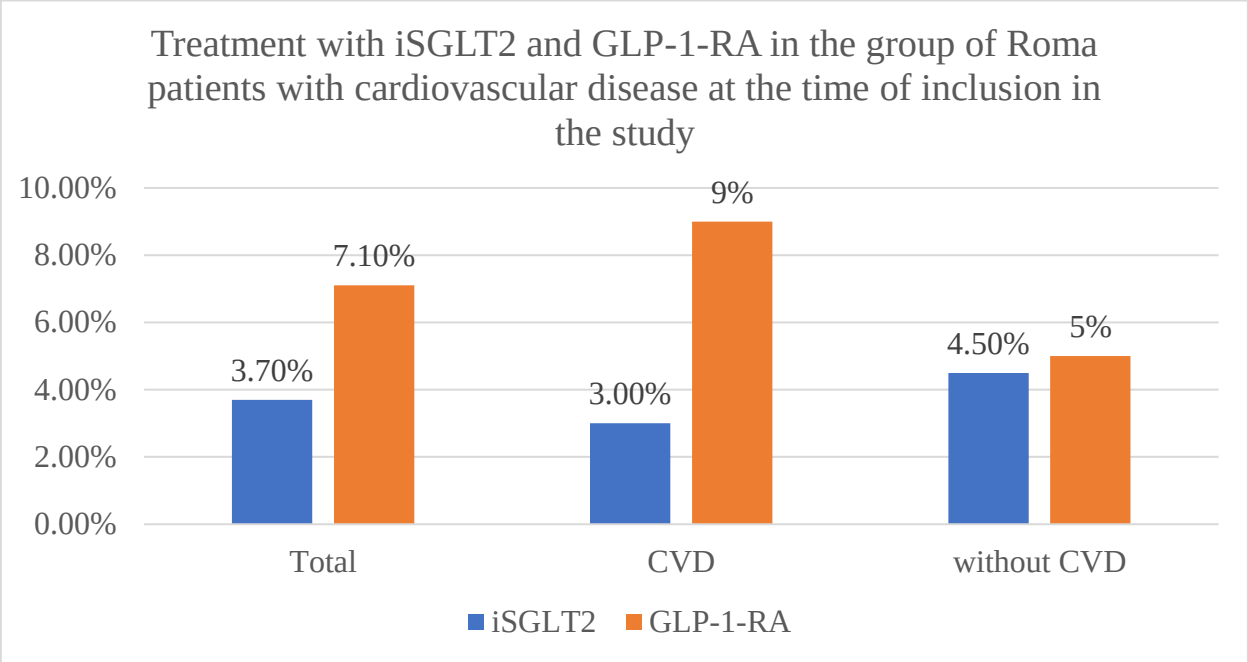
Regarding the particularities of treatment in Roma patients according to the presence of cardiovascular disease (CVD), a twice greater proportion of patients with CVD were using ACE inhibitor (ACEi) or sartan compared to those without CVD (11, 9% and 16% versus 5.6% and 8%). The same trend was observed with beta blocker (BB), calcium channel blocker (BC) and statin use.

Background treatment associated with the group of Roma patients at the time of inclusion in the study



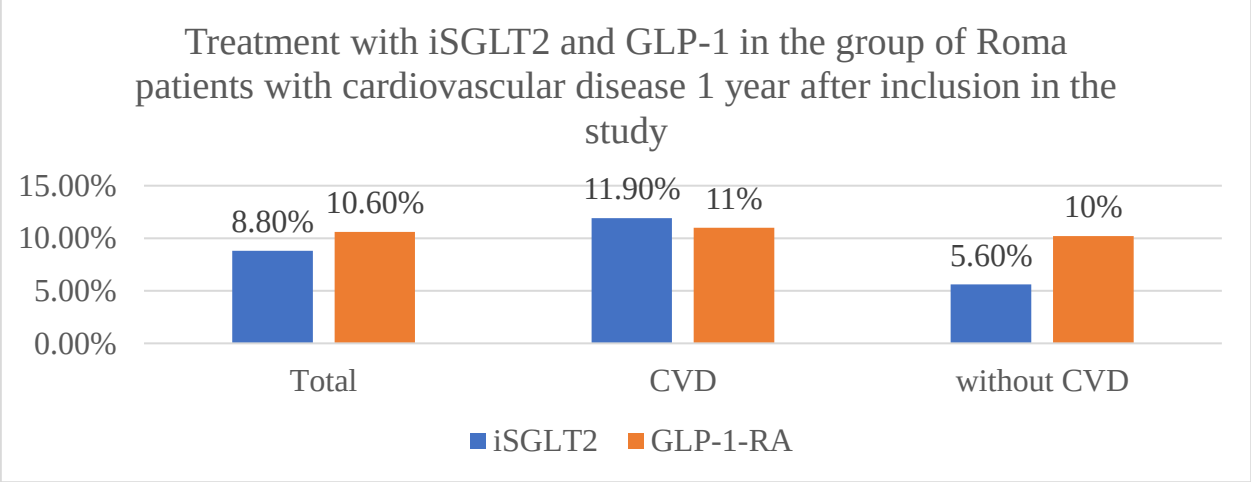
Paradoxically, for iSGLT2 and GLP-1-RA, it was observed that among those with established CVD, SGLT2 inhibitor was less frequent (3% versus 4.5%), whereas 9% of those with CVD, compared to 5% of those without CVD, used GLP-1-RA.

Treatment with iSGLT2 and GLP-1-RA in the group of Roma patients with cardiovascular disease at the time of inclusion in the study



At 1 year after inclusion in the study, both the percentage of patients with iSGLT2 and AR-GLP-1 increased among those with established CVD (11.9% and 11%, respectively), being higher compared to those without CVD (5.6% and 10%, respectively).

Treatment with iSGLT2 and GLP-1-RA in the group of Roma patients with cardiovascular disease 1 year after inclusion in the study



Conclusions and personal contributions

In this thesis, we analyzed the clinical characteristics of a group of Roma patients compared to a group of non-Roma patients. The results of the study highlighted certain important aspects as follows.

Both in the non-Roma group and in the Roma group, the majority had type 2 diabetes (95.1% and 87.8%, respectively). More than 50% of the subjects had no family history of diabetes [29].

Regarding the associated pathologies, a significant percentage of non-Roma patients had hypertension (81.1%), almost 15% more than the Roma group (67.7%). There were minor differences in dyslipidemia, exceeding 75% in both groups. A predominance of obesity was also observed (62.2% in the Roma group and 50.3% in the non-Roma group). Metabolic syndrome was significantly present in both groups, reaching 94.3% in the case of Roma patients and 89.1% in the case of non-Roma patients (p=0.008). Hepatic steatosis was found in 55.3% of non-Roma subjects and in 48.5% of Roma patients [29].

Analyzing the prevalence of cardiovascular diseases, there were no differences in myocardial infarction, with approximately 12% of patients in each group having it; however, the number of patients with a history of stroke was 2.1 times higher in the Roma group compared to non-Roma (42 versus 20 patients, p=0.067). The prevalence of stable angina pectoris and heart failure was significantly lower in the non-Roma group (p=0.0001) [29].

The most prevalent microvascular complication was peripheral polyneuropathy, exceeding 70% in both groups. In the Roma population, chronic kidney disease was present in 22.1% of patients, while in the non-Roma group, almost 35% associated this complication, and almost a third of the participants in both groups associated diabetic retinopathy, being observed a slightly higher percentage among non-Roma patients (38.3% versus 33.25%). Orthostatic hypotension was more prevalent in the Roma population compared to the corresponding group, representing 14.6% [29].

We assessed diabetes-related distress using the DDS questionnaire among 310 patients, including 165 Roma patients and 145 non-Roma subjects.

In the study population, a large proportion of patients experienced diabetes-related distress, with 24.8% (n=82) having moderate distress and 29.7% (n=121) having severe distress. Regarding the total DDS score, non-Roma patients showed a predominance of non-distress

cases (61.7%, n=66 compared to 38.3%, n=41 in the Roma population), while more patients Roma experienced severe distress compared to the non-Roma group (64.5%, n=78 versus 35.5%, n=43). The same trend was observed in the DDS subscales for emotional burden, physician-related distress, regimen-related distress, and interpersonal distress. Overall, approximately one-third of study patients reported severe distress on the DDS subscales for emotional burden, physician-related distress, and interpersonal distress, while nearly half of them described severe regimen-related distress [30].

Lack of education, longer duration of diabetes and higher HbA1c level (over 8%) were shown to influence the risk of severe DDS in the non-Roma group. In the case of Roma patients, unemployment status was a risk factor for severe DDS [30].

Analyzing the living conditions, a greater number of Roma patients (55.2%, n=91) live with their family (with their parents and/or children), while more than half of the non-Roma patients (51.7 %, n=75) live with their spouse. In both groups, the majority of patients are retired (57.9% in the non-Roma group versus 48.5% among the Roma). There was minimal difference in salaried patients (33.1% in the non-Roma group versus 27.3% in the Roma group). A higher proportion of Roma subjects are unemployed compared to the non-Roma group (20.6% vs. 6.2%). More than one third of non-Roma patients completed 12 classes (n=55, 37.9%), while almost two thirds (n=95, 57.6%) of Roma patients completed 8 classes. In the group of non-Roma patients there were no patients without any completed school, compared to the Roma population, where there were 8 patients (4.8%).

The prevalence of chronic kidney disease was higher among Roma patients, reaching 56.50% (n=203), compared to the non-Roma group (43.50%, n=156) [31].

Roma patients at very high risk of progression to dialysis had a lower mean age, a shorter median duration of diabetes, as well as a higher mean value of abdominal circumference and BMI compared to non-Roma; regarding the lipid profile, the mean CT and LDL-c was also higher in the first group. Moreover, patients at high risk of progression to dialysis in both groups presented the highest level of insulin resistance, measured by the TyG index, with a mean value of 10.13±0.60 in the Roma group and 10.09±0.82 in the matched group [31].

Factors associated with a very high risk of BCR progression in the entire cohort were weight, abdominal circumference, BMI, and ABSI. In non-Roma patients, weight, abdominal

circumference, BMI, triglyceride level and ABSI were shown to contribute to a very high risk of BCR progression, while no statistical association was found among Roma patients [31].

Selective references

[1] "Rezultate definitive: Caracteristici etno-culturale demografice – Recensamantul Populatiei si Locuintelor." https://www.recensamantromania.ro/rezultate-rpl-2021/rezultate-definitive-caracteristici-etno-culturale-demografice/ (accessed May 07, 2024).

[2] Enache G, Rusu E, Ilinca A, *et al.*, "Prevalence of overweight and obesity in a Roma population from southern Romania - Calarasi county," *Acta Endocrinologica*, vol. 14, no. 1. Acta Endocrinologica Foundation, pp. 122–130, Jan. 01, 2018, doi: 10.4183/aeb.2018.122.

[3] Weiss E, Japie C, Balahura AM, et al.,"Cardiovascular risk factors in a Roma sample population from Romania," *Rom. J. Intern. Med.*, vol. 56, no. 3, pp. 193–202, Sep. 2018, doi: 10.2478/rjim-2018-0010.

[4] Enache G, Rusu, Ilinca A, et al, "PREVALENCE OF OBESITY AND NEWLY DIAGNOSED DIABETES IN THE ROMA POPULATION FROM A COUNTY IN THE SOUTH PART OF ROMANIA (CĂLĂRAŞI COUNTY) -PRELIMINARY RESULTS," *Rom. J. Diabetes Nutr. Metab. Dis.*, vol. 23, no. 1, pp. 27–36, Mar. 2016, doi: 10.1515/rjdnmd-2016-0004.

[5] "Social determinants of health." https://www.who.int/health-topics/social-determinants-of-health#tab=tab_1 (accessed Feb. 08, 2022).

[6] Fisher L, Polonsky WH, Hessler D, "Addressing diabetes distress in clinical care: a practical guide," *Diabet. Med.*, vol. 36, no. 7, pp. 803–812, Jul. 2019, doi: 10.1111/DME.13967.

[7] Cuschieri S, "The STROBE guidelines," *Saudi J. Anaesth.*, vol. 13, no. Suppl 1, p. S31, Apr. 2019, doi: 10.4103/SJA.SJA_543_18.

[8] Kajikawa M, Maruhashi T, Kishimoto S, *et al.*, "A body shape index is associated with endothelial dysfunction in both men and women," *Sci. Rep.*, vol. 11, no. 1, p. 17873, Dec. 2021, doi: 10.1038/S41598-021-97325-0.

[9] Enache G, Rusu E, Ilinca A, *et al.*, "Prevalence of overweight and obesity in a Roma population from southern Romania - Calarasi county," *Acta Endocrinologica*, vol. 14, no. 1. Acta Endocrinologica Foundation, pp. 122–130, Jan. 01, 2018, doi: 10.4183/aeb.2018.122.

[10] "Health and the Roma Community, analysis of the situation in Europe," Accessed: Apr. 16, 2024. [Online]. Available: www.gitanos.org.

[11] Ginter R, Krajcovicova-Kudlackova M, Kacala O, et al. "Health status of Romanies (Gypsies) in the Slovak Republic and in the neighbouring countries." *Bratisl Lek Listy*. 2001;102(10):479-484.

[12] Kósa Z, Moravcsik-Kornyicki Á, Diószegi J, *et al.*, "Prevalence of metabolic syndrome among Roma: a comparative health examination survey in Hungary," *Eur. J. Public Health*, vol. 25, no. 2, pp. 299–304, Apr. 2015, doi: 10.1093/EURPUB/CKU157.

[13] Fedačko J, Pella D, Jarcuska P, *et al.*, "CLINICAL AND BIOCHEMICAL DETERMINANTS OF METABOLIC SYNDROME AMONG ROMA AND NON-ROMA SUBJECTS IN THE EASTERN PART OF SLOVAKIA," *Cent Eur J Public Heal.*, vol. 22, pp. S75–S80, 2014.

[14] "Ghid de management al diabetului zaharat elaborat de către," *Soc. Română Diabet, Nutr. şi Boli Metab. Fed. Română Diabet, Nutr. şi Boli Metab.*, 2021, vol 1.

[15] Llanaj E, Vincze F, Kósa Z,et al., "Dietary Profile and Nutritional Status of the Roma Population Living in Segregated Colonies in Northeast Hungary," *Nutrients*, vol. 12, no. 9, pp. 1–21, Sep. 2020, doi: 10.3390/NU12092836.

[16] Janevic T, Jankovic J, Bradley E, "Socioeconomic position, gender, and inequalities in self-rated health between Roma and non-Roma in Serbia," *Int. J. Public Health*, vol. 57, no. 1, pp. 49–55, 2012, doi: 10.1007/S00038-011-0277-1.

[17] Petraki I, *et al.*, "Living in Roma Settlements in Greece: Self-Perceived Health Status, Chronic Diseases and Associated Social Determinants of Health," *Int. J. Environ. Res. Public Health*, vol. 18, no. 16, Aug. 2021, doi: 10.3390/IJERPH18168403.

[18] Kasabji F, Alrajo A, Vincze F, et al., "Self-Declared Roma Ethnicity and Health Insurance Expenditures: A Nationwide Cross-Sectional Investigation at the General Medical Practice Level in Hungary," *Int. J. Environ. Res. Public Health*, vol. 17, no. 23, pp. 1–17, Dec. 2020, doi: 10.3390/IJERPH17238998.

[19] Doherty RP, *et al.*, "A survey of quality of life indicators in the Romanian Roma population following the 'Decade of Roma Inclusion,'" *F1000Research*, vol. 6, p. 1692, Dec. 2017, doi: 10.12688/F1000RESEARCH.12546.3.

[20] German J, *et al.*, "Factors Associated With Diabetes Distress Among Patients With Poorly Controlled Type 2 Diabetes," *J. Endocr. Soc.*, vol. 7, no. 5, pp. 1–8, Mar. 2023, doi: 10.1210/JENDSO/BVAD031.

[21] Kokoszka A, Pacura A, Kostecka B, et al., "Body self-esteem is related to subjective well-being, severity of depressive symptoms, BMI, glycated hemoglobin levels, and diabetes-related distress in type 2 diabetes," *PLoS One*, vol. 17, no. 2, Feb. 2022, doi: 10.1371/JOURNAL.PONE.0263766.

[22] Pintaudi B, *et al.*, "Correlates of diabetes-related distress in type 2 diabetes: Findings from the benchmarking network for clinical and humanistic outcomes in diabetes (BENCH-D) study," *J. Psychosom. Res.*, vol. 79, no. 5, pp. 348–354, 2015, doi: 10.1016/J.JPSYCHORES.2015.08.010.

[23] "Standards of Care in Diabetes-2024," *Diabetes care*, vol. 47, no. 1, 2024, doi: 10.2337/dc24-SREV.

[24] Mota M, Popa S, Mota E, *et al.*, "Prevalence of diabetes mellitus and prediabetes in the adult Romanian population: PREDATORR study," *J. Diabetes*, vol. 8, no. 3, pp. 336–344, May 2016, doi: 10.1111/1753-0407.12297.

[25] Macejova Z, *et al.*, "The Roma Population Living in Segregated Settlements in Eastern Slovakia Has a Higher Prevalence of Metabolic Syndrome, Kidney Disease, Viral Hepatitis B and E, and Some Parasitic Diseases Compared to the Majority Population," *Int. J. Environ. Res. Public Health*, vol. 17, no. 9, May 2020, doi: 10.3390/IJERPH17093112.

[26] Kolvek G, *et al.*, "End-stage renal disease among Roma and non-Roma: Roma are at risk," *Int. J. Public Health*, vol. 57, no. 4, pp. 751–754, 2012, doi: 10.1007/S00038-012-0365-X.

[27] Kolvek G, Straussova Z, Majernikova M,et al., "Health Differences between Roma and Non-Roma in the Slovak Dialyzed Population," *Int. J. Environ. Res. Public Health*, vol. 15, no. 2, Feb. 2018, doi: 10.3390/IJERPH15020360.

[28] Chen S, Chen L, Jiang H, "Prognosis and risk factors of chronic kidney disease progression in patients with diabetic kidney disease and non-diabetic kidney disease: a prospective cohort CKD-ROUTE study," *Ren. Fail.*, vol. 44, no. 1, pp. 1309–1318, 2022, doi: 10.1080/0886022X.2022.2106872.

[29] **Cosoreanu A**, Rusu E, Rusu F, *et al.*, "Clinical and Metabolic Particularities of a Roma Population with Diabetes—Considering Ethnic Disparities in Approaching Healthcare Management," *Biomed. 2024, Vol. 12, Page 1422*, vol. 12, no. 7, p. 1422, Jun. 2024, doi: 10.3390/BIOMEDICINES12071422.

[30] **Cosoreanu A**, Rusu E, Mihai DA, *et al.*, "Diabetes Distress Among the Roma Population From a Tertiary Care Center in Romania," *Cureus*, vol. 16, no. 5, May 2024, doi: 10.7759/CUREUS.60348.

[31] **Cosoreanu A**, Rusu E, Rusu F, et al., "Progression of Chronic Kidney Disease to Dialysis in the Roma Population With Type 2 Diabetes Mellitus in Comparison With Caucasian Patients," *Cureus*, vol. 16, no. 6, Jun. 2024, doi: 10.7759/CUREUS.62118.

Published articles

1. **Cosoreanu, A**.; Rusu, E.; Rusu, F.; Stanciu, S.; Ungureanu, I.; Donici, M.; Visinescu, A.; Enache, G.; Radulian, G. Clinical and Metabolic Particularities of a Roma Population with Diabetes—Considering Ethnic Disparities in Approaching Healthcare Management. *Biomedicines* **2024**, *12*, 1422. Indexed in Web of Science and Pubmed, impact factor 3,9; https://doi.org/10.3390/biomedicines12071422 (Chapter 6)

2. **Cosoreanu, A**., Rusu, E., Mihai, D. A., Rusu, F., Pantea, I., Paunica, I., Ungureanu, I., & Radulian, G. (2024). Diabetes Distress Among the Roma Population From a Tertiary Care Center in Romania. *Cureus*, *16*(5), e60348. Indexed in Web of Science and Pubmed, impact factor 1,2; https://doi.org/10.7759/cureus.60348 (Chapter 7)

3. **Cosoreanu, A.,** Rusu, E., Rusu, F., Stanciu, S., Enache, G., Radulian, G. (2024). Progression of Chronic Kidney Disease to Dialysis in the Roma Population With Type 2 Diabetes Mellitus in Comparison With Caucasian Patients. Cureus 16(6): e62118. Indexed in Web of Science and Pubmed, impact factor 1,2; https://doi.org/10.7759/cureus.62118 (Chapter 8)