Chapter

Characteristics of Acute Myocardial Damage in Uzbekistan: Data Register "RACSMI-Uz"

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Abstract

In 2015, a register of acute coronary events (acute coronary syndrome and acute myocardial infarction) was carried out in one of the districts of the city of Tashkent. The study included 782 patients, of which 491 (63.7%) were analyzed (hereinafter 100%) and the remaining 291 (36.3%) were dead (according to the civil registry office). The average age of patients was 58.3 ± 7.9 years. The features of the patient's nosological structures were established separately for men and women when admitted to hospital and discharged from hospital, which will make it possible to further adjust the tactics of management of these categories of patients, taking into account their gender and other uncompensated risk factors.

Keywords: acute coronary syndrome, acute myocardial infarction, register, risk factors, men, women, arterial hypertension, obesity, diabetes

1. Introduction

The emergence of epidemiology as a science made it possible to formulate the basic principles of conducting research, which make it possible to obtain real information about the prevalence of diseases, the characteristics of their occurrence and course, outcomes, etc. [1]. One of the first major epidemiological studies in the field of cardiology was the well-known Framingham study, which revealed the main factors contributing to the development of cardiovascular diseases (CVD), as well as the role of these diseases in mortality rates [2, 3].

At the same time, epidemiological studies are not the most successful way to study a particular disease, especially when it comes to studying the characteristics of its course, outcomes, the treatment used, and its effectiveness. In the mid-twentieth century, it became clear that the most accurate method for obtaining information about the real clinical course of the disease, its outcomes, etc. in certain regions or even in individual medical institutions is the so-called registers, which are an organized system for collecting information about patients having a specific disease or receiving a specific treatment [1, 4].

For several decades, the registers of acute myocardial infarction (AMI) and, more recently, the registers of acute coronary syndrome (ACS) are regularly held in different countries of the world, and their scale varies from individual clinics (and even departments in clinics) to large regions, whole countries, and even groups of countries (international registries). Perhaps the most famous are registers such as Global Registry of Acute Coronary Events Project (GRACE), registers of the European Society of Cardiology (EHS-ACS-I, EHS-ACS-II), and CRUSADE register [5]. However, these registries do not allow a comprehensive assessment of the quality of diagnosis and treatment of arterial hypertension (AH), coronary heart disease (CHD), chronic heart failure, diabetes mellitus (DM), their combinations, etc. in actual clinical practice, to determine the structure of risk factors (RFs) and comorbidities in this category of patients.

Individual attention is required for patients with concomitant disorders of carbohydrate metabolism, in particular with the presence of DM. According to the International Diabetes Federation (IDF, 2014), at present, diabetes affects 400 million people in the world, and by 2035, their number will increase to 600 million people. It is known that DM increases the risk of developing CVD by a factor of 2–4, and mortality with a combination of CVD and DM increases four to five times [6, 7]. The paradox of DM is the increase in CVD in women and the lack of reduction in the growth of these diseases in men, in countries that have achieved significant success in the treatment of coronary artery disease (CHD) [8]. The combination of a whole cluster of rapid development and progression of atherosclerosis based on insulin resistance—hyperglycemia, dyslipidemia, AH—allowed the expert committee of the US National Cholesterol Education Program (NCEP) to equate type 2 diabetes to CHD. Today, DM is considered as equivalent to the presence of clinically significant CVD [9]. Nevertheless, against the background of modern technologies and rapidly developing interventional treatment methods for acute forms of CHD, the attention of clinicians is more focused on the treatment of the disease itself than on the causes of it or RF of its development. Used in modern clinical practice, standards for the treatment of CHD (β-blockers, BAB; angiotensin-converting enzyme inhibitors, inhibitors ACE inhibitors; aspirin, statins, antiplatelet agents, etc.), according to numerous randomized clinical trials [10], have proven to be effective, safe, and positive prognosis in this category of patients. However, there remains the question of how these drugs are regularly and consistently used by the patients themselves and what impact this has on the further course of the disease and the condition of the patients. From this perspective, the real evaluation of therapy received by patients in such practical health conditions is of great scientific and practical interest.

The foregoing implies the relevance and practical significance of the creation of the register for acute coronary syndrome and acute myocardial infarction in Uzbekistan (RACSMI-Uz), with the inclusion of patients with similar diagnoses, as well as an assessment of the interdependence of these RFs and gender characteristics. On the territory of Uzbekistan, such registers were not previously conducted; therefore, this study is not only practically interesting and relevant but also in demand.

2. Own results of research

2.1 Material and methods of research

The research material was created and processed, in accordance with the developed register protocol (map-register), a database of personal data of patients hospitalized with a diagnosis of ACS/AMI for 1 calendar (2015) year.

Data analysis of all patients with ACS/AMI during the register implied that the following conditions were:

- Patients must meet inclusion criteria.
- Patient involvement should not affect the approaches to his treatment.
- The inclusion of the patient in the register must be accompanied by his registration in the database with filling in the "register card" for each patient.

2.1.1 Inclusion criteria

The register included patients aged from 18 to 70 years old who applied to the emergency medical service, hospitalized in relevant hospitals for ACS/AMI.

- ACS and AMI were diagnosed based on generally accepted criteria.

2.1.1.1 Clinical characteristic

Complaints of patients with acute coronary insufficiency include the following:

- Frequent heartbeat.
- The pain, which is usually described as pressure, squeezing or burning in the entire left half of the chest and can be transmitted to the neck, shoulder, jaw, rear upper region of the body and to the left arm.
- Dyspnea on exertion.
- Diaphoresis (excessive sweating), due to the irritant effect of the sympathetic trunk.
- Nausea, due to stimulation of the vagus nerve.
- Severe fatigue, even with minimal exertion.

2.1.1.2 ECG diagnosis

WHO experts have suggested distinguishing between certain ECG changes, indicating a myocardial infarction, and ambiguous ECG changes that allow to suspect myocardial infarction [11]. The following ECG changes are diagnostically significant:

- New or repeated lifting of the ST segment by 1 mm or more in at least two adjacent chest leads or by 2 mm or more in two leads from the extremities. Depression of the ST segment in leads V1–V3 is considered as the equivalent of ST-elevation with suspected IM posterior localization.
- The emergence of new or deepening of existing pathological teeth Q (duration ≥30 ms and depth ≥ 1 mm in two adjacent chest leads or in two leads from the extremities). An increase in the amplitude of the R-wave in leads V1–V3 is considered as the equivalent of the Q wave in cases of suspected IM of posterior location.
- Acute blockade of the left bundle of His.
- Interpretation of the ECG dynamics against the background of changes caused by previous MI, especially in its acute period, can be very difficult. Therefore,

crucial in the diagnosis of recurrent MI acquire serum markers of necrosis. Among them, the leading role belongs to CPK, CPK-MB, and myoglobin but not troponins, since elevated levels of the latter in the blood persist for a long time and may mask their possible new rises. Re-elevation of CPK-MB above normal or 50% higher than the previous peak, or repeated elevation of total CPK or myoglobin twice as high as the upper limit of normal, allows a sufficient degree of confidence to diagnose a relapse of a heart attack.

2.1.1.3 Dynamics of myocardial damage markers

In our study, we evaluated troponin-T in a qualitative manner using a special indicator. Troponin-T is a myocardic protein, and its elevated blood level is diagnosed 2–3 h after a heart attack. The maximum amount of protein is detected 10 h after the onset of the attack. Troponin-T is preserved in the blood during a heart attack at a very high level for quite a long time—up to 7 days. Troponin-T refers to cardiospecific markers, which make it possible to determine undiagnosed infarction that has passed in a patient without clearly expressed symptoms and who does not have pronounced signs according to the ECG results. The test is very simple to use. Two to three drops of the patient's blood are applied to a special indicator. You can evaluate the result of the study in 10–15 min. When staining two bands on the indicator, we can conclude that the patient suffered a heart attack. If only one lane turned out to be colored, then health problems are caused by other causes and pathologies [12].

2.1.2 Exclusion criteria

- Age under 18 and over 70 years

2.1.2.1 Statistical analysis

Statistical processing of the results was carried out on a Pentium-IV personal computer using the STATISTICA 6 software package. Calculate the arithmetic mean (M) and root-mean-square (standard) deviation (SD).

In our study to avoid statistical inaccuracy, the analysis was accompanied by a check on the normal distribution of clinical signs.

To compare the arithmetic means of the two groups, the t-student test was used. To assess the presence of relationships between indicators, a correlation analysis was performed with the calculation of the Pearson correlation coefficient. To analyze the reliability of differences between qualitative signs, the $\chi 2$ criterion was used.

2.1.2.2 Ethical aspects

The study was conducted in accordance with the principles of the Helsinki Declaration.

2.2 Comparative analysis of the results of the register "RACSMI-Uz" depending on gender

For a comparative analysis of clinical and anamnestic data, as well as determining patient adherence to medical recommendations, depending on gender two groups of patients were allocated: 1g = 243 male patients and 2g = 206 female patients.

The study found that men with ACS/AMI were younger than women. The age difference was due to the fact that among men, patients younger than 50 years prevailed. Namely, the age category up to 40 years in the group of men was 3.3% and in the group of women = 0.5% (p = 0.076 и $\chi 2$ = 2157); the number of men aged 41–50 years was 20.6% and among women = 12.1% (p = 0.024 и $\chi 2$ = 5116).

On the contrary, age categories 51–60 years and 61+ were priority for females. In particular, the number of men aged 51–60 turned out to be 36.2%, and the number of women = 40.3%; the number of men in the 60+ category turned out to be 39.9% and for women = 47.1%. This was confirmed during the correlation analysis (**Figure 1**).

The calculation of body mass index (BMI) was carried out in a total of 225 patients, of whom 125 were men and 100 women. Analysis of BMI by sex found that normal weight in men was observed in 17.6% and in women—in 15.0% of cases. However, being overweight, i.e., BMI values from 25 to 30 kg/m^2 were recorded in men much more often than in women (52.8 and 37.0%, respectively, men and women, p = 0.001 и $\chi 2$ = 10,573). Obesity of varying severity, in contrast, was more often observed in women than in men (**Table 1**). This was confirmed during the correlation analysis (**Figure 2**).

Thus, depending on gender, it was found that ACS/AMI was more often recorded in men, amounting to 54.1%; the incidence of ACS/AMI among women was 45.9%. In the age aspect, men with ACS/AMI were younger than women, and in terms of weight characteristics, obesity of various severity prevailed among women (48.0% in women vs. 29.6% in men, p = 0.007).

According to anamnestic data, postponed cardiovascular catastrophes were more often observed in males. Namely, the transferred myocardial infarction (TMI) was noted by men 1.8 times more often than women (p = 0.0000 и $\chi 2$ = 14,282); the

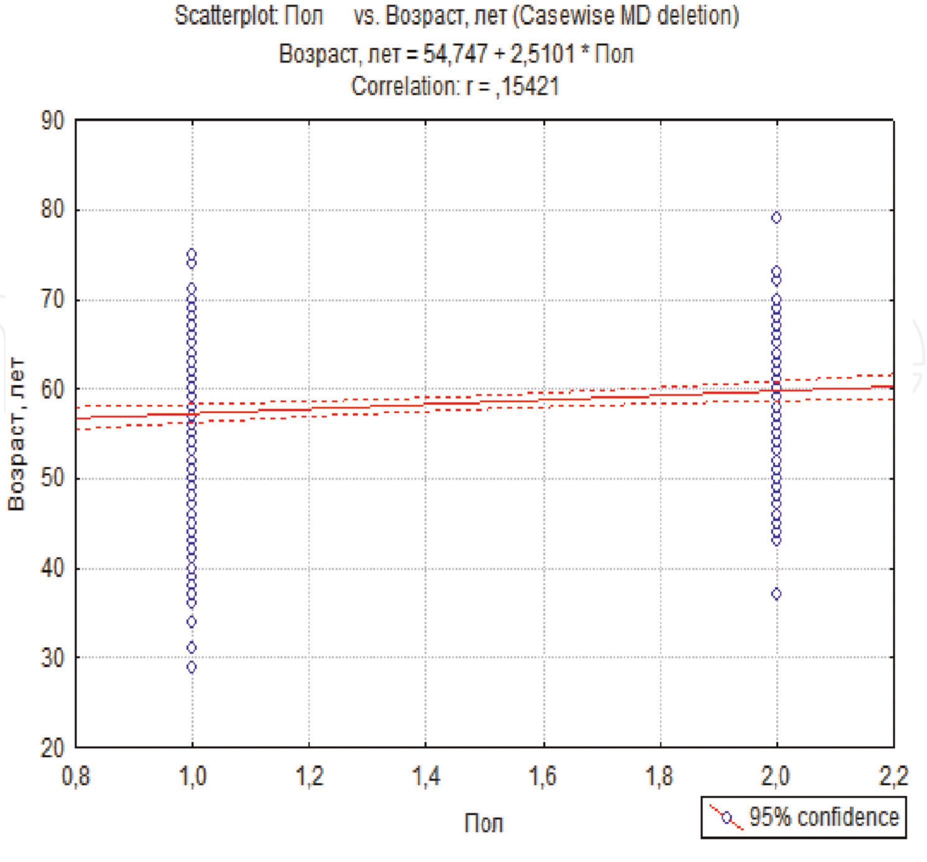

Figure 1.
Graph of correlation between gender and age of patients. p = 0.001; r = 0.154; t = 3.277. On the X-axis, the numeral "1"—male gender, and the numeral "2"—female gender; Y-axis, age of patients in years.

Indicator	Men (n = 243)	Women (n = 206)	p	χ2
Age, years	57.3 ± 8.6	59.8 ± 7.3	**0.001**	
Weight, kg	83.5 ± 11.2	79.2 ± 14.2	**0.012**	
Height, cm	171.7 ± 5.2	162.9 ± 6.1	**0.000**	
BMI, kg/m^2	28.4 ± 3.7	29.7 ± 4.6	**0.020**	
BMI measurement carried out, n (%)	**125 (51.4%)**	**100 (48.5%)**		
Normal weight, %	17.6	15.0	0.732	0.117
Excess weight (BMI = 25.1–30.0 kg/m^2), %	52.8	37.0	**0.026**	**4.969**
Obesity 1 degree (BMI = 30.1–35.0 kg/m^2), %	26.4	35.0	0.211	1.562
Obesity of 2 degrees, (BMI = 35.1–40.0 kg/m^2), %	2.4	10.0	**0.032**	4.581
Obesity of 3 degrees, (BMI ≥ 40.1 kg/m^2), %	0.8	3.0	0.458	0.550

Notes: n, the number of patients; p and χ2, significance of differences between groups; BMI, body mass index

Table 1.
Anthropometric characteristics of patients.

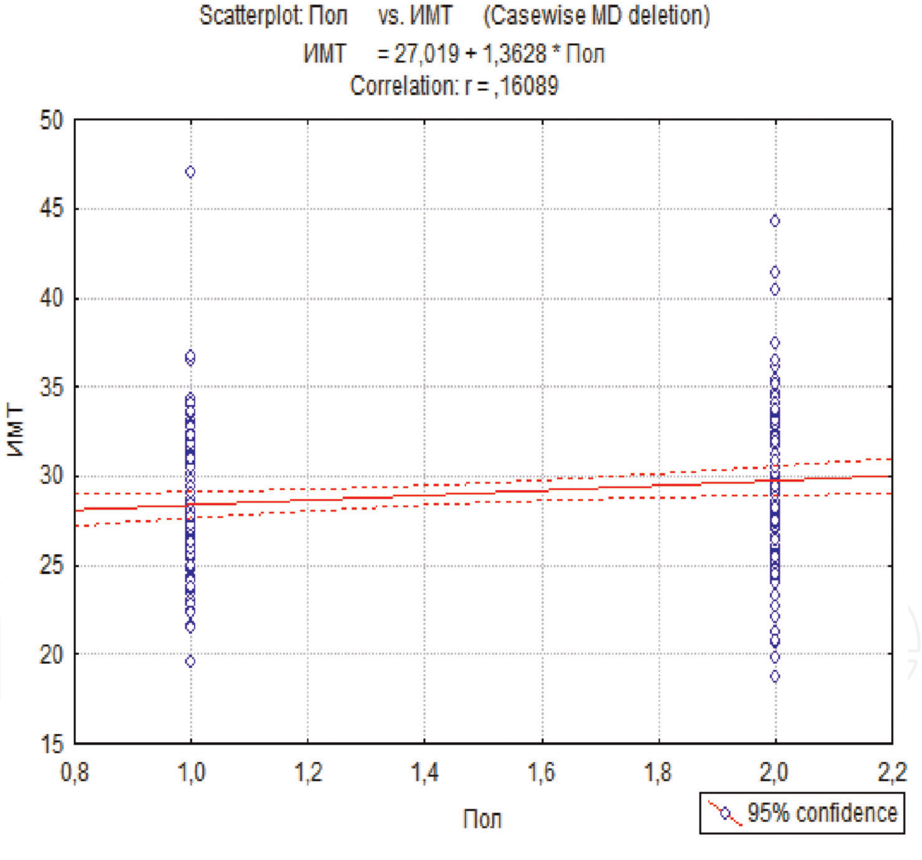

Figure 2.
Graph of correlation between gender and BMI of patients. p = 0.015; r = 0.161; t = 2.434. On the X-axis: The numeral "1"—male gender and the numeral "2"—female gender; Y-axis: BMI, body mass index in kg/m^2.

presence of a stroke in men was 1.7% more than in the female group; percutaneous coronary interventions (PCI) or coronary artery bypass surgery (CABG) in men was 11.5%, which was 3.3% more than in women (**Figure 3**).

The average age of women with TMI was 61.5 ± 7.8 years and of men = 58.4 ± 8.4 years (p = 0.041); on the contrary, the age of women with stroke was 59.6 ± 9.5 years and for men = 61.3 ± 7.1 years (p = 0.204).

The age of persons with cardiac surgery did not depend on any gender dependency: for women = 57.7 ± 7.1 years and for men = 58.6 ± 5.6 years (p = 0.246). Despite the fact that men with a history of TMI were younger, nevertheless, they were more likely to have stenotic contractions of ≥50%; however, revealed differences did not reach significance level.

The analysis of RFs is presented in **Figure 3**, from which it is clear that smoking, hypertension, and hypercholesterolemia (HChE) prevailed among men. In women, the main RFs were disorders of both carbohydrate and lipid metabolisms, hypertension, and obesity. The difference in RFs—smoking, impaired carbohydrate metabolism, and obesity—reached a statistically significant level (**Figure 4**). However, the total component of the RFs for the averaged value in women was less than in men: the average number of RFs in men = 3.6 ± 1.2 and in women = 2.4 ± 1.1 (p = 0.0000).

Thus, with ACS/AMI, gender-independent RFs turned out to be AH and HChE and gender-related—smoking (for men) and carbohydrate metabolism disorders and obesity (for women). The transferred of cardiovascular accidents was prerogative of males, while age was a controversial point in the development of this or that damage (TMI occurred in younger men and stroke in older men, compared to women).

The next stage of the study was an assessment of the patients' adherence to therapy, depending on gender. From these positions, there were no statistically significant differences between the groups. The average number of medications taken per day among men was 2.2 ± 1.7 per person and among women = 2.2 ± 1.6, respectively (p = 1.000). The substantive aspect of conservative therapy is presented in **Figure 5**, from which it can be seen that both men and women had approximately the same proportions for the main groups of drugs taken, but the difference did not reach significance level.

However, when calculating quantitative values, it was found that, in general, the female population turned out to be more committed to pharmacotherapy than the male population (the number of committed women was 80.6% against men = 75.7%, p = 0.261, and $\chi 2$ = 1.264). At the same time, the women's group prevailed in taking

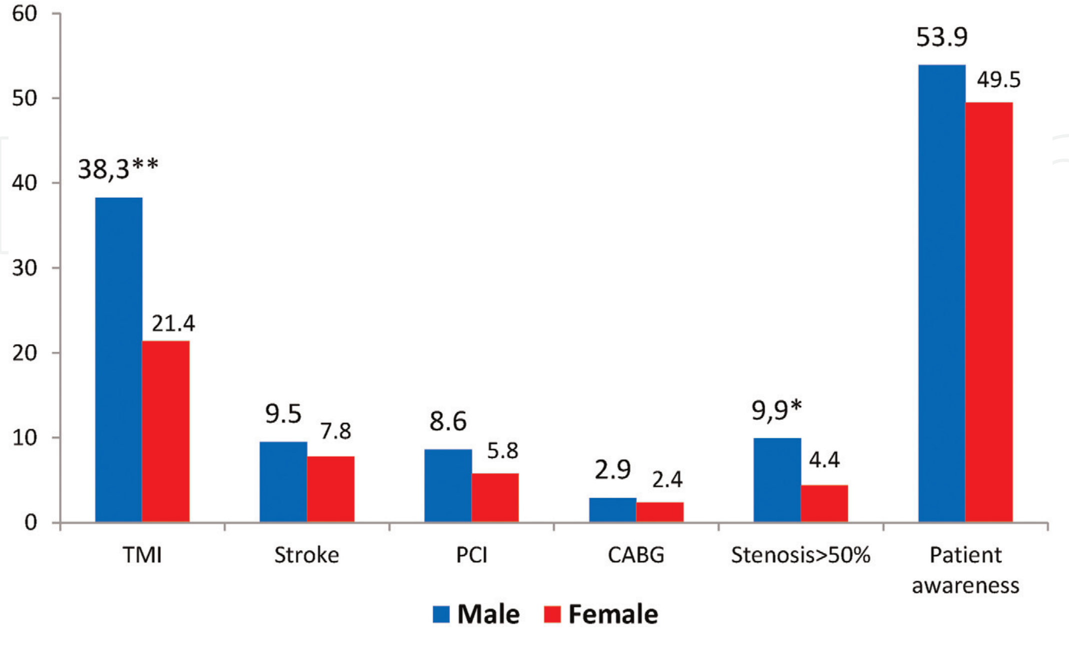

Figure 3.
*Anamnestic patient characteristics. Note: *significance of differences between groups at p < 0.05; **significance of differences between groups at p < 0.001; TMI, transferred myocardial infarction; PCI, percutaneous coronary intervention; CABG, coronary artery bypass grafting; presence of stenosis ≥ 50%; patient awareness of the presence of a cardiovascular pathology; data are presented in percentage.*

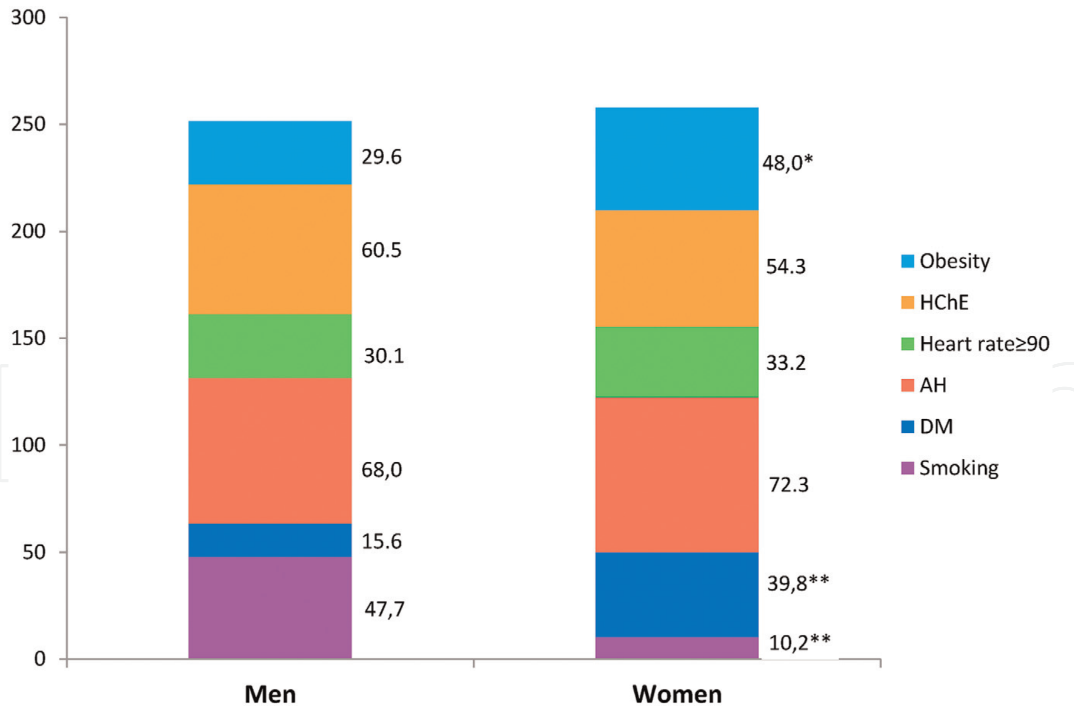

Figure 4.
*Risk factors by gender. Note: Data are presented in percentage; **significance of differences between groups with $p < 0.001$ and *a tendency to significance of differences between groups ($p = 0.057$).*

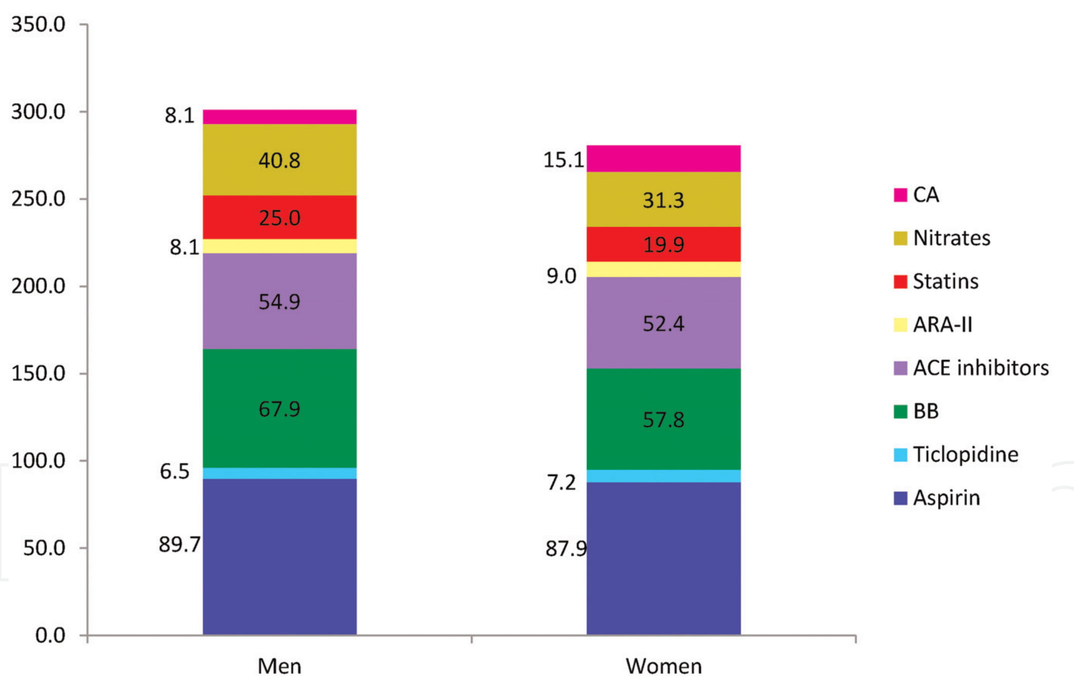

Figure 5.
The main groups of medications taken, depending on gender. Note: the data are presented in percentage, all $p > 0.05$; ARA-II, angiotensin receptor antagonists-II; CA, calcium antagonists; BB, beta blockers.

from 1 to 3 medicines per day, men's—from 4 or more pharmaceuticals per day, but the difference did not reach the level of confidence (**Table 2**).

A correlation analysis revealed that adherence to therapy increases with age, regardless of gender (**Figure 6**).

Thus, this fragment of the study showed that women's adherence to therapy was slightly higher than that of men; men were prone to taking more drugs, although the proportional ratio between the groups of drugs taken was not significantly

The number of medications taken per day	Men (n = 184)	Women (n = 166)	p	χ2
1 drug, %	17.4	20.5	0.548	0.362
2 drugs, %	20.6	22.3	0.809	0.059
3 drugs, %	26.1	29.5	0.551	0.356
4 drugs, %	23.9	19.9	0.435	0.609
5 drugs, %	9.8	6.6	0.381	0.766
6 and more drugs, %	2.2	1.2	0.776	0.081

Table 2.
Distribution of patients according to the daily ration of medications among men and women.

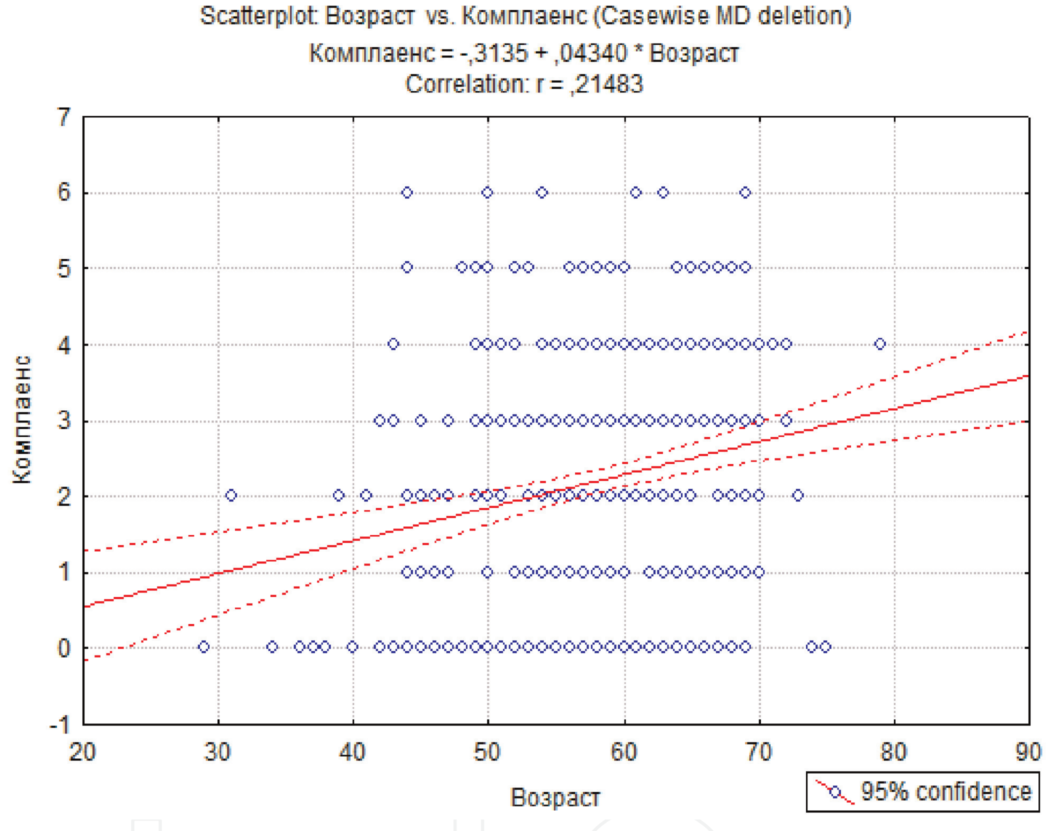

Figure 6.
Graph of correlation between age of patients and adherence to therapy. p = 0.000; r = 0.214; t = 4619. On the X-axis, age in years; on the Y-axis, the number of drugs taken per day.

different between men and women. However, a direct correlation was found between the age of the respondents and the number of medications taken per day.

2.3 The relationship of arterial hypertension with acute coronary events (a fragment of the study "RACSMI-Uz")

To assess the effect of hypertension, two groups were formed: group 1—47 respondents without hypertension (control group) and group 2—385 people with the presence of hypertension with varying severity. The groups were comparable in age and sex, as well as height-weight parameters. The distribution of individuals according to BMI established that the number of patients with overweight in the group with AH was significantly higher than in the control group ($p = 0.019$; $\chi 2 = 5.520$), and the number of patients with AH and normal weight was almost two times less than in the control group (**Table 3**).

Indicators	Group 1 (control) n = 47	Group 2 (with the presence of AH) n = 385	p	χ2
Age, years	57.1 ± 9.8	58.6 ± 7.9	0.233	
Number of men, %	59.6%	53.9%		
Weight, kg	80.7 ± 16.6	81.7 ± 12.4	0.617	
Height, cm	168.4 ± 4.8	167.8 ± 7.3	0.583	
BMI, kg/m^2	28.5 ± 5.9	29.1 ± 4.1	0.370	
Normal weight, %	29.8	15.1	0.019	5.520
Obesity 1 degree, %	36.2	46.2	0.249	1.331
Obesity 2 degree, %	25.5	37.1	0.160	1.976
Obesity 3 degree, %	8.5	1.6	0.013	6.143

Notes: n, number of patients; AH, arterial hypertension; %, percentage of patients with this symptom; BMI, body mass index

Table 3.
Comparative characteristics of patient growth and weight indicators depending on the presence of arterial hypertension.

Analysis of anamnestic data showed that in group 2, individuals with myocardial infarction prevailed (33.2 and 8.5%, respectively, in groups 2 and 1; p = 0.000 and χ2 = 10.941). Also, hypertension was significantly more frequently accompanied by the development of chronic heart failure (53.3 and 23.4%, respectively, in groups 2 and 1; p = 0.000 and χ2 = 13.751). Patients with hypertension who underwent PCI or CABG were noted in 7.3 and 3.1% of cases, while in the control group, the corresponding figures were 8.5 and 0% (p = 0,110 и χ2 = 2554). The presence of stenoses >50% in the coronary vessels in the first group was detected in 4.3% of patients and in the second group—in 7.8% of the respondents (p = 0.562 и χ2 = 0.225). An individual conversation awareness of patients of acute coronary disease has been established in 53.5% of patients with hypertension and 38.3%—in the control group (p = 0.069; χ2 = 3.295). Analysis of bad habits did not reveal significant differences between groups. The number of nonsmokers among patients with hypertension was 59.5% and in the comparison group—55.3%. The number of smokers in group 2 was 24.1 and 25.5% in group 1; the number of people who stop smoking in group 2 was 16.4% and in 1 group—19.2%.

The clinical characteristics included in this fragment of patients showed that the average values of heart rate (HR) in both compared groups practically did not differ; however, HR > 80 beats/min among patients with AH was observed in 49.9% of cases, which is 1, five times more than in people without AH (**Table 4**).

Of the concomitant nosologies, the presence of type 2 diabetes mellitus (DM) among control group patients occurred in 4.3% and among patients with hypertension—in 34.8% of patients, while the average blood glucose level in group 1 was 5.8 ± 2.6 mmol/L and in group 2 = 6.3 ± 2.9 mmol/L (p = 0.260). Evaluation of the blood glucose level only in patients with DM showed that in the group with hypertension, this indicator was equal to 8.4 ± 3.5 mmol/L, which was 0.7 mmol/L higher than in the first group (p = 0.194).

Significant, but somewhat paradoxical, differences were found in the evaluation of blood lipid spectrum. Namely, the number of patients with hypercholesterolemia was 1.5 times higher among patients of the first group, i.e., without hypertension, which was confirmed by digital indicators in blood tests. However, the average level of triglycerides among respondents without AH was 1.5 times lower than in the comparison group (**Table 5**).

Indicators	Group 1 (control) n = 47	Group 2 (with the presence of AH) n = 385	p	χ2
HR > 80 beats/min	34.1	49.9	0.058	3.593
Average HR, beats/min	80.8 ± 16.7	84.6 ± 18.2	0.174	
The average HR in patients with HR > 80 beats/min	97.7 ± 15.8	96.3 ± 17.4	0.599	
Mean SBP, mm Hg	115.9 ± 10.1	143.8 ± 27.7	**0.000**	
Mean DBP, mm Hg	75.1 ± 9.3	87.1 ± 13.8	**0.000**	

Notes: n, the number of patients; SBP and DBP, systolic and diastolic blood pressure

Table 4.
Comparative characteristics of hemodynamic parameters of patients depending on the presence of arterial hypertension.

Indicators	Group 1 (control) n = 47	Group 2 (with the presence of AH) n = 385	p	χ2
The number of patients with normal levels of TCh	19.2%	46.2%	**0.000**	11.438
The average level of TCh, mg/dL	205.6 ± 46.6	156.7 ± 92.9	**0.000**	
The average level of TCh in patients with HChE	221.25 ± 36.1	205.1 ± 82.6	0.186	
The number of patients with HChE	80.8%	53.8%	**0.000**	11.438
The average level of TG, mg/dL	143.1 ± 80.7	211.7 ± 186.2	**0.013**	

Notes: n, the number of patients; TCh, total cholesterol; HChE, hypercholesterolemia; TG, triglycerides

Table 5.
Lipid blood spectrum of the compared patient groups.

Analysis of the main ECG changes in ACS/AMI in the studied patient groups revealed that for individuals with hypertension, the most characteristic are ST-segment depression (35.6% in 2 g and 25.5% in 1 g; p = 0.228; χ2 = 1.455) and inversion of the T-wave without ST-displacement (16.3% in 2g and 8.5% in 1g; p = 0.234; χ2 = 1.418), while ST-elevation was observed <15% of cases (**Figure** 7).

The distribution of patients of group 2 according to the level of BP showed that optimal, normal, and high-normal BP occurred in 37.7% of cases, and in the remaining 62.3%, there was AH of varying severity (**Figure 8**). The distribution of optimal, normal, and high-normal levels of BP in the second group is probably due to received antihypertensive therapy.

An in-depth comparative assessment of the clinical and functional parameters of patients depending on the degree of AH showed that in patients with grade 2 hypertension, the number of patients with DM was much higher than among patients with grade 1 hypertension or grade 3 hypertension, but the average blood glucose level was not a significant difference. It was also found that over 50% of patients with AH, regardless of its degree, were characterized by elevated heart rate.

However, the correlation analysis did not reveal the relationship between HR and BP values (p = 0.564; t = −0.576). In addition, patients with hypertension had elevated levels of blood triglycerides, especially those with hypertension first and third degree (p = 0.0000); however, indicators of total cholesterol were lower than

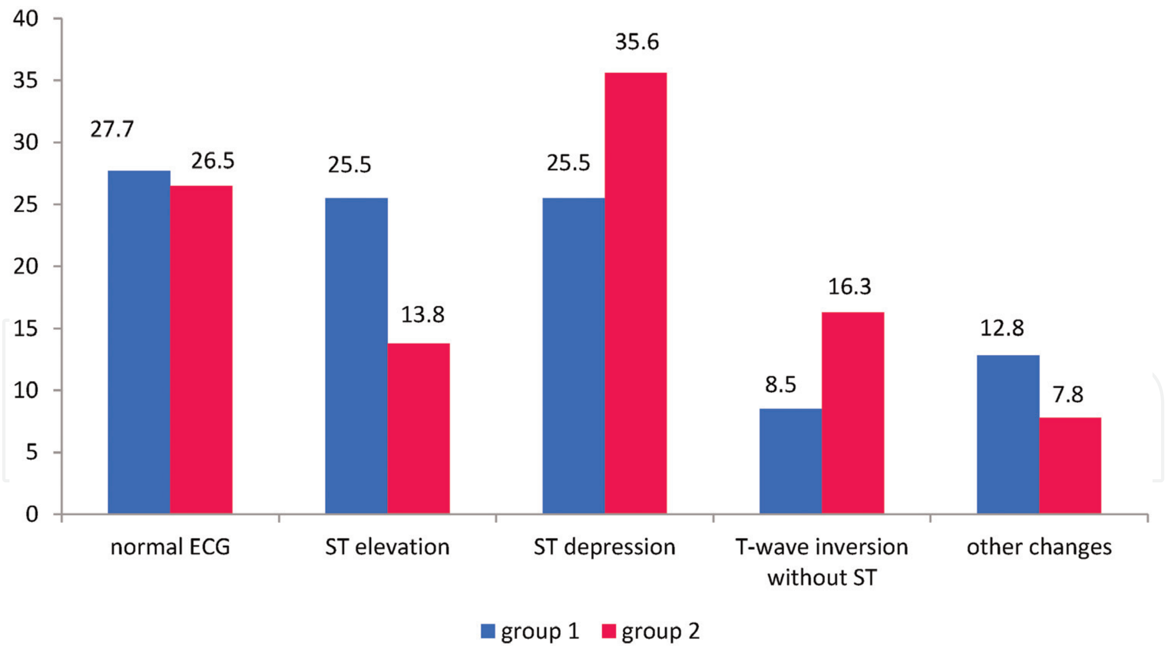

Figure 7.
The occurrence of ECG changes in the compared groups of patients (%).

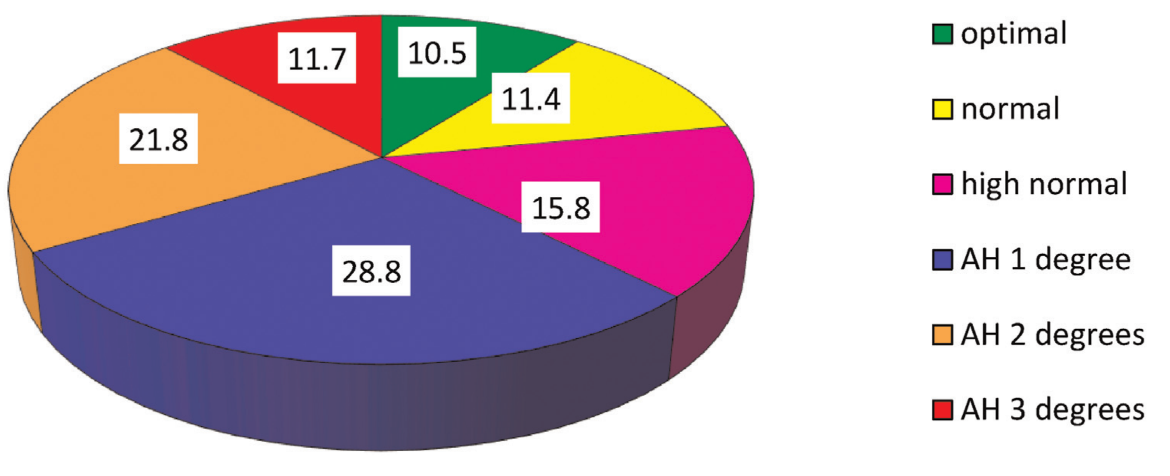

Figure 8.
Distribution of patients in group 2 by blood pressure levels.

in the control group. When comparing the lipid spectrum with the blood pressure numbers, no correlation dependence was found. According to ECG parameters, there were no significant differences in the analyzed patients; with the exception of ST-elevation, the phenomenon of which was less frequently observed among respondents with AH 2 degree (**Table 6**).

The evaluation of the treatment of patients with AH, regardless of its severity, showed that all patients in this category took on average 2.4 ± 1.6 drugs, which was two times higher than in the control group; however, antihypertensive drugs such as BB and ACE inhibitors among people with AH were used much more often than in the control group (**Table 7**).

2.4 Comparative analysis of patients with acute coronary events depending on the presence/absence of diabetes mellitus (data from the "RACSMI-Uz" registry)

To assess the impact of DM, two groups were identified: group 1, 207 respondents without diabetes (control group), and group 2, 159 people with DM, of which

Indicators	**Control group (n = 47)**	**Patients with AH 1 (n = 105)**	**Patients with AH 2 (n = 79)**	**Patients with AH 3 (n = 42)**
Age, years	57.1 ± 9.8	58.8 ± 7.9	60.2 ± 6.6*	58.9 ± 7.3
Number of men, % of patients	59.6	55.2	41.8	57.1
BMI, kg/m2	28.5 ± 5.9	29.1 ± 3.8	27.9 ± 3.1	30.3 ± 4.9
DM, % of patients	4.3	29.5*	38**	30.9*
The average level of blood glucose, mmol/L	5.8 ± 2.6	6.1 ± 2.4	6.1 ± 2.2	6.0 ± 2.4
HR > 80 beats/min, % of patients	34.1	58.1*	55.7*	59.5*
Average HR, beats/min	80.8 ± 16.7	84.3 ± 13.7	85.5 ± 16.4	84.8 ± 12.7
Characteristics of BP				
Mean SBP, mm Hg	115.9 ± 10.1	143.7 ± 4.9**	162.2 ± 4.1**	193.8 ± 21.3**
Average DBP, mm Hg	75.1 ± 9.3	89.1 ± 7.0**	95.9 ± 7.3**	101.7 ± 17.3**
The average level of TCh, mg/dL	205.6 ± 46.6	177.3 ± 82.5*	1977 ± 45.2	167.3 ± 31.5**
The average level of TG, mg/dL	146.1 ± 80.7	222.5 ± 188.7*	160.1 ± 53.4	232.3 ± 45.3**
ECG changes				
Normal ECG, %	27.7	27.6	24.1	28.6
Elevation ST, %	25.5	12.4	6.3*	14.3
Depression ST, %	25.5	42.9	40.5	40.5
Inversion of the T-wave without ST, %	8.5	14.3	20.2	9.5
Other changes	12.8	2.8%*	8.9	7.1
Commitment to therapy				
The average number of medications taken	1.2 ± 1.5	2.4 ± 1.5**	2.4 ± 1.6**	2.7 ± 1.7**
BB, %	27.7	53.3*	48.1*	54.8*
ACE inhibitors/ARA, %	17.0/0	46.7/8.6**	51.9/3.8*	57.1/7.1**
Calcium antagonists	6.4	11.4	6.3	14.3
Aspirin	40.4	74.3**	74.7**	80.9**
Nitrates	17.0	22.9	31.6	47.6*
Statins	10.6	19.1	20.2	11.9

**significance of differences in comparison with the control group at $p < 0.05$*
***the significance of differences in comparison with the control group at $p < 0.001$Notes: OH, total cholesterol; TG, triglycerides; BB, β-blockers; ACE inhibitors, angiotensin-converting enzyme inhibitors; ARA, angiotensin II receptor antagonists.*

Table 6.
Comparative analysis of clinical and functional parameters depending on the degree of hypertension.

41.5% had diabetes compensated by diet, 38.4% had diabetes compensated by taking hypoglycemic drug tablets, 6.9% had diabetes compensated by insulin intake, and 13.2% had newly diagnosed type 2 diabetes.

Indicator	Group 1 without DM (n = 207)	Group 2 with DM (n = 159)	p	χ2
Number of men, %	62.3	46.5	**0.004**	**8.435**
Number of women, %	37.7	53.5		
The average age of men, years	57.1 ± 8.9	58.7 ± 8.1	0.208	
The average age of women, years	58.6 ± 7.7	61.2 ± 6.9*	**0.024**	
Weight, kg	80.1 ± 11.2	83.8 ± 13.5	**0.004**	
Height, cm	168.4 ± 6.6	168.7 ± 6.9	0.673	
BMI, kg/m^2	28.2 ± 3.5	30.2 ± 4.6	**0.000**	
Obesity, n (%)	80.7	87.4	0.113	2.513
Normal weight (BMI = 18–24.9 kg/m^2), %	19.3	12.6		
Excess weight (BMI = 25–29.9 kg/m^2), %	52.2	35.2	**0.002**	**9.777**
Obesity grade (BMI = 30–34.9 kg/m^2), %	25.6	39.6	**0.006**	**7.529**
Obesity grade 2 (BMI = 35–39.9 kg/m^2), %	2.9	8.8	**0.020**	**5.450**
Obesity grade 3 (BMI ≥40 kg/m^2), %	0	3.8	**0.016**	**5.774**

**p = 0.036 in the intragroup comparison of the average age of men and women*
Note: BMI, body mass index; n, the number of patients; DM, diabetes mellitus

Table 7.
Gender-anthropometric characteristics of compared groups of patients.

The study found that patients in group 2 were much older than patients in group 1 (mean age of patients in group 1 = 57.7 ± 8.5 years and in group 2 = 60.1 ± 7.6 years; p = 0.005). The age difference was due to the predominance of young people in group 1. Namely, the category of ≤45 years in group 1 was 9.7%, and in group 2–3.8% (p = 0.049 и χ2 = 3874) of respondents (**Figure 9**).

On the contrary, in group 2 the number of patients older than 66 years was greater than in the comparison group (28.9 vs. 21.7%, p = 0.170 и χ2 = 1880).

The average age of men was younger than the average age of women, regardless of the presence or absence of diabetes. This difference in group 2 reaches the level of confidence (**Table 7**). Correlation analysis between age and the presence of DM has established a direct relationship (**Figure 10**).

Gender-anthropometric characteristics of patients are presented in **Table 7**, from which it can be seen that in group 2, the number of women was greater than in group 1, and the weight characteristics of patients in group 2 exceeded those in patients of the comparison group. A more detailed analysis found that among persons with DM, obesity of varying severity was more common (52.2 vs. 28.5%, respectively, in groups 2 and 1; p = 0.000 и χ2 = 20,284).

A correlation analysis revealed a direct relationship between blood glucose and BMI, as well as between gender and diabetes, while in the latter case, the correlation reached a statistically significant level (**Figures 11** and **12**).

BP was measured in 94.7% of respondents in the first group and in 95.6% in the second group: a total of 348 patients. The mean figures of both systolic and diastolic BP were comparable between the groups, as well as the quantitative components of the main gradations of BP. The presence of AH in individuals of group 1 was in 48.3% of cases, and in group 2—in 49.7% of cases (**Table 8**). When carrying out the correlation analysis, we did not reveal any relationship between the blood glucose level and the BP values.

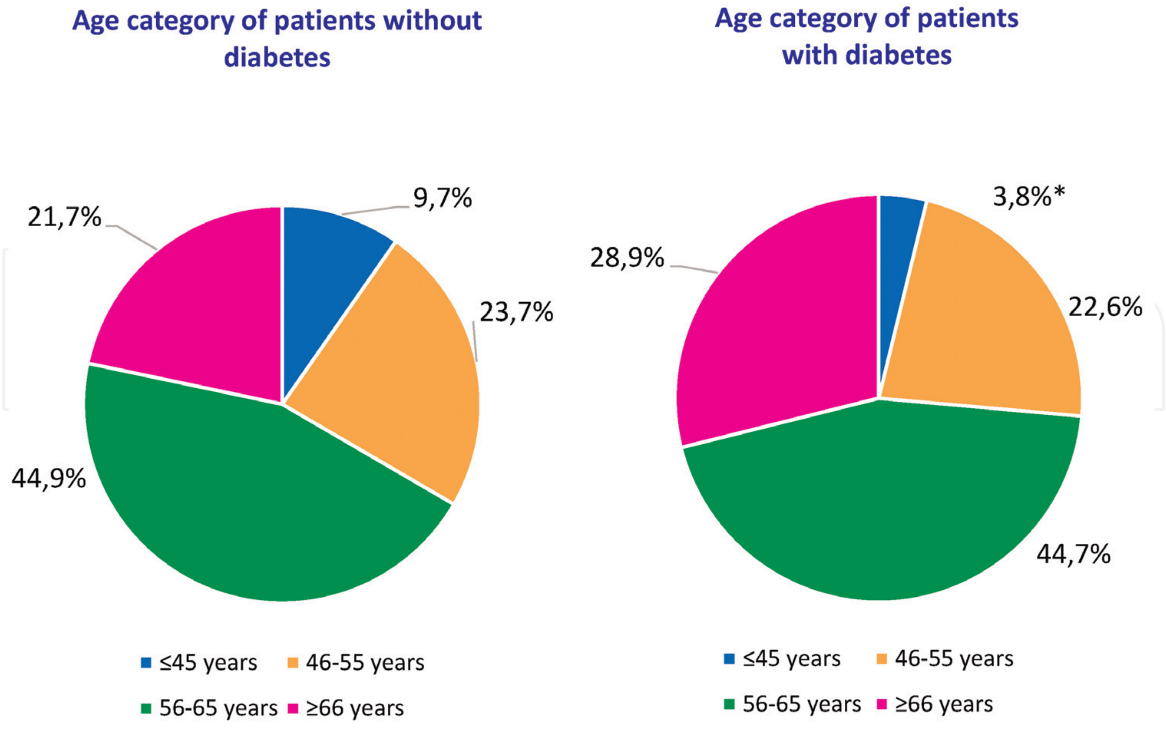

Figure 9.
*The distribution of patients by age. *significance of differences between groups at $p < 0.05$.*

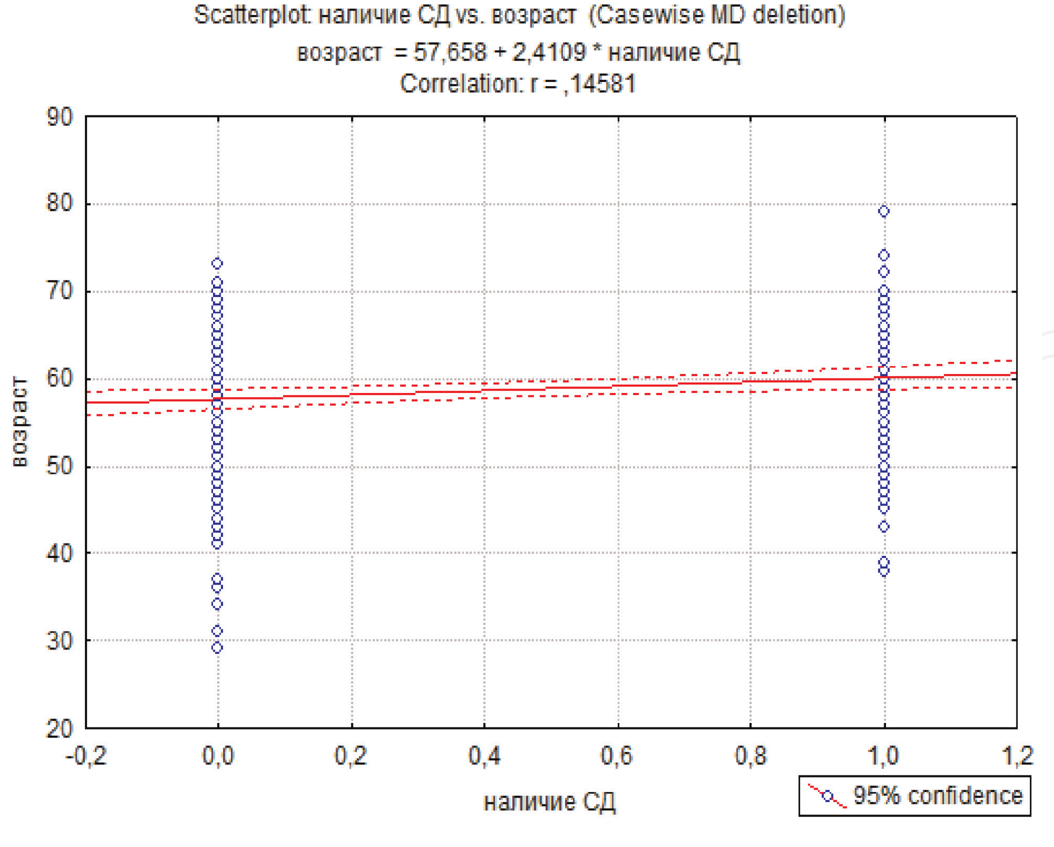

Figure 10.
Graph of correlation between the presence of diabetes and age of patients. $p = 0.005$; $t = 2781$; $r = 0.145$. On the X-axis, "0" is the absence of SD and "1" is the presence of SD; on the Y-axis, age of patients in years.

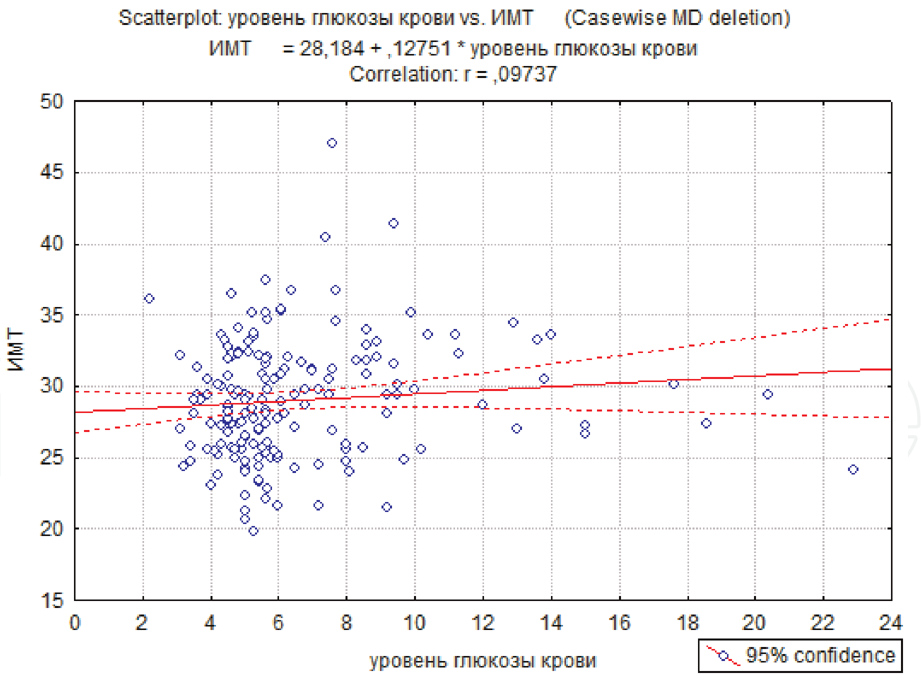

Figure 11.
The graph of the correlation between the level of blood glucose (mmol/L): X-axis and body mass index (kg/m²); Y-axis, p = 0.202; t = 1.279; r = 0.097.

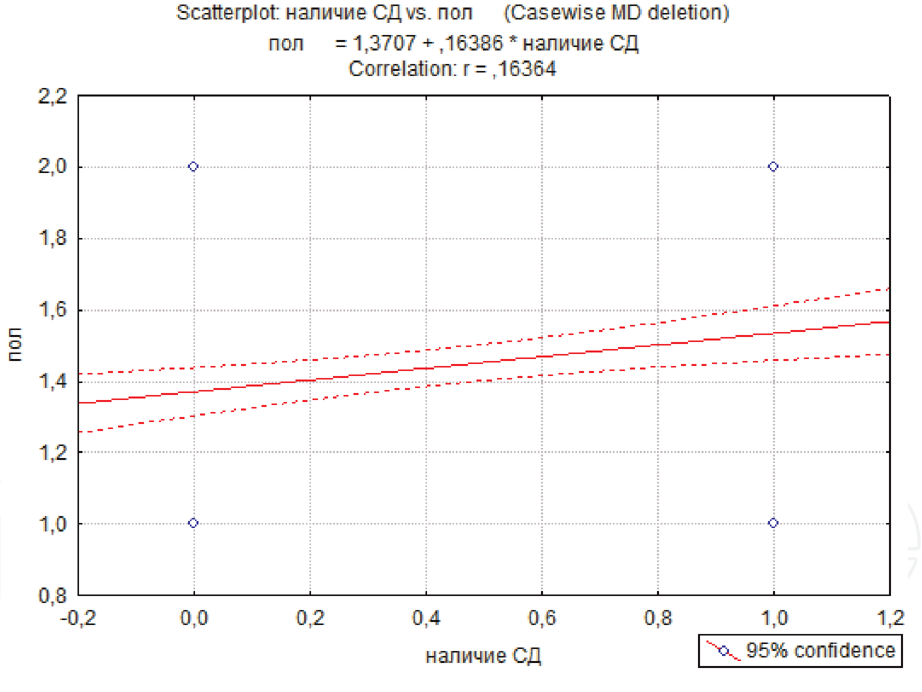

Figure 12.
Graph of correlation between the presence of DM and gender. p = 0.001; t = 3.156; r = 0.163. On the X-axis, "0" is the absence of DM and "1" is the presence of DM; on the Y-axis, "1" men and "2" women.

Analysis of lipid metabolism was carried out in 1/5 of the subjects, 40 of them from group 1 and 36 from group 2. In this aspect, it was found that the levels of total cholesterol in group 1 = 187.8 ± 51.5 mg/dL and in group 2 = 199.1 ± 47.8 mg/dL (p = 0.326). The number of patients with total cholesterol over 180 mg/dL in the first group was 55.0% and in the second group—61.1% of patients, while the average level of total blood cholesterol in the first group = 222.1 ± 40.2 mg/dL and in group 2 = 224.1 ± 43.6 mg/dL (p = 0.514).

Indicator	Group 1 without DM (n = 196)	Group 2 with DM (n = 152)	p	χ2
Mean SBP, mm Hg	138.8 ± 29.4	138.3 ± 28.4	0.873	
Mean DBP, mm Hg	85.0 ± 15.9	83.9 ± 14.0	0.501	
Optimal BP < 120 mm Hg, %	15.8	19.7	0.417	0.659
Normal BP, 120–129 mm Hg, %	15.3	15.1	0.916	0.011
High-normal BP, 130–139 mm Hg, %	17.9	13.2	0.297	1.090
AH-1 degree, 140–159 mm Hg, %	25.5	21.7	0.485	0.487
AH-2 degrees, 160–179 mm Hg, %	15.8	20.4	0.334	0.933
AH-3 degrees, ≥180 mm.rt.st., %	9.7	9.9	0.898	0.016

Notes: n, the number of patients; SBP/DBP, systolic/diastolic blood pressure; DM, diabetes mellitus; AH, arterial hypertension

Table 8.
Blood pressure indicators depending on the presence or absence of diabetes.

Analysis of blood triglyceride levels revealed a clear prevalence of this indicator in patients with diabetes (159.8 ± 83.1 mg/dL in the first group and 261.9 ± 217.85 mg/dL in the second group, $p = 0.015$). The number of patients with hypertriglyceridemia in group 1 was 17.5% and in group 2—41.7% of patients ($p = 0.054$; $\chi 2 = 3.701$), while the content of blood triglycerides in group 1 = 283.0 ± 90.1 mg/dL for and in group 2 = 426.2 ± 222.6 mg/dL ($p = 0.120$). When carrying out the correlation analysis, a directly proportional relationship was established; i.e., an increase in blood glucose levels is directly correlated with an increase in blood triglyceride levels, while the dependence was not so pronounced with total cholesterol (**Figures 13** and **14**). From the above, it follows that the presence of diabetes is associated with dyslipidemia, in particular with hypertriglyceridemia.

From anamnestic data, it was found that chronic heart failure was more often observed among patients of group 2 (56.0 vs. 45.4% of cases in groups 2 and 1, respectively, $p = 0.058$, $\chi 2 = 3.603$). 34.8% in the first group and 31.4% of patients in the second group were indicated on the transferred AMI in the anamnesis. Previously, PCI/CABG was observed in 9.2 and 3.4% of respondents in group 1 and 9.4 and 1.9% of persons in group 2. However, stenosis >50% was more common in patients with diabetes than in the comparison group (78.9% in group 1 and 93.3% in group 2, $p = 0.005$, $\chi 2 = 7.905$).

One of the fragments of the study was the analysis of thrombolytic therapy (TLT). From this perspective, it was found that TLT in group 1 was performed in 54.1% and in group 2 in 59.1% of patients. At the same time, the success of the TLT procedure in group 1 was 62.5% and in group 2—60.6%. This was also confirmed during the correlation analysis, which showed that the blood glucose level did not affect the success of the TLT procedure ($p = 0.944$; $t = 0.069$; $r = 0.005$). However, a more detailed analysis found that among patients of group 2, the form of DM is of considerable importance when conducting TLT. **Figure 15** presents a graph of the correlation dependence between various forms of DM and the success of TLT. As can be seen in **Figure 15**, the TLT procedure was more successful in patients who are on glucose-lowering drugs, including insulin therapy, and in patients with newly diagnosed forms of the disease (**Figure 15**).

Thus, in patients with ACS/AMI, comorbid with diabetes, the success of thrombolysis was directly dependent on the form of diabetes and ongoing antidiabetic therapy.

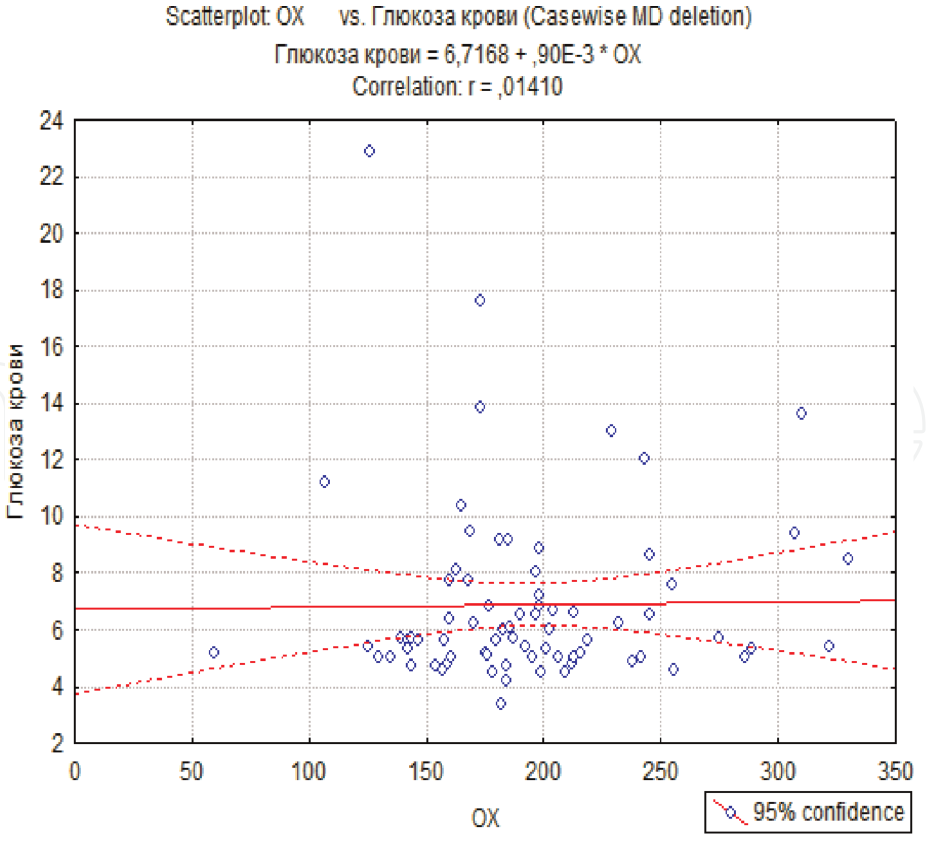

Figure 13.
The graph of the correlation between the level of blood glucose and total cholesterol (n = 76). p = 0.905; t = 0.119; r = 0.014; X-axis, total cholesterol values; Y-axis, blood glucose values.

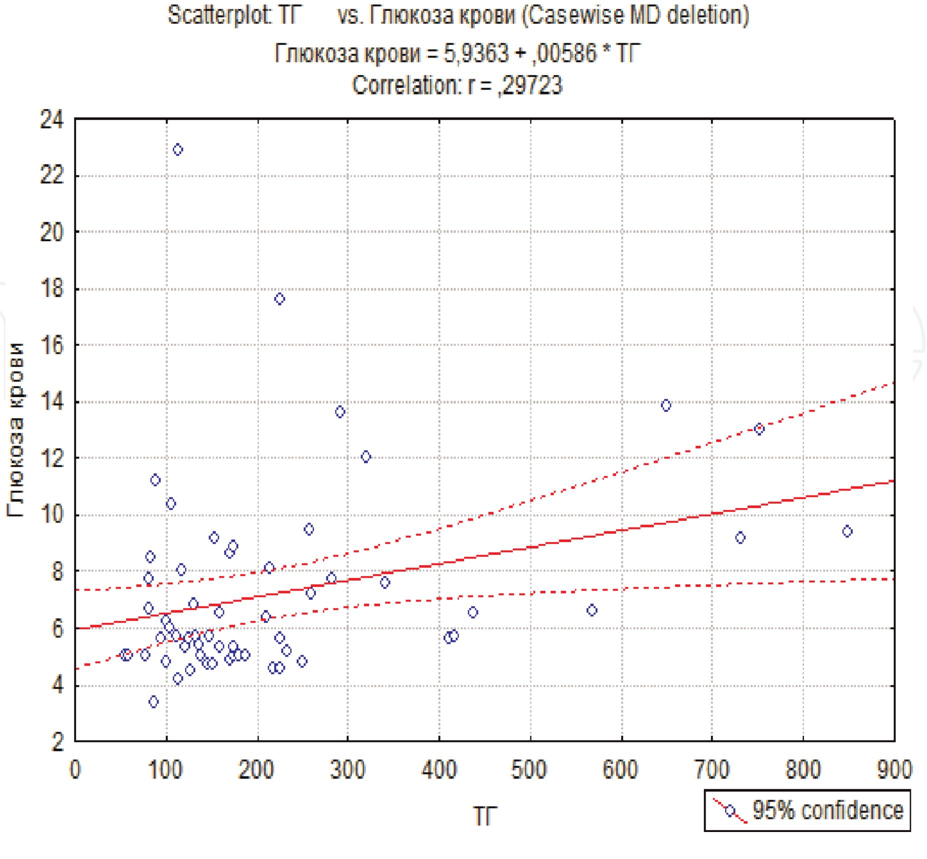

Figure 14.
The graph of the correlation between the level of blood glucose and triglycerides (n = 76). p = 0.021; t = 2.371; r = 0,279. On the X-axis, the values of triglycerides; Y-axis, blood glucose values.

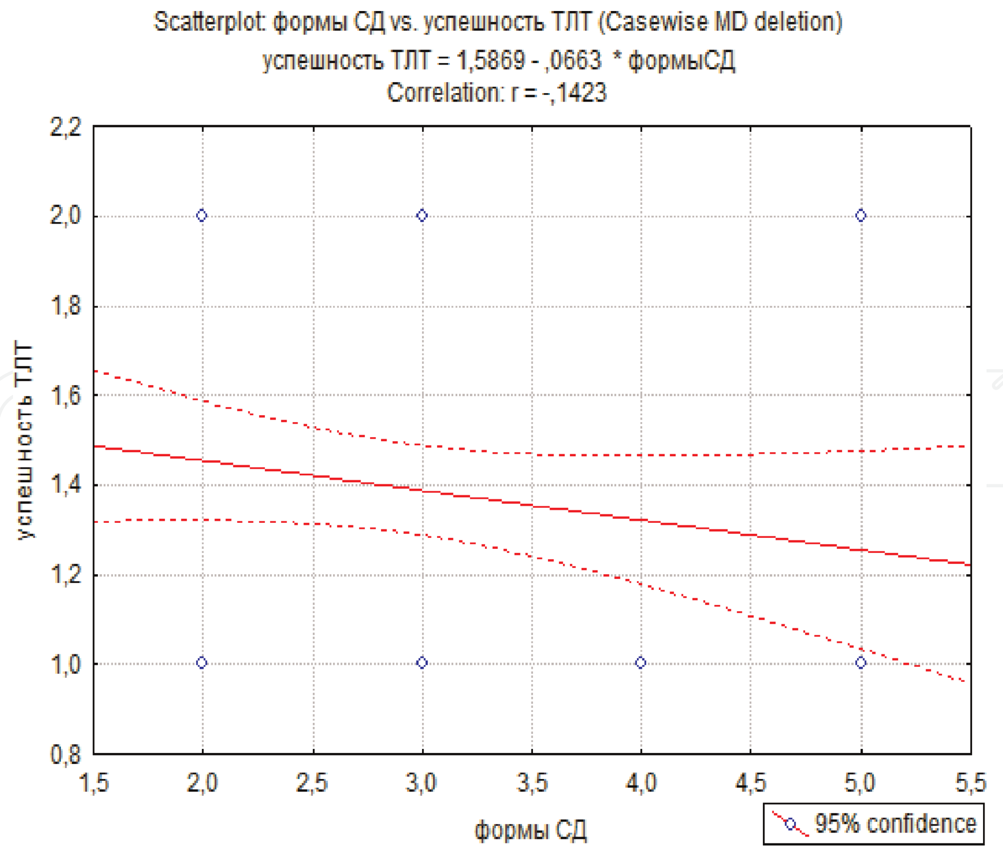

Figure 15.
Graph of correlation between various forms of diabetes and the success of the TLT procedure. p = 0.171; t = −1.3784 r = −0.142; Notes: On the X-axis, the number "2," DM compensated by diet; the number "3," DM compensated by the intake of tablets medications; the number "4," DM compensated by insulin; and the number "5," the first revealed diabetes; on the Y-axis, numeral "1," a successful thrombolytic therapy (TLT), and the numeral "2," unsuccessful TLT.

2.5 Discussion of the results of the study "RACSMI-Uz"

Gender is a very significant factor in the occurrence and course of AMI. Men get sick much more often than women, especially at young and middle ages, but with increasing age, these differences disappear. The cause of female immunity to AMI at a young age is due to the subtleties of the hormonal system of the body of women, with a significant role belongs to an increased amount of estrogen. This is the main hormone of the female reproductive system, taking an active part in the reproductive function. Estrogen in the female body performs a number of functions, one of which is the dilation of the heart's own blood vessels, which contributes to leaching of sclerotic plaques and prolonging the normal functioning of the myocardium [13]. After menopause, the hormonal system of the female body significantly changes its work, and the content of estrogen in the blood decreases. This leads to a violation of the protection of coronary vessels from harmful influences and the development of CHD [13]. The results of our register revealed that women with ACS/AMI were older than men, and, for the most part, age over 50 years prevailed. Unfortunately, in the map-register used by us, there were no questions concerning the state of health of the female body; therefore, we cannot judge the hormonal status of the analyzed female population. However, the identified age limit—over 50 years old—can probably be considered as evidence of the menopausal period of women included in this register.

Most of the generally recognized RFs of CVD are common for men and women; however, the accumulated scientific data to date indicate the presence of certain features of the manifestation of RF in the female population [14–16]. In our registry, the majority of patients had combined cardiac pathology, with the most frequent option being a combination of CHD and AH (over 80% of patients).

The study found that the average level of triglycerides in respondents with hypertension was 1.5 times higher than in the comparison group. According to scientific information sources, an increased level of triglycerides is observed in those who already have high levels of low-density lipoproteins and low levels of high-density lipoproteins in the blood; are obese; have type 2 diabetes, decreased thyroid function, and neurotic syndrome; and consume excessive amounts of alcohol. It is completely natural to ask whether triglycerides are related to an increased cardiovascular risk in these patients or whether they simply reflect metabolic disturbances. The final answer to the question about the participation of triglycerides in the process of atherosclerotic vascular lesion has not yet been received. It is assumed that an increase in triglycerides reflects an increased content of atherogenic lipid particles, such as intermediate density lipoproteins and very low-density lipoproteins, which, among other things, cause and maintain inflammation of the vascular wall [17]. Probably, this is the explanation of the hypertriglyceridemia detected in our registry specifically in individuals with hypertension.

In the CREATE-ECLA study, 30-day mortality in patients with AMI with ST-elevation differed significantly depending on the glucose content in the blood and was 6.6% of patients with glycemia within the lower tertile and 14% of patients with glycemia within the upper tertile [18, 19]. According to the register of the RECORD, the presence of diabetes, as the FR of the development of ACS, occurred in 18.1% of respondents [20]. The results of our study “ROXIM-Uz” revealed that 34.8% of patients with hypertension had concomitant diabetes.

It is well-known that people who are overweight and obese have a higher risk of developing metabolic syndrome, type 2 diabetes, AH, and CHD [21]. Findings from epidemiological studies have repeatedly confirmed the strong positive relationship between obesity and the risk of developing DM. In our study, a similar trend is observed. In the group of patients with DM, the number of people with obesity of varying severity was 1.8 times greater than in the group of patients without diabetes.

One of the most important causes of high cardiovascular morbidity and mortality in patients with diabetes is the accelerated development of the atherosclerotic process [22]. In our study, it was found that stenosis >50% was more often detected in patients with diabetes (93.3%) than in the comparison group (78.9%). Endothelial dysfunction is the earliest stage in the development of adverse cardiovascular complications in patients with diabetes [23]. However, the relationship between diabetes and vascular pathology remains unclear.

Under conditions of hyperglycemia, there is an increased formation of the end products of glycation and their precursors, which leads to a change in the structure of blood proteins and the extracellular matrix, disrupting the function of nerve fibers. Levels of all previous glycolysis intermediates become elevated, which triggers alternative paths; glyceraldehyde-3-phosphate, glycerol, and methylglyoxal enter the pathway of protein kinase C and the end products of glycation, fructose-6-phosphate enters the hexosamine pathway, and glucose itself enters the polyol pathway. All the above pathological pathways for utilization of glucose and its metabolites cause diabetic complications and damage to the nervous tissue and the vascular wall (neuropathy and angiopathy) [24].

To verify the positive effect of insulin on the course of AMI in patients with diabetes, a diabetes, insulin, glucose infusion in acute myocardial infarction (DIGAMI) study was conducted, which showed that with the development of AMI in patients with diabetes, adding to therapy the glucose-insulin-potassium mixture followed by insulin therapy can reduce mortality after 1 and 3 years. [25, 26]. The direct correlation between the forms of diabetes and the success of TLT identified in our study is probably due to the fact that patients receiving hypoglycemic drugs, including insulin therapy, are characterized by relatively intact endothelial functionality and, thus, have a more favorable prognosis than patients, adhering to dietary recommendations only.

Numerous studies confirm the positive effect of treatment standards for treating one or the other diseases [27]. The results of our register showed that persons with ACS/AMI comorbid with AH are characterized by high adherence to therapy with β-blockers and ACE inhibitors; however, despite this, they still developed destabilization of CHD, probably due to, as mentioned above, the development of refractoriness to drug therapy.

In work Wang et al. [28] when analyzing 382 elderly patients from six Macau Medical Centers, China, the best adherence to therapy was observed in people over 65 years of age. A similar trend has occurred in our register. As for the predominance of women in the group of committed patients that we received during the course of work, this fact is confirmed by other researchers who show that women are more committed to treatment than men [29–31].

Thus, the register "RACSMI-Uz" conducted in the clinic conditions of the Republican Specialized Scientific Medical Center for Cardiology allowed obtaining objective data on the demographic, anamnestic, and clinical characteristics of patients with acute coronary pathology in only one of the districts of Tashkent city. The results obtained revealed both positive aspects in the treatment plan of this category of patients and established a number of issues that require further study.

3. Conclusions

ACS/AMI is more commonly reported in men. In the age aspect, men with ACS/AMI turned out to be younger than women, and in terms of weight characteristics, obesity of varying severity prevailed among women.

With ACS/AMI, gender-independent risk factors (RF) were hypertension and hypercholesterolemia GHS, and gender-related factors were smoking (for men) and carbohydrate metabolism disorders and obesity (for women). The history of cardiovascular catastrophes was prerogative of males, while age seemed to be a controversial point in the development of this or that damage (TMI occurred in younger men and stroke in older men compared with women).

Adherence to therapy in women was slightly higher than in men, although in a proportional ratio in the accepted groups of drugs, there were no significant differences between men and women. However, a direct correlation was found between the age of the respondents and the number of medications taken per day. Adherence to taking drugs in patients with ACS/AMI with comorbid hypertension was two times higher than among those without hypertension.

Arterial hypertension as a risk factor was recorded in 89% of patients with ACS/AMI, of which in 36.7% of cases hypertension was noted in history and in 52.3% of cases—hypertension of various severity occurred at the present time.

In ACS/AMI, concomitant comorbid conditions, such as obesity, previous myocardial infarction, chronic heart failure, and type 2 diabetes, were the prerogative of individuals with hypertension and, accordingly, were characterized by a large number of patients with stenotic >50% of the coronary arteries.

In ACS/AMI, the number of patients with heart rate > 80 beats/min among patients with AH was 1.5 times more than among those without it; however, when considering heart rate depending on the degree of AH, no significant differences were found.

The lipid spectrum of patients with ACS/AMI, comorbid with AH, was characterized by hypertriglyceridemia and relatively intact values of total blood cholesterol, while ST-segment depression and T-wave inversion were more often recorded on the ECG than the ST-elevation.

In patients with acute coronary events comorbid with DM, a direct correlation was observed with age, female sex, obesity, and hypertriglyceridemia; on the contrary, no dependence was found between the blood pressure figures and the blood glucose level.

In patients with ACS/AMI, in combination with DM, symptoms of chronic heart failure were observed much more often than in individuals without diabetes, which was probably due to a significantly higher incidence of diagnostically significant stenotic constriction in the coronary arteries.

In patients with ACS/AMI comorbid with DM, the success of thrombolysis was directly dependent on the form of diabetes and hypoglycemic therapy.

Acknowledgement

I express my gratitude to the employees of the register “RACSMI-Uz” who took part in the collection of information: Aminov A. A., Abidova D. E., Alieva Z. Kh., Mun O. R., Urinov O., and Mamarajapova D. A.

Also, on behalf of the participants of the “RACSMI-Uz” register, the staff of the Republican Specialized Scientific-Practical Medical Center for Cardiology of the Ministry of Health of the Republic of Uzbekistan expresses gratitude to the administrative and medical workers of the city clinical hospitals, family polyclinics and emergency medical care in Mirzo-Ulugbek district of Tashkent for their cooperation and assistance in conducting this project.

Conflict of interest

In the course of the “ROXIM-Uz” register, no conflicts of interest arose.

Abbreviations

ACS	acute coronary syndrome
AMI	acute myocardial infarction
ACE inhibitors	angiotensin-converting enzyme inhibitors
ARA	angiotensin II receptor antagonists
AH	arterial hypertension
BB	β-blockers
BP	blood pressure
beats/min	beats per minute
BMI	body mass index
CA	calcium antagonists
CVD	cardiovascular diseases
CABG	coronary artery bypass grafting
CHD	coronary heart disease
DM	diabetes mellitus
DBP	diastolic blood pressure
ECG	electrocardiogram
HR	heart rate

HChE	hypercholesterolemia
IDF	international diabetes federation
mm Hg	millimeters of mercury
PCI	percutaneous coronary intervention
TMI	transferred myocardial infarction
RACSMI-Uz	register of acute coronary syndrome and myocardial infarction in Uzbekistan
RF	risk factors for coronary artery disease
SBP	systolic blood pressure
TLT	thrombolytic therapy
TCh	total cholesterol
TG	triglycerides

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References

[1] Fletcher RH, Fletcher SW. Clinical Epidemiology: The Essentials. Vol. 4th–xv. London: Lippincott Williams and Wilkins; 2005. 252p

[2] D'Agostino RB Sr, Vasan RS, Pencina MJ, Wolf PA, Cobain M, Massaro JM, et al. General cardiovascular risk profile for use in primary care: The Framingham heart study. Circulation. 2008;**117**(6):743-753

[3] Pencina MJ, D'Agostino RB Sr, Larson MG, Massaro JM, Vasan RS. Predicting the 30-year risk of cardiovascular disease: The Framingham heart study. Circulation. 2009;**119**(24): 3078-3084

[4] Gliklich RE, Dreyer NA, Leavy MB, editors. Registries for Evaluating Patient Outcomes: A User's Guide [Internet]. 3rd ed. US, Rockville (MD): Agency for Healthcare Research and Quality; Apr 2014. Report No.: 13(14)-EHC111. AHRQ Methods for Effective Health Care

[5] Ginzburg ML. Evaluation of the immediate and long-term results of treatment of patients with acute myocardial infarction within the register [Material doctoral dissertation]. Moscow; 2016. 211p. Available from: https://www.gnicpm.ru/data/files/dictionary/1547/158/DissertationGinzburgML.pdf

[6] Kronenberg GM, Mel-med S, Polonsky KS, Larsen PR. In: Dedova II, Melnichenko GA, editors. Diabetes and Carbohydrate Metabolism: Translation from English. Moscow, Russia: Reed Elsiver LLC; 2010. 448p

[7] Lorber D. Importance of cardiovascular disease risk with type 2 diabetes mellitus. Diabetes, Metabolic Syndrome and Obesity. 2014;**7**:169-183

[8] Donath MY, Shoelson SE. Type 2 diabetes as an inflammatory disease. Nature Reviews Immunology. 14 Jan 2011;**11**:98-107

[9] Ametov AS, Kurochkin IO, Zubkov AA. Diabetes mellitus and cardiovascular diseases. Russian Medical Journal. Endocrinology. 2014;**13**: 943-958

[10] ESC Congress 2018. Focus on Updated Recommendations for the Treatment of Hypertension. Available from: https://www.umj.com.ua/article/130071/esc-congress-2018-aktsent-na-obnovlennye-rekomendatsii-po-lecheniyu-arterialnoj-gipertenzii

[11] Repeated myocardial infarction of unspecified localization (I22.9). Version: Directory of Diseases MedElement. Available from: https://diseases.medelement.com/disease/3787

[12] Methods of diagnosis of myocardial infarction. Available from: https://serdce.biz/diagnostika/diagnostika-infarkta-miokarda.html

[13] Encyclopedia of Cardiology. Available from: http://cardiobook.ru/priznaki-infarkta-miokarda-u-zhenshhin/

[14] Dvoretsky LI, Gibradze NT, Cherkasova NA. Coronary heart disease in women. Russian Medical Journal. 2011;**2**:79-86. https://www.rmj.ru/articles/kardiologiya/Ishemicheskaya_bolezny_serdca_u_ghenschin/#ixzz55l0cbLLG

[15] Boytsov SA, Boytsov S, et al. The Cardiovascular Disease Registry (REKVAZA): Diagnostics, combined cardiovascular pathology, comorbidities, and treatment under real outpatient polyclinic practice. Cardiovascular Therapy and Prevention. 2014;**13**(6):44-50. DOI: 10.15829/1728-8800-2014-6-3-8. ISSN:

2619-0125. Available from: https://cardiovascular.elpub.ru/jour/article/view/81

[16] James MT. Longitudinal studies 4: Matching strategies to evaluate risk. Methods in Molecular Biology. 2015; **1281**:133-143

[17] 5 and 5 Medicine. Triglycerides are elevated, what does this mean? Available from: http://www.5u5.ru/articles/articles-drugs/160-triglitsetidy-kak-faktor-riska.html

[18] Deedwania P, Kosiborod M, Barrett E, et al. Hyperglycemia and acute coronary syndrome: A scientific statement from the American Heart Association Diabetes Committee of the Council on Nutrition, Physical Activity, and Metabolism. Circulation. 2008;**117**: 1610-1619

[19] Abadal AC, Flores JS. The significance of hyperglycemia in acute coronary syndrome. Revista Española de Cardiología. 2008;**61**(5):447-450

[20] Erlich AD, Gratsiansky NA. Independent register of acute coronary syndromes record. Characteristics of patients and treatment before discharge from the hospital. Atherothrombosis. 2009;**1**(2):105-119

[21] Flegal KM, Kit BK, Orpana H, Graubard BI. Association of all-cause mortality with overweight and obesity using standard body mass index categories: A systematic review and meta-analysis. JAMA. 2013;**309**(1):71-82

[22] de Ferranti SD, de Boer IH, Fonseca V, Fox CS, et al. Type 1 diabetes mellitus and cardiovascular disease: A scientific statement from the American Heart Association and American Diabetes Association. Diabetes Care. 2014;**37**(10): 2843-2863

[23] Kotb NA, Gaber R, Salah W, Elhendy A. Relations among glycemic control, circulating endothelial cells, nitric oxide, and flow mediated dilation in patients with type 2 diabetes mellitus. Experimental and Clinical Endocrinology & Diabetes. 2012;**120**(8): 460-465

[24] Podachina SV. From classical therapy of diabetic neuropathy to solving the problem of hyperglycemic memory. Effective pharmacotherapy. Endocrinology. 2012;**1**:48-52

[25] Malmberg K, Rydén L, Efendic S, Herlitz J, Nicol P, Waldenström A, et al. Randomized trial of insulin glucose infusion followed by subcutaneous insulin treatment in diabetic patients with acute myocardial infarction (DIGAMI study): Effects on mortality at 1 year. Journal of the American College of Cardiology. 1995;**26**(1):57-65

[26] Malmberg K, Rydén L, Hamsten A, Herlitz J, Waldenström A, Wedel H. Effects of insulin treatment on cause-specific one year mortality and morbidity in diabetic patients with acute myocardial infarction. DIGAMI Study Group. Diabetes insulin glucose in acute myocardial infarction. European Heart Journal. 1996;**17**(9):1337-1344

[27] Roth GA, Forouzanfar MH, Moran AE, Barber R, Nguyen G, Feigin VL, et al. Demographic and epidemiologic drivers of global cardiovascular mortality. The New England Journal of Medicine. 2015;**372**(14):1333-1341

[28] Wang W, Lau Y, Loo A, et al. Medication adherence and its associated factors among Chinese community-dwelling older adults with hypertension. Heart & Lung. 2014;**43**(4):278-283

[29] Fodor GJ, Kotrec M, Bacskai K, et al. Is interview a reliable method to verify the compliance with antihypertensive therapy? An international Central-European study. Journal of Hypertension. 2005;**23**:1261-1266

[30] Rao CR, Veena KG, Shetty A, et al. Treatment compliance among patients with hypertension and type 2 diabetes mellitus in a coastal population of Southern India. International Journal of Preventive Medicine. 2014;**5**(8):992-998

[31] Raymundo NAC, Pierin AMG. Adherence to anti-hypertensive treatment within a chronic disease management program: A longitudinal, retrospective study. Revista da Escola de Enfermagem da U.S.P. 2014;**48**(5): 809-881