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Clinical, Anamnestic, and Demographic Characteristics of Patients with Myocardial Infarction in Russian Federation According to the Russian Registry of Acute Myocardial Infarction – REGION–IM

Aim	Based on data from the Russian REGION-MI registry, to characterize patients with myocardial infarction (MI) hospitalized in Russian hospitals, describe their historical, demographic, and clinical characteristics, and compare the results with the data of previous Russian and international registries of acute coronary syndrome.
Material and methods	REGION-MI is a multicenter prospective observational study. The follow-up period was divided into three stages: during the hospital stay, at 6 and 12 months after the inclusion in the registry. Demographic and historic data and information about the present case of MI were entered into the patient's individual record card.
Results	The median age of all patients was 63 years; 68% of patients were men. The mean age of women was older than that of men. Among all MI cases, 70% were ST-segment elevation myocardial infarction (STEMI). Patients with non-ST-segment elevation myocardial infarction (NSTEMI) were older and had more comorbidities than patients with STEMI. The median time from the first symptoms to ECG recording was two hours, and from the first symptoms to CAG 7 hours. CAG was performed in 91% of patients with STEMI and 84% of patients with NSTEMI. Stenting was performed in 69% of patients. Although many patients had a complicated cardiovascular history, at the time of admission only 31.5% of patients were taking at least one drug from the groups of antiplatelets, oral anticoagulants, statins, and beta-blockers.
Conclusion	Patients with MI in the Russian Federation are younger than patients with MI in European countries. Among the clinical and historical characteristics, conspicuous is the presence of modifiable risk factors in many patients, as well as the presence of a previous diagnosis of ischemic heart disease. Furthermore, a small proportion of patients took statins, antiplatelet agents or anticoagulants at the outpatient stage, which indicates a great reserve of both primary and secondary prevention of cardiovascular diseases in the Russian Federation. The delayed seeking medical help is also noticeable, which indicates the need for increasing the public awareness of the symptoms of MI and the importance of timely hospitalization.

Keywords	Cardiovascular diseases; ischemic heart disease; acute coronary syndrome; myocardial infarction; registry of acute myocardial infarction, REGION-MI
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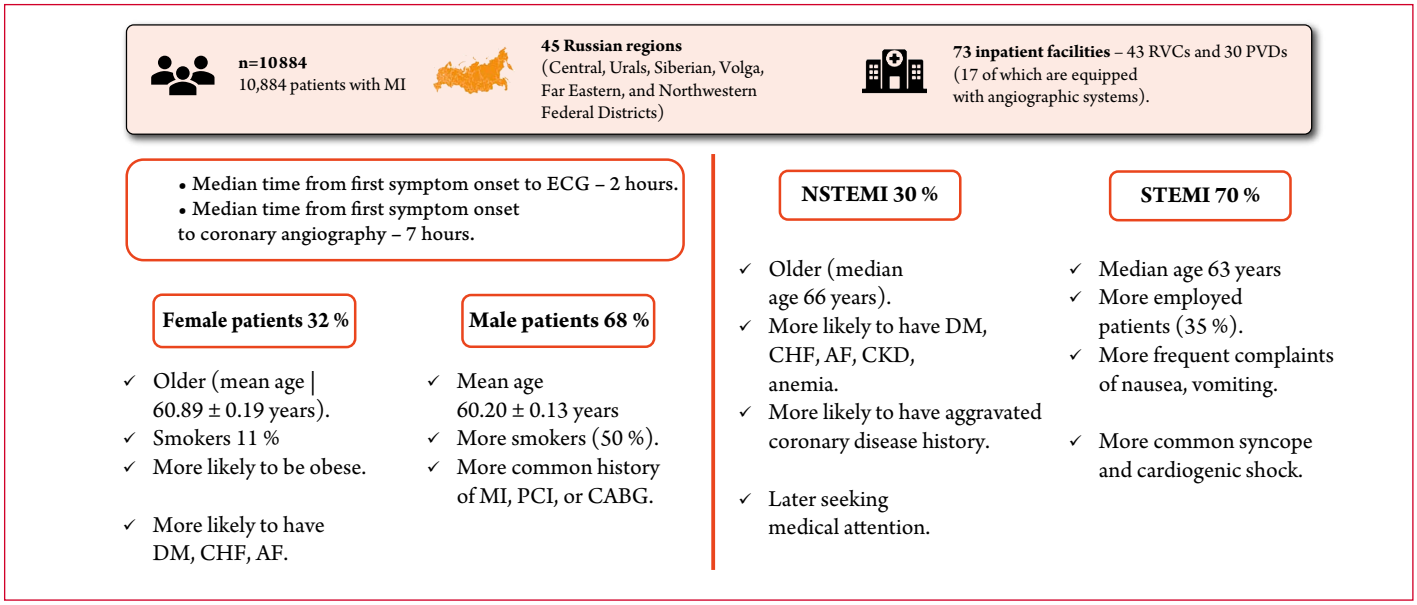
Central illustration. Clinical, Anamnestic, and Demographic Characteristics of Patients with Myocardial Infarction in Russian Federation According to the Russian Registry of Acute Myocardial Infarction – REGION–IM



MI, myocardial infarction; NSTEMI, non-ST-segment elevation myocardial infarction; STEMI, ST-segment elevation myocardial infarction; CABG, coronary artery bypass grafting; PVD, primary vascular department; RVC, regional vascular center; DM, diabetes mellitus; AF, atrial fibrillation; CKD, chronic kidney disease; CHF, chronic heart failure; PCI, percutaneous coronary intervention; ECG, electrocardiogram.

Introduction

Circulatory diseases are the leading cause of disability and mortality, even among the able-bodied population, both in the Russian Federation and in most other parts of the world. In 2020, coronary artery disease (CAD) accounted for 54.2% of all circulatory disease mortality in the Russian Federation, with myocardial infarction (MI) deaths reaching 58,079 [1].

Over the past few decades, the treatment options for MI patients have increased significantly with the widespread use of medications with proven efficacy and the use of invasive therapies. For the past several decades, standards of care for MI have been based on clinical guidelines developed by experts in the field. Similar guidelines are also in place in the Russian Federation. The quality of care and prognosis of patients with MI is determined by adherence to clinical guidelines. However, patient care does not always follow clinical guidelines in real-world clinical practice. The reasons are both objective and subjective. In particular, guidelines based on the results of randomized trials cannot cover the full range of clinical situations, patient characteristics, etc.

The most reliable information about the characteristics of patients with a specific pathology and their treatment in everyday clinical practice comes from specially organized observational clinical studies. These are called registries. Since 2020, the Myocardial Infarction Registry has been conducted in the Russian Federation. Its purpose is to collect and analyze data on diagnosis and treatment of patients with acute MI in Russian hospitals, short-term and long-term outcomes.

Objective

The objective of the study was to characterize patients with myocardial infarction admitted to Russian hospitals and to describe their anamnestic, demographic, and clinical characteristics using data from the REGION-MI registry and to compare the results with those of previous Russian and foreign ACS registries.

Material and Methods

The Russian rEGIstry Of acute myocardial iNfarction (REGION-MI) is a multicenter prospective observational study [2]. The register included all patients admitted to hospitals with the diagnosis of acute MI established using the criteria of the ESC Guidelines on Fourth Universal Definition of Myocardial Infarction (2018). Patients were included in the study after they or their representatives signed the informed consent to take part in the study and the personal data processing consent. The study protocol and the informed consent form were approved by the Ethics Committee of the Academician Chazov National Medical Research Center. This project was developed and is carried out following the ethical principles of the Declaration of Helsinki, the ICH harmonized tripartite guideline, and the Russian GOST standard on Good Clinical Practice. The study is conducted on the Quinta platform (certificate of state registration of computer program No. 2016615129 «Universal software complex for collection, processing, and management of geographically distributed clinical and epidemiological data in remote access mode, copyright Aston Consulting JSC»). The case report form contains the following data: demographic

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characteristics; clinical characteristics and medical history; information on the current case of MI (time of the onset of the first symptoms, time of the first medical care encounter, time of hospitalization); findings of laboratory tests and clinical examinations, coronary angiography and PCI; information on the thrombolytic therapy; drug therapy (drugs administered at the time of admission, before hospitalization, and during the hospital stay); clinical outcomes during the hospital stay. The follow-up period is divided into 3 stages: observation during the hospital stay, 6 and 12 months after enrollment in the registry.

The REGION-MI registry involves hospitals included in the MI Network in the Central, Ural, Siberian, and Far Eastern Federal Districts (a total of 45 Russian regions). A total of 73 hospitals (30 hospitals with primary vascular departments (PVDs) and 43 regional vascular centers (RVCs)) were included in the study. Of the 30 PVDs, 17 departments are equipped with angiographic systems. A total of 10,884 patients were included between November 1, 2020 and June 30, 2023.

Statistical data processing was conducted in SPSS Statistics v. 24 (IBM, USA). All anamnestic, clinical, and laboratory data obtained were processed by analysis of variance. The means (M), the standard deviations, the errors of the mean (m), and the medians (Me) were determined for the quantitative parameters. The t-test was used to compare independent sample means, and the Mann–Whitney U test was used to compare medians. The frequency of a sign or an event was determined for qualitative variables. The chi-squared test was used to compare the frequency of an attribute. Pairwise comparisons were made using a pairwise proportion test with the Holm correction. Statistical significance was defined as a p-value < 0.05.

Table 1. Demographic and anamnestic data of patients included in REGION-MI

Parameter	All patients (n=10,884)	Patients with STEMI (n=7,631)	Patients with NSTEMI (n=3,253)	P, (for STEMI and NSTEMI patients)
Age, years, median (min-max)	63 (18–98)	63 (18–97)	66 (26–98)	0.000
Mean age, years	64	63	66	0.000
Age > 75 years, %	16	14	21	0.000
Age < 50 years, %	13	15	8	0.000
Male, %	68	70	64	0.000
Mean age of male patients, years, M ± m	60.20±0.13	59.44±0.1	62.14±0.2	0.000
Mean age of female patients, years, M ± m	69.89±0.19	68.97±0.2	71.7±0.3	0.000
Patients with higher education, %	16	17	13	0.000
Employed patients, %	33	35	27	0.000
Patients living with family, %	77	79	81	0.000
Weight ≤ 60 kg, %	7	7	7	0.813
BMI ≥ 30 kg/m²*	30	30	31	0.234
Mean BMI, kg/m²	28.73	28.69	28.83	0.194
Smokers, %	38	41	31	0.000
History of IS/TIA, %	8	7	9	0.001
Patients with hypertension, %	86	84	91	0.000
Patients with diabetes mellitus, %	19	17	22	0.000
Patients with CHF, %	25	21	34	0.000
History of AF, %	10	9	14	0.000
GFR ≥ 60 mL/min/1.73 m², %	67	70	62	0.000
GFR 31–59 mL/min/1.73 m², %	25	24	29	0.000
GFR ≤ 30 mL/min/1.73 m², %	4	3	5	0.000
Hemoglobin < 10 g/dL, %	4	3	5	0.000
High risk of bleeding (ARC-HBR), %	31	28	38	0.000
Patients with angina, %	35	31	44	0.000
History of PCI/CABG, %	11	9	16	0.000
Patients with recurrent MI, %	19	15	29	0.000

MI, myocardial infarction; CHF, chronic heart failure; IS, ischemic stroke; CABG, coronary artery bypass grafting; TIA, transient ischemic attack; PCI, percutaneous coronary intervention; GFR, glomerular filtration rate; AF, atrial fibrillation.
* BMI, body mass index, m/h2, where m is body mass in kg, h is height in m.

Results

Demographic and anamnestic characteristics of subjects are given in Table 1.

The median age of all patients was 63 years. ST-segment elevation myocardial infarction (STEMI) accounted for 70% of all cases of MI. Patients with non-ST-segment elevation myocardial infarction (NSTEMI), both male and female, were significantly older than patients with STEMI ($p < 0.05$). Among STEMI patients, 15% were younger than 50 years, and among NSTEMI patients, 8% were younger than 50 years. Among patients admitted to hospital with STEMI, 35% are employed, and among hospitalized NSTEMI patients, 27% are employed. The proportion of elderly patients (>75 years) was 16% of the total cohort (14% of patients with STEMI and 21% of patients with NSTEMI).

The majority of patients included in the REGION-MI registry (86%) have hypertension, nearly one-third of patients were smokers or had a long-term smoking history at the time of hospitalization, and 30% were obese. NSTEMI patients included in the study are older than STEMI patients and have more comorbidities. Patients with NSTEMI are more likely to have a history of hypertension, diabetes mellitus (DM), chronic heart failure (CHF), atrial fibrillation (AF), chronic kidney disease (CKD), and anemia with a decrease in hemoglobin of less than 10 g/dL ($p < 0.05$). More patients with high bleeding risk according to the ARC-HBR scale were registered among patients with NSTEMI compared to those with STEMI (38% vs. 28%, $p < 0.05$). Previous coronary disease history (angina pectoris, history of MI, stenting, or coronary artery bypass grafting) was also significantly more common in patients with NSTEMI compared to those hospitalized with STEMI ($p < 0.05$).

Of the total number of patients included in the study, 68% were male. The mean age of females was higher than that of males – 69.89 ± 0.19 years vs. 60.20 ± 0.13 years (Table 2). Female patients were more likely to have a history of comorbidities such as DM, AF, CHF, and were more likely to have angina pectoris. Male patients were more likely to be smokers.

The most common complaints of patients with MI were chest pain and discomfort (92%), dyspnea and shortness of breath (29%), weakness (60%) (Table 3). The frequency of chest pain was almost identical in patients with STEMI and NSTEMI, while symptoms such as nausea, vomiting, syncope, and circulatory arrest were more frequent in the STEMI group ($p < 0.05$). The incidence of cardiogenic shock was higher in patients with STEMI ($p < 0.05$).

The median time from first symptom onset to the ECG was 2 hours (Table 4). NSTEMI patients sought medical care later than STEMI patients. The median time from symptom onset to ECG was 4 hours for NSTEMI and 2 hours for STEMI ($p < 0.05$).

Table 2. Demographic and anamnestic data of male and female patients included in REGION-MI

Parameter	Female patients (n=3,467)	Male patients (n=7,417)	p
Age, years, median (min-max)	70 (26–98)	61 (18–97)	0.000
Mean age, years	69.89 ± 0.19	60.20 ± 0.13	0.000
Age > 75 years, %	33	8	0.000
Age < 50 years, %	4	17	0.000
Patients with higher education, %	13	18	0.000
Patients living with family, %	66	81	0.000
Weight ≤ 60 kg, %	13	4	0.000
BMI ≥ 30 kg/m²*	42	25	0.000
Smokers, %	11	50	0.000
History of IS/TIA, %	10	7	0.000
Patients with hypertension, %	94	82	0.000
Patients with diabetes mellitus, %	31	13	0.000
Patients with CHF, %	33	21	0.000
History of AF, %	14	8	0.000
GFR ≤ 60 mL/min/1.73 m², %	53	79	0.000
GFR 31–59 mL/min/1.73 m², %	40	19	0.000
GFR ≤ 30 mL/min/1.73 m², %	7	2	0.000
Hemoglobin < 10 g/dL, %	6	2	0.000
High risk of bleeding (ARC-HBR), %	48	23	0.000
Patients with angina, %	40	32	0.000
History of PCI/CABG, %	9	12	0.000
Patients with recurrent MI, %	17	19	0.129

MI, myocardial infarction; CHF, chronic heart failure; IS, ischemic stroke; CABG, coronary artery bypass grafting; TIA, transient ischemic attack; PCI, percutaneous coronary intervention; GFR, glomerular filtration rate; AF, atrial fibrillation.
*BMI, body mass index, m/h^2, where m is body mass in kg, h is height in m.

Patients living alone sought medical care significantly later than those living with family (3 hours vs. 2 hours, $p < 0.05$) (Table 5). The time from first symptoms to hospitalization of more than 12 hours was less common in patients younger than 50 years compared to patients 50 to 70 years and patients older

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Table 3. Symptoms in patients with MI

Symptom	All patients (n=10,884)	Patients with STEMI (n=7,631)	Patients with NSTEMI (n=3,253)	p
Chest pain/ discomfort, %	92	93	90	0.000
Dyspnea, suffocation, shortness of breath, %	29	28	33	0.000
Weakness, %	60	62	55	0.000
Palpitation, %	8	6	11	0.000
Nausea, vomiting, %	6	7	4	0.000
Syncope, %	2	2	1	0.002
Circulatory arrest, %	0.2	0.3 (n = 24)	0.1 (n = 3)	0.054
Other symptoms, %	8	8.4	6.9	0.009
Cardiogenic shock, %	2.5	2.9	1.6	0.000

Table 4. Time intervals

Parameter	All patients (n=10,884)	Patients with STEMI (n=7,631)	Patients with NSTEMI (n=3,253)	P
Time of first symptom onset:				
– From 0:00 to 06:00, %	23	22	24	0.088
– From 06:01 to 12:00, %	36	36	38	0.014
– From 12:01 to 18:00, %	24	25	22	0.001
– From 18:01 to 23:59, %	17	17	16	0.164
Time from the first symptoms to ECG, Me, h	2	2	4	0.000
Time from the first symptoms to coronary angiography, Me, h	7	6	16	0.000
Time from the first symptoms to hospitalization < 12 h, %	66	71	53	0.000
Time from the first symptoms to hospitalization ≥ 12 h, %	34	29	47	0.000

STEMI, ST-segment elevation myocardial infarction; NSTEMI, non-ST-segment elevation myocardial infarction, ECG. electrocardiography.

than 70 years – 29%, 35%, and 34%, respectively ($p < 0.05$). There was no difference in the time between symptom onset, first encounter, and hospitalization between weekdays and weekends. The first symptoms of MI occurred more often in the morning (6:01–12:00) and afternoon (12:01–18:00). There was a higher percentage of NSTEMI among MI occurring in the morning hours and a higher percentage of STEMI among MI occurring in the afternoon hours. There was no significant difference in the incidence of MI in any of the seasons.

94% of patients with MI were hospitalized in centers that were equipped with an angiographic system (Table 6), coronary artery angiography was performed in 89%. Coronary artery angiography was performed more often in STEMI than in NSTEMI (91% vs. 84%, $p < 0.05$). Stenting was performed in 69%. Patients who did not undergo stenting were significantly older than those who underwent PCI, with a median age of 65 and 63 years, respectively. Among those who did not undergo stenting, there were more patients older than 75 years, patients at high risk of bleeding according to the ARC-HBR scale, and patients with hemoglobin levels less than 10 g/dL (Table 7). Single-vessel disease was more common in patients with STEMI, whereas multivessel disease was more common in patients with NSTEMI. Patients with STEMI were significantly more likely than patients with NSTEMI to receive stenting in a single coronary artery.

Of the 10,884 patients with MI included in the study, 3,431 (31.5%) were taking at least one medication from the group of antiplatelets, oral anticoagulants, statins, or beta-blockers at the time of hospitalization (Table 8). Patients with NSTEMI were significantly more likely to be taking one of the P2Y12 platelet receptor inhibitors, dual antiplatelet therapy (DAPT), and statins prior to hospitalization compared to patients with STEMI.

Discussion

This article characterizes the subjects of the REGION-MI registry at the time of inclusion completion. The majority of hospital admissions in REGION-MI were STEMI patients (70%). In the study conducted at the RVC Dzhanelidze Research Institute of Emergency Medicine in St. Petersburg in 2009–2012, patients with STEMI also outnumbered patients with NSTEMI – 62% and 38%, respectively [3]. In economically developed countries, the incidence of STEMI has been decreasing over the past decades. According to various registries, the incidence of NSTEMI is at least comparable to, if not exceeding, the incidence of STEMI. For example, the percentage of STEMI was 50.9% in the French FAST-MI registry in 2015 [4], 46.6% in the German PATIENT CARE registry in 2016 [5], only 39.3% in the American Chest Pain-MI registry in 2018 [6], and 41% in the Swedish SWEDEHEART registry in 2022 [7]. Researchers attribute the decrease in the incidence of STEMI to improved organization of medical care and treatment of patients with cardiovascular pathology and effective primary prevention [8, 9]. Nevertheless, the percentage of STE-ACS was 37% and that of NSTE-ACS was 63% in the Russian RECORD-3 registry conducted in 2015 [10]. This significant prevalence of patients with STEMI in

Table 5. Time from symptom onset to first medical encounter and hospitalization, depending on patient characteristics

Characteristics	Time from symptom onset to first encounter, Me, h	p	Time from symptom onset to hospitalization, Me, h	p
Male	2	0.000	4	
Female	3		4	
Higher education	1	0.013	3	0.000
Non-higher education	2		4	
Living with family	2	0.003	4	
Living alone	3		4	
Working day	2	–	4	
Weekend, holiday	2		4	

the REGION-MI registry is due in part to the fact that it was initiated in 2020, during the ongoing COVID-19 pandemic, when patients were trying to avoid going to medical facilities as much as possible. Consequently, patients with STEMI, who tend to have more pronounced clinical symptoms, were the most likely to seek help. Meanwhile, according to the Ministry of Health's official surveillance data for 2022, new cases of STEMI were much more common than NSTEMI.

In REGION-MI, 68% of patients were male. Foreign registries have reported similar data, with males accounting for about two-thirds of those hospitalized with MI. For example, the percentage of male patients with MI was 72% in France [4], 73% in Germany [5], and 71% in the American Chest-Pain Registry [6].

The mean age of all patients included in the study was 64 years, and the median age was 63 years. Female patients were significantly older than male patients, with a median age of 61 years for the latter and 70 years for the former. Similar differences in the age of MI patients have been observed worldwide. Female patients with MI are on average 9 years older than men according to the Turkish TURKMI registry [11] and 8 years older according to the Austrian STEMI registry [12]. There is a slightly smaller age difference of 5 years between male and female patients with MI in Sweden [7].

Patients with NSTEMI were older than patients with STEMI (median age 66 vs. 63 years) and had more comorbidities and a more frequent history of MI or myocardial revascularization. The higher incidence of NSTEMI in older patients is explained by the fact that they have more comorbidities and more pronounced manifestations of atherosclerosis.

In the RECORD-3 registry, the majority of patients were hospitalized due to STEMI (63%) [10]. Therefore, the overall patient cohort was expectedly older than in our study: mean age was 64.6 ± 12.0 years, and the percentage of patients older than 75 years was 63% (whereas only 16% were older than 75 years in the REGION-MI registry).

In the TURKMI registry [11], the majority of patients were male (73.9%), and females were older than males. The mean age of female and male patients was comparable to that in REGION-MI (68.3 ± 12.8 and 59.8 ± 12.6 years vs. 69.89 ± 0.19 and 69.2 ± 0.13 years). However, TURKMI had more patients younger than 50 years among both STEMI (22.1%) and NSTEMI (15.7%) patients compared to REGION-MI (15% and 8%, respectively). The development of MI

Table 6. Coronary angiography, PCI in patients included in the REGION-MI register

Parameter	All patients (n=10,884)	Patients with STEMI (n=7,631)	Patients with NSTEMI (n=3,253)	p
Hospitalized to RVCs and PVDs equipped with angiographic systems, %	94	95	91	0.000
Hospitalized to PVDs without angiographic systems, %	6	5	9	0.000
Coronary angiography performed, %	89	91	84	0.000
Single-artery stenosis, %	30	32	26	0.000
Stenosis in two arteries, %	24	24	24	0.979
Stenosis in three or more arteries, %	14	12	19	0.000
Patients who underwent stenting, %	69	75	55	0.000
Sent(s) implanted in a single artery, %	64	70	50	0.000
Stents implanted in two arteries, %	4	4	4	0.461
Stents implanted in three arteries, %	0.4	0.4	1	0.270
LCA trunk stented, %	2.5	1.8	4.5	0.000
LAD stented, %	46	45.8	46.8	0.348
LCx stented, %	19.3	16.1	29.5	0.000
RCA stented, %	39.1	42.4	28.5	0.000
Graft stented, %	0.4	0.2	0.7	0.000

LCA, left coronary artery; LCx, left circumflex artery; RCA, right coronary artery; LAD, left anterior descending artery; PVD, primary vascular department; RVC, regional vascular center.

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at an earlier age in Turkish patients is most likely due to a higher prevalence of hyperlipidemia and smoking (48.8% of patients in the TURKMI cohort were smokers). As in our study, patients with NSTEMI were statistically significantly older than those with STEMI. Patients with NSTEMI had more comorbidities than those with STEMI. There were more patients with DM (33.9% vs. 19%) and patients with a history of PCI/CABG (26.1% vs. 11%) in the overall TURKMI cohort compared to REGION-MI. The number of patients with other cardiovascular diseases was lower than in REGION-MI, with significantly fewer patients having hypertension (49.5% vs. 86%), CHF (2.3% vs. 25%), AF (1.2% vs. 10%), and a history of MI (13.6% vs. 19%).

Table 7. Clinical and anamnestic characteristics of patients according to stenting procedure

Parameter	No stenting, n=3,421	Stenting, n=7,463	p
Age, years, median	65	63	0.000
Age > 75 years, %	22	13	0.000
Age < 50 years, %	10	14	0.000
Male, %	64	70	0.000
Weight ≤ 60 kg, %	8	6	0.000
BMI > 30 kg/m²*	30	30	0.889
Smokers, %	32	41	0.000
History of IS/TIA, %	10	7	0.000
Patients with hypertension, %	87	85	0.005
Patients with diabetes mellitus, %	21	18	0.000
Patients with CHF, %	32	22	0.000
History of AF, %	14	8	0.000
GFR ≤ 60 mL/min/1.73 m², %	59	71	0.000
GFR 31–59 mL/min/1.73 m², %	28	24	0.000
GFR ≤ 30 mL/min/1.73 m², %	6	3	0.000
Hemoglobin < 10 g/dL, %	6	3	0.000
High risk of bleeding (ARC-HBR), %	38	27	0.000
Patients with angina, %	37	34	0.001
History of PCI/CABG, %	12	10	0.000
Patients with recurrent MI, %	25	15	0.000

IS, ischemic stroke; MI, myocardial infarction; BMI, body mass index; CABG, coronary artery bypass grafting; GFR, glomerular filtration rate; TIA, transient ischemic attack; AF, atrial fibrillation; CHF, chronic heart failure; PCI, percutaneous coronary intervention; ARC-HBR, Academic Research Consortium for High Bleeding Risk.

Table 8. Treatment at the time of hospitalization

Drug	All patients (n=3,431)	Patients with STEMI (n=2,164)	Patients with NSTEMI (n=1,267)	p
Acetylsalicylic acid, %	34	34	36	0.222
Clopidogrel/ticagrelor/prasugrel, %	4	2	5	0.000
DAPT, %	9	7	13	0.000
Statins, %	26	21	35	0.000
Beta-blockers, %	36	35	38	0.085
Oral anticoagulants (warfarin or DOAC),%	4	4	5	0.207

DAPT, dual antiplatelet therapy; DOAC, direct oral anticoagulant.

In the Chest Pain-MI registry [6], the majority of patients (70%) were also male. The median age of patients with STEMI was 63 years and 66 years for NSTEMI, which is consistent with our findings. In the Chest Pain-MI registry compared to our study, diabetes mellitus was more common in patients with STEMI (28.3%), hypertension was significantly less common (66.5%), the percentage of patients with CVA, AF, a history of MI was comparable to our data (15%), and cardiogenic shock developed significantly more often (7.5%). In the American registry, patients with NSTEMI were also more likely to have a history of diabetes mellitus (41.3%), and the prevalence of hypertension and recurrent MI was similar to our data (80.7% and 28.2%). The significantly higher rate of history of PCI and CABG in the Chest Pain-MI registry compared to the REGION-MI registry is noteworthy: 19.8% and 5.4% for patients with STEMI and 30.5% and 16.2% for patients with NSTEMI, respectively.

Patients with MI in the French FAST-MI registry [4] were older than patients in REGION-MI, with a mean age of 66 ± 14 years and 29% of patients older than 75 years. Patients with NSTEMI were also older and had more comorbidities than those with STEMI. The prevalence of DM, history of MI, and smoking was 22%, 18%, and 36%, respectively, comparable to our data. In the FAST-MI registry, patients were significantly less likely to have hypertension (54%) and CHF (5%) than patients in REGION-MI and were more likely to have a history of myocardial revascularization (22%).

In the Swedish SWEDEHEART registry [7], patients who had experienced MI in 2022 were significantly older than those in our registry, with a median age of 71 years. As in our study, women were on average 5–6 years older than men. The later

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onset of MI in Sweden is most likely due to a lower prevalence of hyperlipidemia, dietary habits, especially the predominance of fish and vegetables in the diet, and more intensive primary prevention (use of statins). In addition, according to the SWEDEHEART registry, risk factors such as hypertension (60%) and smoking (22%) were less common, 21% of patients had a history of PCI and 6% had a history of CABG, suggesting timely invasive treatment of coronary atherosclerosis.

The most common complaint in both STEMI and NSTEMI patients in the REGION-MI registry was chest pain (92%); among other symptoms, palpitations, nausea, syncope, and circulatory arrest were more common in STEMI patients and dyspnea was more common in NSTEMI patients. According to various registries, the overwhelming majority of patients had chest pain as the most characteristic symptom of ACS [4, 10, 11]. In RECORD-3, as in our study, more patients (44%) reported dyspnea, statistically significantly more in patients with NSTEMI. As in REGION-MI [10], syncope and circulatory arrest were more common in STEMI. In the TURKMI registry [11], as in REGION-MI, dyspnea was more common in patients with NSTEMI, whereas syncope and circulatory arrest were more characteristic of STEMI. Circulatory arrest occurred in 1.8% of cases in TURKMI and in 2% of cases in FAST-MI, more frequently than in our study (0.2%). The increased incidence of syncope and circulatory arrest in STEMI is associated with impaired blood flow to the sinus and atrioventricular nodules during acute occlusion of the coronary arteries, resulting in conduction abnormalities, bradycardia, and also with a large volume of myocardial damage in STEMI, leading to the development of life-threatening arrhythmias. The higher prevalence of dyspnea in patients with STEMI is most likely due to the fact that patients in this group are older and have more comorbidities, including DM and CHF.

According to our study, the first symptoms of MI occurred more frequently in the morning hours, from 6:00 to 12:00. There is evidence that this is the time when MI, sudden circulatory arrest and ventricular arrhythmias are more likely to occur. This time-related trend is due to the association of cardiovascular diseases with circadian rhythms [13], expressed in the activation of the sympathetic nervous system in the morning hours, which increases heart rate, peripheral resistance, blood pressure and promotes thrombosis. In the morning hours, platelet aggregation is increased, and the thrombolytic function of the blood is decreased [14, 15]. These factors increase the risk of plaque destabilization with the development of thrombosis on its surface [16].

The median time from first symptoms to ECG (first medical encounter) in REGION-MI was 2 hours for patients with STEMI and 4 hours for patients with NSTEMI. The median time from first symptoms to coronary angiography in patients with STEMI was 6 hours, while in NSTEMI it was, as expected, much longer – 16 hours. Despite the launch of the REGION-MI registry during the COVID-19 pandemic, when patients were reluctant to seek medical care for fear of infection and delayed going to the doctor as long as possible, some positive changes were observed in the Russian Federation, such as a decrease in total ischemic time in patients with MI. For example, according to the RECORD-3 registry, the median time from first symptom onset to ECG in patients with STEMI was 2.2 hours, the time from first symptoms to hospitalization was 6 hours, so the time to coronary angiography was longer than in our study [10]. In the French FAST-MI registry, median time from first symptom onset to ECG was 189 minutes, significantly longer than in our study [4]. In the SWEDEHEART registry, the total ischemic time in patients with STEMI was significantly shorter than in our study, with a median time from symptom onset to primary PCI of only 160 minutes [7].

Of the patients included in REGION-MI, 94% were hospitalized in the centers equipped with angiographic systems. Patients with STEMI were more likely than patients with NSTEMI to be admitted to an «invasive» hospital (95% vs. 91%) and were statistically significantly more likely to undergo coronary angiography (91% vs. 84%) and PCI (75% vs. 55%). In the RECORD-3 registry, only 72% were admitted to hospitals equipped with angiographic systems, so the rate of coronary angiography and PCI was significantly lower than in our study: coronary angiography was performed in 70% of patients with STEMI and PCI in 55%. Among patients with NSTEMI, 46% underwent coronary angiography and 20% underwent PCI [10]. In the TURKMI registry, coronary angiography and PCI were performed more frequently, 93.7% and 73.2%, respectively, whereas in the overall cohort of our study, 89% of patients underwent coronary angiography and 69% underwent PCI [11]. This difference is due to the fact that only hospitals equipped with angiographic systems were included in the Turkish registry. Although 93% of patients in the FAST-MI registry were admitted to PCI centers, which is comparable to our data, coronary angiography and PCI were performed significantly more often. Coronary angiography was performed in 99% of patients with STEMI and 95% of patients with NSTEMI; PCI was performed in 90% of patients with STEMI and 67% of patients with NSTEMI [4].

In the REGION-MI registry, 30% of patients had single-vessel disease detected by coronary angiography, and such coronary anatomy was more common in STEMI compared to NSTEMI. In contrast, multivessel disease was more common in patients with NSTEMI. This is because patients with NSTEMI were older and more likely to have a history of DM, which is associated with greater progression of atherosclerosis. Despite the fact that multivessel disease was diagnosed in more than 60% of STEMI cases, PCI was performed on a single artery in 70% of patients, suggesting that the tactic of stenting

only the infarct-related artery rather than complete myocardial revascularization was chosen in the majority of patients in the acute period. In both the German PATIENT-CARE registry and our registry, approximately one third of patients had single-vessel disease (35.7%), with single-vessel disease being statistically significantly more common in STEMI and multivessel disease more common in NSTEMI, but these differences were not statistically significant [5].

Patients with MI in REGION-MI had a large number of cardiovascular comorbidities, including IS/TIA, AF, an aggravated coronary disease history such as angina pectoris, a history of MI, PCI or CABG, and hyperlipidemia [17]. However, only one-third of patients were taking at least one of the medications used to prevent and treat cardiovascular disease. For example, 34% used acetylsalicylic acid, 4% used P2Y12 inhibitors, 36% used beta-blockers, and 4% used oral anticoagulants. Only 26% of patients were taking statins at the time of hospitalization, while the majority of patients had an exacerbated cardiovascular history and indications for hypolipidemic therapy. All of this suggests that not only primary, but also secondary prevention of CAD is inadequate. Similar data were obtained in the RECORD-3 registry, where approximately one-third of patients were taking acetylsalicylic acid and statins, 2% were taking an oral anticoagulant, and 13% had a history of AF [10]. Patients with NSTEMI who had more comorbidities were statistically significantly more likely to receive antiplatelet and hypolipidemic therapy compared to patients with STEMI. In the Turkish TURKMI registry [11] and the French FAST-MI registry [4], patients with NSTEMI also received the above-mentioned drug therapy more frequently than patients with STEMI. Interestingly, patients in the Turkish and French registries were significantly more likely to be taking a P2Y12 receptor inhibitor than patients in our registry – 13.3% and 18%, respectively. This may be due to the fact that patients with risk factors for CAD/ACS in the Russian Federation do not actively seek outpatient treatment.

Conclusion

According to the REGION-MI registry, the majority of hospitalized patients with myocardial infarction are male. Patients with myocardial infarction in the Russian Federation are younger than patients with myocardial infarction in Europe. At the time of the index event, approximately one-third of patients with MI in the Russian Federation are employed. Among the clinical and anamnestic characteristics, the presence of modifiable risk factors in a large number of patients and the presence of a previously established diagnosis of coronary artery disease stand out. At the same time, an insignificant percentage of patients were taking statins, antiplatelets, or anticoagulants in the outpatient setting, suggesting a large reserve of both primary and secondary prevention of cardiovascular diseases in the Russian Federation. The delay in seeking medical attention is also remarkable, indicating the need to increase public awareness of the symptoms of MI and the importance of timely hospitalization.

Limitations

Only hospitals included in the «infarction network» participate in the registry, which excludes the analysis of cases of acute MI in non-specialized hospitals; not all regions of the Russian Federation participate in the registry program; the STEMI and NSTEMI groups differ in the number of patients included, with more patients with STEMI; some patients were lost to follow-up; data are collected through telephone contacts, not at appointments, which can distort the information received.

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