Primerjava izhoda zdravljenja bolnikov z akutnim miokardnim infarktom z dvigom veznice ST (STEMI) z bolniki brez dviga veznice ST (NSTEMI)

Treatment outcome of patients with acute ST-elevation myocardial infarction (STEMI) vs. non-ST-elevation myocardial infarction (NSTEMI)

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Ključne besede:
akutni miokardni infarct s trajnim dvigom veznice ST, akutni miokardni infarkt brez trajnega dviga veznice ST, umrljivost, ponovna hospitalizacija, perkutana koronarna intervencija

Key words:
acute myocardial infarction with sustained ST elevation, acute myocardial infarction without sustained ST elevation, mortality, rehospitalization, percutaneous coronary intervention

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Izvleček

Namen: *Med miokardnimi infarkti s trajnim dvigom veznice ST (STEMI) in brez trajnega dviga veznice ST (NSTEMI) obstajajo podobnosti in razlike. Namen tega prispevka je primerjava umrljivosti in ponovne hospitalizacije med STEMI in NSTEMI bolniki.*

Metode: *V retrospektivni raziskavi smo primerjali prevalenco osnovnih kliničnih podatkov, zdravljenje in izhod zdravljenja med 491 STEMI in 304 NSTEMI bolniki, sprejetimi od januarja do decembra 2023. Vodilna reperfuzijska strategija je bila primarna perkutana koronarna intervencija (PCI). Izhod zdravljenja je bila hospitalna, 30-dnevna in šest-mesečna umrljivost ter ponovna hospitalizacija v šestih mesecih.*

Rezultati: *NSTEMI bolniki so bili*

Abstract

Purpose: *There are both similarities and differences in the baseline clinical characteristics, treatment strategies, and outcomes between patients with ST-segment elevation myocardial infarction (STEMI) vs. non-ST-segment elevation myocardial infarction (NSTEMI). The purpose of this study was to compare mortality and rehospitalization rates between STEMI and NSTEMI patients.*

Methods: *In this retrospective study, baseline clinical characteristics, treatment strategies, and outcomes were compared among 491 STEMI and 304 NSTEMI patients admitted from January to December 2023. Percutaneous coronary intervention (PCI) was the main reperfusion strategy. Out-*

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statistično značilno starejši z več spremljajočimi boleznimi, STEMI bolniki pa so bili bistveno pogosteje oživljani, ter tudi kadilci z obsežnejšo miokardno nekrozo. Zgodnja PCI (v prvih 24 urah) je bila bistveno pogosteje opravljena pri STEMI (90,6 % v primerjavi s 45,1 %, p < 0,001) kot pri NSTEMI bolnikih, pri vseh pa uvedena ustrezna priporočena antitrombotična terapija. Akutno bolnišnično srčno popuščanje je prevladovalo pri STEMI bolnikih (28,9 % v primerjavi z 20 %, p = 0.02), med STEMI in NSTEMI bolniki pa ni bilo pomembnih razlik v umrljivosti (bolnišnična: 5,5 % v primerjavi s 5,6 %; 30-dnevna: 5,5 % v primerjavi s 4,6 %; šest-mesečna: 6,7 % v primerjavi s 7,2 %). NSTEMI bolniki so bili rehospitalizirani pogosteje.

Zaključki: *NSTEMI bolniki so bili starejši z več spremljajočimi boleznimi, STEMI bolniki pa so imeli večjo miokardno poškodbo z večjo prevalenco akutnega bolnišničnega srčnega popuščanja. Zaradi več zgodnje PCI pri STEMI kot NSTEMI bolnikih, kombinirane z ustrezno farmakološko terapijo, so bile umrljivosti pri STEMI in NSTEMI bolnikih podobne, a z večjim deležem ponovnih hospitalizacij pri NSTEMI bolnikih.*

comes included in-hospital, 30-day, and 6-month mortality rates, as well as rehospitalization rates within 6 months.

Results: *NSTEMI patients were significantly older and had more comorbidities, whereas STEMI patients were more frequently smokers, more frequently required resuscitation, and had more extensive myocardial injury. Early PCI (within the first 24 h) was performed significantly more often for STEMI than NSTEMI patients (90.6% vs. 45.1%, p < 0.001), and all patients received guideline-recommended antithrombotic therapy. Acute in-hospital heart failure was more prevalent in STEMI patients (28.9% vs. 20%, p = 0.02). There were no significant differences in in-hospital, 30-day, and 6-month mortality rates between STEMI and NSTEMI patients (5.5% vs. 5.6%, 5.5% vs. 4.6%, 6.7% vs. 7.2%, respectively). However, NSTEMI patients were more frequently rehospitalized.*

Conclusions: *NSTEMI patients were older and had more comorbidities, whereas STEMI patients had more extensive myocardial injury and a higher prevalence of acute in-hospital heart failure. More frequent use of early PCI in STEMI patients, combined with appropriate pharmacological therapy, may explain the similar mortality rates observed between STEMI and NSTEMI patients, despite a higher rate of rehospitalization rate in NSTEMI patients.*

INTRODUCTION

Acute myocardial infarction (MI) is a major cause of morbidity and mortality worldwide (1). Acute MI denotes the presence of acute myocardial injury, as evidenced by fluctuations in serum troponin levels (2). In addition to clinical presentation with chest pain and/or dyspnea, changes to standard electrocardiographic findings are crucial to distinguish acute ST-segment elevation myocardial infarction (STEMI) from non-ST-segment elevation myocardial infarction (NSTEMI) (2). Both forms of acute MI share many similarities but also exhibit important differences. In both STEMI and NSTEMI, the main symptom of ischemia is chest pain at rest, accompanied by less specific symptoms, such as dyspnea, palpitations, nausea, and abdominal pain. Notably, chest pain is typically more intense and persistent in STEMI than NSTEMI (2-4). Despite the differences in changes to standard electrocardiographic findings, the underlying pathophysiological mechanisms of STEMI and NSTEMI are similar, as both are most commonly caused by thrombus formation on a ruptured, eroded, or inflamed vulnerable atherosclerotic plaque, which results in complete occlusion of a coronary artery in STEMI or near-complete narrowing of the coronary artery lumen in NSTEMI. To a lesser extent, myocardial infarction with non-obstructive

coronary arteries (MINOCA) is most often observed in NSTEMI patients (2-5).

In the developed world, the incidence of MI has decreased over the past two decades, largely due to a reduction in STEMI cases. However, the prevalence of NSTEMI remains high (4-7). Risk factors for STEMI and NSTEMI are largely similar, although NSTEMI patients are generally older and have more comorbidities as compared with STEMI patients (4, 5, 7).

Treatment strategies for STEMI and NSTEMI patients are broadly similar and include early reperfusion therapy with percutaneous coronary intervention (PCI), combined with antithrombotic therapy or, in some cases, surgical revascularization. Primary PCI is the treatment of choice and the highest priority for STEMI patients. Coronary revascularization by PCI is also recommended as early as possible for high-risk NSTEMI patients (3, 4). Over the past decades, significant differences in early and late mortality have been observed between STEMI and NSTEMI patients, as the risk of early mortality is higher, while the risk of long-term mortality is lower in STEMI patients as compared with NSTEMI patients (4, 6, 7).

The aim of this study was to compare baseline characteristics, admission data, treatment strategies, early and late mortality, and rehospitalization rates within 6 months following the acute event between STEMI and NSTEMI patients.

PATIENTS AND METHODS

The cohort of this retrospective, single-center observational study included 795 consecutive patients with acute MI (70.4% men, mean age 66.3 ± 12.2 years) who were admitted to the University Medical Centre Maribor (UKC Maribor) from January to December 2023. UKC Maribor is a tertiary clinical center in northeastern Slovenia that serves as a referral 24/7 regional center for primary PCI in STEMI patients and for high-risk NSTEMI patients, covering a population of approximately 850,000 inhabitants. Patient medical records were retrieved from an electronic database and reviewed based on the International Classification of Diseases (10th Revision) codes I21.0–I21.4 and I21.9, specific for MI. According to established criteria, 491 STEMI patients and 304 NSTEMI patients were identified (2, 3). Baseline admission data included age, sex, comorbidities, out-of-hospital cardiac arrest prior to admission, time to primary PCI in STEMI patients, estimated glomerular filtration rate, high-sensitivity cardiac troponin I levels ≥1000 pg/L, smoking status, positive family history of MI, body mass index (BMI), and lipid profile (total cholesterol, high-density lipoprotein cholesterol, triglycerides, low-density lipoprotein cholesterol).

Treatment of STEMI and NSTEMI patients in 2023 was conducted in accordance with the European Society of Cardiology guidelines for acute coronary syndromes (3). The main reperfusion strategy was primary PCI for STEMI patients and early PCI following coronary angiography for high-risk NSTEMI patients. The treatment data included the use of PCI and/or surgical revascularization, Thrombolysis in Myocardial Infarction grade III flow after PCI, vascular access (radial or femoral), and antithrombotic therapy (3).

STEMI patients were transferred directly to the catheterization laboratory for coronary angiography and primary PCI. After the procedure, patients were monitored in the Coronary Care Unit or Intensive Care Unit for approximately 24 h or longer in case of complications until transfer to the cardiology ward or local hospitals in stable condition (3).

NSTEMI patients were admitted to the Coronary Care Unit and monitored until coronary angiography, with or without PCI, was performed. PCI was carried out based on the decision of the interventional cardiologist. Early PCI was performed for high-risk NSTEMI patients with disease of up to three vessels, potentially in multiple sessions during hospitalization. Surgical revascularization was the most preferred strategy for patients with multivessel coronary artery disease (CAD) (3).

During hospitalization, all complications were recorded. Acute heart failure was classified according to Killip classes II–IV and arrhythmias were categorized as ventricular and/or atrial (3, 8). Acute kidney injury was defined as an increase in serum

creatinine of at least 50% from baseline within the first 48 h (9). In-hospital bacterial infection was defined as the presence of microorganisms in normally sterile body tissues or fluids with or without clinical signs (fever, increased inflammatory markers) or initiation of antibiotic therapy based on strong clinical suspicion (10). Acute bleeding events were defined as Bleeding Academic Research Consortium type 3–5 (11).

Standard pharmacological treatments were recorded, which included acetylsalicylic acid with clopidogrel, ticagrelor, or prasugrel, unfractionated and low-molecular-weight heparin (LMWH), noradrenalin, dobutamin, levosimendan, loop diuretics, and glycoprotein (GP) IIb/IIIa antagonists. Interventions for complications included intra-aortic balloon pump, veno-arterial extracorporeal membrane oxygenation, and mechanical ventilation (3, 12, 13).

Data analysis and endpoints

The compared baseline characteristics between STEMI and NSTEMI patients included admission data, treatments, in-hospital complications, and outcomes, comprising in-hospital, 30-day, and 6-month mortality rates, as well as rehospitalization rates due to heart failure, need for PCI, reinfarction, or bleeding within 6 months.

Ethical approval

The protocol of this retrospective observational study was approved by the Institutional Medical Ethics Committee of the University Medical Centre Maribor (approval UKC-MB-KME-72/24) and conducted in accordance with the Declaration of Helsinki (1996 revision) and its subsequent amendments. The requirement for informed consent was waived due to the retrospective nature of this study. Patient data were protected in accordance with applicable legislation.

Statistical analysis

Statistical analysis was performed using IBM SPSS Statistics for Windows (version 19; IBM Corporation, Armonk, N.Y., USA). Data are presented as means ± standard deviations or percentages. Group differences were assessed using the two-sided Student's t-test for continuous variables and Fisher's exact test for categorical variables. A probability (p) value < 0.05 was considered statistically significant. Cumulative 6-month survival was estimated using the Kaplan–Meier method, and differences between groups (STEMI vs. NSTEMI) were assessed using the log-rank test.

RESULTS

The baseline characteristics and admission data of all included MI patients, along with comparisons between STEMI and NSTEMI patients, are presented in Table 1. NSTEMI patients were significantly older than STEMI patients and had significantly higher prevalence of comorbidities (arterial hypertension, diabetes, prior MI), whereas STEMI patients had significantly higher prevalences of smoking, family history of MI, prior resuscitation, and admission levels of high-sensitivity cardiac troponin I levels ≥1000 pg/L. There were no significant differences between STEMI and NSTEMI patients in terms of sex, MI location, BMI, lipid profile, or the prevalence of MINOCA.

Treatment data for STEMI and NSTEMI patients are presented in Table 2. Overall, 98% of STEMI patients and 95.4% of NSTEMI patients underwent coronary angiography; however, this difference was borderline significant ($p = 0.053$). Coronary angiography demonstrated occlusion of the culprit epicardial coronary artery in the majority of STEMI cases, whereas high-grade epicardial coronary stenosis was more common in NSTEMI patients.

Among the 11 MINOCA patients (4 with STEMI and 7 with NSTEMI), stenosis of the epicardial coronary arteries was observed in less than half. The underlying mechanisms included atherosclerosis, tortuosity of the coronary arteries, and spontaneous coronary artery dissection in 7, 1, and 3 patients, respectively.

STEMI patients received early PCI (primary PCI) significantly more frequently than NSTEMI patients (92.3% vs. 61.8%, respectively, $p < 0.001$), particularly within the first 24 h of hospitalization (90.6% vs. 45.1%, $p < 0.001$). For STEMI patients, primary PCI was performed within the first 12 h of chest

Table 1. *Baseline characteristics and admission data of patients with MI and comparison between STEMI and NSTEMI subgroups.*

Baseline and admission characteristics	All patients (n = 795)	STEMI patients (n = 491)	NSTEMI patients (n = 304)	p
Men (%)	70.4%	72.3%	67.4%	0.151
Women (%)	29.6%	27.7%	32.6%	0.151
Age (mean ± SD, years)	66.3 ± 12.2	64.4 ± 12.3	69.4 ± 11.2	<0.001
BMI (mean ± SD, kg/m2)	28.6 ± 4.6	28.6 ± 4.4	28.5 ± 4.9	0.844
Anterior MI (%)	46.9%	47%	33.3%	0.689
Age ≥ 65 years (%)	56.4	50.5	65.8	<0.001
AH (%)	59.5%	52.7%	70.4%	<0.001
Prior MI (%)	17.1%	11.2%	26.6%	<0.001
Diabetes (%)	26.2%	23%	31.3%	0.013
Smoking (%)	33.2%	38.8%	24%	<0.001
Prior resuscitation (%)	6,9%	10,8%	0,7%	<0,001
MINOCA (%)	1.4%	0.8%	2.3%	0.116
Killip II-IV ob sprejemu (%)	17.9%	18.9%	16.1%	0.341
Positive family history of MI (%)	10.4%	18.3%	1.9%	<0.001
Admission hs-TnI ≥ 1000 pg/L (%)	48.8	57.4	34.7	<0,001
Total cholesterol (mean ± SD, mmol/L)	4,7 ± 2,0	4,8 ± 2,3	4,6 ± 1,4	0,198
HDL cholesterol (mean ± SD, mmol/L)	1,2 ± 0,4	1,2 ± 0,4	1,23 ± 0,5	0,077
LDL cholesterol (mean ± SD, mmol/L)	3,0 ± 3,5	2,98 ± 1,0	3,0 ± 5,6	0,691
Triglicerides (mean ± SD, mmol/L)	1.8 ± 3.9	1.6 ± 1.8	2.1 ± 5.9	0.067

Abbreviations: STEMI, ST-elevation myocardial infarction; NSTEMI, non-ST-elevation myocardial infarction; SD, standard deviation; MI, myocardial infarction; AH, arterial hypertension;; MINOCA, myocardial infarction with non-obstructive coronary arteries; hs-TnI, high-sensitivity Troponin I; HDL, high density lipoprotein; LDL, low density lipoprotein.

Table 2. *Treatment of patients with MI and comparison between STEMI and NSTEMI subgroups.*

Treatments	All patients (n = 795)	STEMI patients (n = 491)	NSTEMI patients (n = 304)	p
Coronary angiography (%)	97%	98%	95.4%	0.053
PCI (%)	80.6	92.3	61.8	<0.001
PCI in the first 24 h (%)	73.2	90.6	45.1	<0.001
Radial access (%)	58.3	52	69.3	<0.001
Femoralni access (%)	41.7	48	30.7	<0.001
Single-vessel CAD (%)	36.6	43.5	24.7	<0.001
Two-vessel CAD (%)	32.7	34.1	30.2	<0.001
Multi-vessel CAD (%)	30.5	22.4	44.4	<0.001
Thrombus aspiration (%)	7.5	9.9	2	<0.001
Balloon angioplasty (%)	77.8	78.2	76.8	0.681
Stenting (%)	89	92.6	81.3	<0.001

Abbreviations: PCI, percutaneous coronary intervention; CAD, coronary artery disease.

Table 3. *In-hospital pharmacological therapy for patients with MI and comparison between STEMI and NSTEMI subgroups.*

In-hospital phramacological therapy (%)	All patients (n = 795)	STEMI patients (n = 491)	NSTEMI patients (n = 304)	p
ASA	97.6%	98.6%	96%	0.031
P_2Y_{12} inhibitor (%)	89.9	95.9	80.3	<0.001
Ticagrelor	58.8%	71.9%	36.9%	<0.001
Prasugrel	10.6%	11.1%	9.7%	0.549
Clopidogrel	22.9%	14.6%	36.9%	<0.001
Statin (%)	89.3%	91.3%	86.1%	0.032
Standard heparin (%)	64.9%	74.9%	45.4	<0.001
LMWH (%)	28.6%	19.9%	42.6%	<0.001
GP IIb/IIIa inhibitors (%)	25.8%	34.8%	11.3%	<0.001
Noradrenalin (%)	13.8%	16.9%	8.9%	0.001
Dobutamin (%)	6.5%	7.1%	5.7%	0.597
Levosimendan (%)	6.5%	9.2%	2.3%	<0.001
Antibiotics (%)	19.9%	21.4%	17.5%	0.201
Diuretics (%)	21.4%	19.2%	2.3%	<0.001
Fondaparinux (%)	8.6%	2.3%	18.9%	<0.001
VA ECMO (%)	0.6%	0.8%	0.3%	0.654
Mechanical ventilation (%)	9.8	11	7.9	0.177
IABP (%)	1.1	1.4	0.7	0.495
CABG (%)	7.4	4.1	12.8	<0.001
CABG or PCI (%)	86.9	94.1	75.3	<0.001

Abbreviations: ASA, acetylsalicylic acid; LMWH, low-molecular weight heparin; GP, glycoprotein; VA ECMO, veno-arterial extra-corporeal membrane oxygenation; IABP, intra-aortic balloon pump; CABG, coronary artery bypass graft; PCI, percutaneous coronary intervention.

Table 4. *In-hospital complications of patients with MI and comparison between STEMI and NSTEMI subgroups.*

Hospital complications (%)	All patients (n = 795)	STEMI patients (n = 491)	NSTEMI patients (n = 304)	p
Killip classes ≥ II (%)	25.8	28.9	20.7	0.012
Cardiogenic shock (%)	11.7%	14.1	7.9	0.009
Arrhythmias (%)	31.9	38.5	21.4	<0.001
Hospital infection (%)	20.5	22.8.	14.8.	0.047
Bleeding (%)	8.8	9.2	8.2	0.700
Reinfarction (%)	0.5	0.4	0.7	0.639
In-stent thrombosis (%)	0.6	0.8	0.3	0.654
Acute kidney injury (%)	11.2	11.9	10	0.418
Ejection fraction < 45% (%)	32.9	39	24.3	0.418
Mitral regurgiration (%)	33.2	31.6	35.7	0.290

pain onset in 71.5% of cases, within the first 6 h in 60.6%, and within 3 h in 31.5%. Femoral access was used significantly more often in STEMI patients whereas radial access was more common in NSTEMI patients. Single-vessel CAD predominated in STEMI patients, while multi-vessel CAD was more frequent in NSTEMI patients.

The types of in-hospital pharmacological therapies are presented in Table 3. The use of acetylsalicylic acid, ticagrelor, unfractionated heparin, statins, bail-out therapy with GP IIb/IIIa inhibitors, noradrenalin, levosimendan, and diuretics were applied significantly more frequently for STEMI patients, while NSTEMI patients more frequently received clopidogrel, low-molecular-weight heparin, fondaparinux, and underwent CABG. There were no significant differences in the use of prasugrel, dobutamine, veno-arterial extracorporeal membrane oxygenation, mechanical ventilation, intra-aortic balloon pump, or antibiotics between STEMI and NSTEMI patients.

Hospital complications are presented in Table 4. STEMI patients had a significantly higher incidences of heart failure (Killip class ≥ 2), cardiogenic shock, arrhythmia, and hospital-acquired infection. There were no significant differences in the incidences of bleeding, reinfarction, in-stent thrombosis, acute kidney injury, mitral regurgitation, or ejection fraction <45% between the groups.

The outcome data are presented in Table 5. There were no significant differences in the in-hospital, 30-day, and 6-month mortality rates between STEMI and NSTEMI patients. However, the rehospitalization rate within 6 months was higher in NSTEMI patients. As shown in Figure 1, there was no significant difference in the 6-month survival rates between STEMI and NSTEMI patients (93.3% vs. 92.8%, respectively, log-rank p = 0.789).

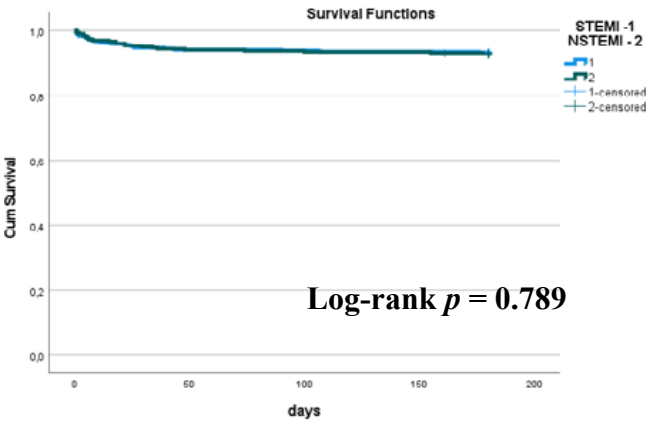

Figure 1. *Six-month survival comparison between STEMI and NSTEMI patients.*

DISCUSSION

Both significant and non-significant differences in the studied characteristics and admission data were observed between STEMI and NSTEMI patients. Among the baseline characteristics and admission data, older age and comorbidities were significantly more prevalent in NSTEMI patients, whereas STEMI patients had higher admission high-sensitivity cardiac troponin I levels ≥1000 pg/L, a higher prevalence of smoking, and more frequent prior resuscitation. Lipid profile, BMI, and the prevalence of heart failure on

Table 5. *Outcome data for patients with MI and comparison between STEMI and NSTEMI subgroups.*

Outcome data	All patients (n = 795)	STEMI patients (n = 491)	NSTEMI patients (n = 304)	p
In-hospital mortality (%)	5.5	5.5	5.6	0.999
30-day mortality (%)	5.2	5.5	4.6	0.624
6-month mortality (%)	6.9	6.7	7.2	0.776
6-month rehospitalization rate (%)	9.1	5	15.5	<0.001
6-month rehospitalization rate or mortality (%)	15.3	11.3	21.5	<0.001

admission were similar between the two groups.

STEMI patients were significantly more likely to be treated with primary PCI within the first 24 h as compared to NSTEMI patients, although coronary angiography was performed within the first 24 h in > 90% of both groups. Femoral access and single-vessel CAD were more common for STEMI patients, whereas multi-vessel CAD, radial access, and CABG were more frequent for NSTEMI patients.

The use of dual antiplatelet therapy, bail-out GP IIb/IIIa inhibitors, and standard heparin was significantly higher in STEMI patients than NSTEMI patients. STEMI patients also more frequently required treatment with noradrenalin, levosimendan, and loop diuretic due to a higher prevalence of in-hospital heart failure, particularly cardiogenic shock. Although no significant differences in mortality were observed between the groups, rehospitalization rates were significantly higher in NSTEMI patients due to heart failure, reinfarction, repeated PCI, or bleeding.

Among all included consecutive acute MI patients, 61.8% had STEMI and 38.2% had NSTEMI. Most studies report a higher prevalence of NSTEMI among acute MI patients (5-7). The lower prevalence of NSTEMI in our cohort may be explained by treatment of NSTEMI patients in smaller local PCI centers in our region, which operate only 8 h per day and 5 days per week.

Our findings confirm previous studies showing that NSTEMI patients are older and have more comorbidities than STEMI patients (5-7). Comorbidities, such as arterial hypertension, diabetes, and prior MI, in NSTEMI patients represent an increased risk of atherosclerosis. STEMI patients, who were on average a few years younger, more frequently had a history of smoking and positive family history of MI.

Although the global prevalence of smoking has declined from 22.7% in 2007 to 17% in 2021, the absolute number of smokers remains high due to population growth (14). According to the World Health Organization, the prevalence of smoking in Slovenia was 17.6% in 2021, despite smoking being banned in public areas since 2007 (15). However, among acute MI patients, 33.2% were smokers and even 38.8% among STEMI patients. The lower prevalence of smoking among older NSTEMI patients likely reflects the implementation of primary and secondary preventive measures.

Regarding the higher proportion of STEMI patients with a family history of MI, our data are consistent with findings of a study of the Danish national registry showing that the number of affected first- and second-degree relatives meaningfully contributes to risk assessment, especially in middle age (16).

The lipid profiles of STEMI and NSTEMI patients were similar. Despite prior MI in 25% and prior PCI in 29.4% of NSTEMI patients, mean low-density lipoprotein cholesterol levels remained well above the recommended target of 1.4–1.8 mmol/L for patients with established atherosclerosis (17).

Our data on PCI use in STEMI patients (>90%), particularly within the first 24 h, are consistent with the European STEMI registry (2021), where primary PCI was used in 83%–97% of cases (18). Although current guidelines recommend performing PCI as soon as possible, only 31.5% of our STEMI patients underwent primary PCI within the first 3 h of chest pain onset, while 45.1% of high-risk NSTEMI patients received early PCI within the first 24 h. High-risk criteria included elevated high-sensitivity cardiac troponin I levels, dynamic ST-segment or T-wave changes, transient ST-segment elevation and a Global Registry of Acute Coronary Events risk score >140 (3). When PCI was not feasible, CABG was performed – 12.8% in NSTEMI versus 4.1% in STEMI patients – to ensure adequate myocardial perfusion. During the initial hospitalization, PCI or CABG was performed for 75.1% of NSTEMI patients, significantly less frequently than for STEMI patients. A 2022 meta-analysis showed that the delayed application of an invasive strategy as compared with standard medical therapy did not significantly affect the hard clinical outcomes of NSTEMI patients (19).

Dual antiplatelet therapy was administered in the majority of both STEMI and NSTEMI patients. Ticagrelor was more commonly used for STEMI patients, whereas clopidogrel was more frequently used for NSTEMI patients due to bleeding or an increased bleeding risk, particularly in older patients

with comorbidities (3). Higher admission levels of high-sensitivity cardiac troponin I levels in STEMI patients reflect more extensive ischemic myocardial injury, which is associated with a higher prevalence of heart failure, including cardiogenic shock, and consequently greater use of noradrenalin, diuretics, and levosimendan (3, 8).

It has long been established that in-hospital heart failure is associated with an increased mortality risk, often due to delays in timely primary PCI for STEMI patients (20). In our cohort of acute MI patients, the incidence of in-hospital acute heart failure was approximately 25%, consistent with reported rates of 7% and 38% in acute coronary syndrome trials (21). Acute heart failure may result from extensive, often anterior-wall myocardial injury. Alternatively, even smaller infarctions can precipitate acute decompensation of chronic heart failure in patients with comorbidities, such as arterial hypertension, previous MI, and type 2 diabetes – particularly in elderly NSTEMI patients (21-23).

Acute heart failure is a major determinant of the mortality of acute MI patients, especially in settings with suboptimal implementation of guideline-directed medical and reperfusion therapies (21,23). In addition to pharmacological therapy, early reperfusion remains crucial, particularly for STEMI patients (3). Despite the high prevalence of acute heart failure in our cohort, the in-hospital and 30-day mortality rates were below 6% due to early PCI and guideline-recommended medical therapy (3, 19, 21-23)

Over the past two decades, the use of reperfusion therapy for both STEMI and NSTEMI has improved in developed countries. In Europe, reperfusion therapy for STEMI patients (primary PCI + intravenous fibrinolysis) increased from 55.8% to 92.7%, and PCI use from 40.4% to 83%–97% (18). In parallel, the in-hospital mortality rate decreased from 7% to 4.4% overall (range, 2.5%–5.9%) in member states and countries affiliated with the European Society of Cardiology (18).

In conclusion, there were both similarities and differences in the studied characteristics and clinical data between STEMI and NSTEMI patients. While the in-hospital, 30-day, and 6-month mortality rates were similar, NSTEMI patients had higher 6-month rehospitalization and combined 6-month rehospitalization/mortality rates. These differences were likely due to older age, greater comorbidity burden, and less likely frequently PCI during the initial hospitalization. NSTEMI patients were significantly older and had more comorbidities, whereas STEMI patients experienced more extensive myocardial injury and higher rates of in-hospital heart failure. However, the higher rate of early PCI and pharmacological therapy resulted in similar mortality data but lower rehospitalization rates for STEMI patients.

STUDY LIMITATIONS

The main limitation of this observational study was the retrospective design, which may have introduced selection and recall biases. Residual confounding could not be entirely excluded. As this was a single-center study, the number of NSTEMI patients was limited, and the findings may not be fully generalizable for this subgroup of acute MI patients. Second, some data were missing, particularly ejection fraction measures and other laboratory parameters, due to early fatalities or early transfers to local hospitals. Nevertheless, these data provide valuable real-world insights into PCI use, pharmacological therapy, in-hospital complications, mortality, and 6-month rehospitalization due to reinfarction, repeat PCI, heart failure, and bleeding in STEMI and NSTEMI patients.

CONFLICT OF INTEREST STATEMENT

The authors have no conflicts of interest to declare.

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