The progress in outcomes of the management of patients with non-ST-segment elevation myocardial infarction between 2005 and 2014 in Poland – a propensity score matching analysis from the PL-ACS registry

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Abstract

Introduction: Dynamic changes both in clinical profile and treatment strategy of non ST-segment elevation myocardial infarction (NSTEMI) patients have been observed recently. The exact impact of them on prognosis in a wide national population remains unclear.

Aim: To evaluate the impact of treatment advances between 2005 and 2014 on the outcomes of NSTEMI cases.

Material and methods: NSTEMI patients from the Polish Registry of Acute Coronary Syndromes (PL-ACS) were included to the analysis. The mortality rate in a hospital observation as well as in 12-month follow-up was evaluated.

Results: The frequency of diabetes, hypertension, prior coronary artery interventions (especially percutaneous coronary intervention) raised. A frequency of invasive procedures increased remarkably (coronary angiography from 35.8% to 90.7%; $p < 0.05$ and percutaneous coronary intervention from 25.7% to 63.6%; $p < 0.05$). The usage of P2Y12 – inhibitors raised substantially from 56% to 93%; $p < 0.05$. In-hospital mortality decreased by fifty percent (in women from 6.6% to 3.3%; $p < 0.001$ and in men from 4.9% to 2.5%; $p < 0.001$, respectively). Similarly, 12-month mortality decreased up to one third (in women from 21.6% to 15.1%; $p < 0.001$ and in men from 17.8% to 12.8%; $p < 0.001$, respectively). Invasive strategy appeared to be the strongest factor decreasing mortality. Into in-hospital observation it reduces triple mortality risk whereas in 12-month follow up twice. Using propensity score matching analysis the impact of the treatment improvements on relative risk reduction was estimated on over 60%.

Conclusions: In last decade the outcomes of NSTEMI in Poland improved substantially. The predominant impact on it had a routine invasive strategy.

Key words: outcomes, non ST-segment elevation myocardial infarction, propensity score matching, invasive treatment.

Summary

Dynamic changes both in clinical profile and treatment strategy of non ST-segment elevation myocardial infarction (NSTEMI) patients have been observed recently. The exact impact of them on prognosis in a wide national population remains unclear. NSTEMI patients from the Polish Registry of Acute Coronary Syndromes (PL-ACS) were included to the analysis. In-hospital mortality decreased by fifty percent (in women from 6.6% to 3.3%; $p < 0.001$ and in men from 4.9% to 2.5%; $p < 0.001$, respectively). Similarly, 12-month mortality decreased up to one third (in women from 21.6% to 15.1%; $p < 0.001$ and in men from 17.8% to 12.8%; $p < 0.001$, respectively). Invasive strategy appeared to be the strongest factor decreasing mortality. Into in-hospital observation it reduces triple mortality risk whereas in 12-month follow up twice. Using propensity score matching analysis the impact of the treatment improvements on relative risk reduction was estimated on over 60%.

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Introduction

In the last decade a non-ST-segment elevation myocardial infarction (NSTEMI) has become the most common MI type in Poland which is consistent with previous observations from the majority of Western European countries [1]. Simultaneously, dynamic changes in the clinical profile and the treatment strategy have been noticed, however their contribution to outcomes in a wide national population remains unclear [2–5].

Aim

Using the data from the Polish Registry of Acute Coronary Syndromes (PL-ACS) we analyzed the trends in clinical characteristics, treatment strategy and outcomes in almost two hundred thousand NSTEMI cases registered between 2005 and 2014.

Material and methods

The study population was drawn from 463 hospitals in Poland providing care for patients with MI. It consists of patients admitted with a diagnosis of NSTEMI according to the guidelines of European Society of Cardiology (ESC) [6–8]. The study covers last 10-year period from 2005 to 2014. Contribution to the study was voluntary, nevertheless it comprises a half of all estimated cases of NSTEMI in Poland in that time. The study complies with the Declaration of Helsinki and was approved by the PL-ACS Registry committee.

Data was collected from the PL-ACS Registry questionnaires that include variables on demographic factors (gender, age), risk factors (smoking, arterial hypertension, hypercholesterolemia, diabetes mellitus and obesity), previous coronary incidences and procedures (MI, percutaneous coronary intervention (PCI), coronary artery by-pass grafting (CABG)), clinical presentation on admission (Killip class, heart rate, systolic blood pressure), electrocardiographic abnormalities (left ventricular ejection fraction (EF) – echocardiographic assessment on admission), coronary angiography (CA), coronary intervention details and in-hospital and post-discharge treatment. In-hospital complications (including bleeding, stroke and re-infarction (ST-elevation in at least two contiguous leads in association with ischemic symptoms)) as well as in-hospital mortality together with 12-month follow-up were evaluated**.** Propensity score matching (PSM) was used to compensate for the nonrandomized design of the study to control for imbalances in patients characteristics.

Statistical analysis

Females and males were analyzed separately. To assess age impact on outcomes the analysis was conducted in consecutive decades of life. Changes over time were investigated as comparison between subgroup in marginal 3-year intervals (2005–2007 and 2012–2014).

Categorical data are presented as numbers and percentages while continuous data as arithmetic mean ± standard deviation (SD). Differences in categorical variables were tested by χ^2 test with Pearson modification whereas in continuous variables with Student *t*-test. A two-sided p-value ≤ 0.05 was considered significant. A logistic regression was used to identify variables that independently contributed to mortality. Propensity scores were calculated using a multiple regression model that included all covariates presented in Table I. Matching was performed using a nearest neighbor algorithm. In-hospital and 12-month mortality were evaluated of the studied groups as well as propensity score-matched subgroups were evaluated. Finally, the impact of the change in the treatment strategy changes was estimated by comparison the relative risk reduction (RRR) in the PSM groups with the RRR in the entire study group.

Results

A total of 197,192 patients (including 77,550 women, 39.3%) hospitalized in Poland due to NSTEMI between 2005 and 2014 were enrolled. All patients from two marginal 3-year periods (i.e. 2005–2007 and 2012–2014) were incorporated to the final analysis (Table II). Two matched cohorts of 17,346 women as well as two matched cohorts of 26,059 men were created as a result of the propensity score matching (Table I).

In the last decade the mean age of males increased from 65.8 ±11.8 to 66.7 ±11.3 years ($p < 0.001$), whereas the mean age of females slightly decreased from 72.3 ±10.8 to 72.1 ±11.0 years ($p = 0.018$). The frequency of major coronary artery disease risk factors like diabetes, arterial hypertension, obesity (in men only), smoking (in women only) increased. In the later years of the study the rate of prior PCI increased significantly. Additionally, there were substantial differences in Killip class, blood pressure, heart rate, ECG and echocardiography (Table II). Differences in the baseline clinical characteristics were equalized by the propensity score matching model (Table I).

During the last decade the frequency of invasive procedures increased remarkably in general population (coronary angiography from 35.8% to 90.7%; $p < 0.05$ and percutaneous coronary intervention from 25.7% to 63.6%; $p < 0.05$) as well as in PSM subgroups (Table III). In addition there were also modifications in medical treatment scheme. The usage of P2Y12 – inhibitors (especially clopidogrel) raised substantially from 56% in 2005–2007 to 93%; $p < 0.05$ in 2012–2014 (Table III).

In that time the risk of in-hospital complications (re-infarction, stroke and cardiovascular death) decreased considerably. On the contrary, the risk of major bleeding incidences was higher in the later years of the study (Table IV). In the whole population in-hospital

Table I. Baseline characteristics of NSTEMI patients after propensity score matching

Parameter	Women			Men		
	2005–2007	2012–2014	*P*-value	2005–2007	2012–2014	*P*-value
	17346 (100%)	17346 (100%)		26059 (100%)	26059 (100%)	
Risk factors:						
Hypertension	13489 (77.8)	13541 (78.1)	0.501	18399 (70.6)	18565 (71.2)	0.109
Diabetes	6106 (35.2)	6094 (35.1)	0.893	6387 (24.5)	6497 (24.9)	0.264
Hypercholesterolemia	7472 (43.1)	7496 (43.2)	0.795	11080 (42.5)	11165 (42.8)	0.452
Smoking	2015 (11.6)	2102 (12.1)	0.149	8098 (31.1)	7997 (30.7)	0.338
Obesity	4310 (24.8)	4338 (25.0)	0.729	4242 (16.3)	4369 (16.8)	0.134
Prior MI	3247 (18.7)	3069 (17.7)	0.013	5954 (22.8)	5570 (22.1)	0.054
Prior PCI	731 (4.2)	876 (5.1)	< 0.001	1666 (6.4)	1987 (7.6)	< 0.001
Prior CABG	693 (4.0)	690 (4.0)	0.934	1634 (6.3)	1650 (6.3)	0.773
Clinical characteristics on admission:						
SBP < 100 mm Hg	651 (3.8)	652 (3.8)	0.448	892 (3.6)	904 (3.5)	0.406
SBP 100–160 mm Hg	12232 (74.4)	12863 (75.0)	0.234	19417 (79.1)	20505 (79.3)	0.566
SBP > 160 mm Hg	3559 (21.6)	3645 (21.2)	0.366	4247 (17.3)	4455 (17.2)	0.834
HR > 100/min	2162 (13.1)	2113 (12.3)	0.029	2747 (11.2)	2779 (10.8)	0.169
Killip class 4	377 (2.2)	344 (2.0)	0.298	564 (2.2)	519 (2.0)	0.251
Killip class 3	939 (5.4)	834 (4.9)	0.025	1083 (4.2)	1008 (3.9)	0.179
Killip class 2	2826 (16.3)	2602 (15.2)	0.007	3477 (13.3)	3305 (12.9)	0.106
ECG: sinus rythm	14209 (86.1)	14678 (85.8)	0.427	21751 (88.2)	22682 (88.1)	0.904
ECG: atrial fibrilation	1690 (10.2)	1659 (9.7)	0.097	1950 (7.9)	1963 (7.6)	0.195
ECG: pacemaker	207 (1.3)	213 (1.2)	0.940	295 (1.2)	285 (1.1)	0.352
ECG: ST-segment depression	7704 (44.4)	7675 (44.2)	0.754	10542 (40.5)	10675 (41.0)	0.236
ECG: T-wave inversion	3409 (19.7)	3384 (19.5)	0.735	4877 (18.7)	4836 (18.6)	0.645
ECG: other ST-T abnormal.	5120 (29.5)	5044 (29.1)	0.370	8557 (32.8)	8383 (32.2)	0.104
ECG: normal	1623 (9.4)	1285 (7.4)	< 0.001	2790 (10.7)	2198 (8.4)	< 0.001
LVEF > 50%	4010 (44.0)	6077 (43.9)	0.968	5802 (39.1)	8262 (38.9)	0.749
LVEF 35–50%	4174 (45.8)	6385 (46.2)	0.550	7116 (47.9)	10168 (47.9)	0.940
LVEF < 35%	939 (10.3)	1372 (9.9)	0.355	1923 (13.0)	2794 (13.2)	0.566
Time pain to admission 0–2 h	1919 (13.1)	1890 (12.4)	0.071	3169 (14.3)	3205 (13.9)	0.190
Time pain to admission 2–12 h	7038 (48.2)	7361 (48.4)	0.652	10594 (47.9)	11149 (48.3)	0.339
Time pain to admission > 12 h	5650 (38.7)	5944 (39.1)	0.438	8376 (37.8)	8728 (37.8)	0.964
Time pain to admission > 24 h	3705 (25.4)	3905 (25.7)	0.508	5585 (25.20	5764 (25.0)	0.531
Prehospital cardiac arrest	190 (1.1)	164 (0.9)	0.173	365 (1.4)	335 (1.3)	0.269

CABG – coronary artery by-pass graft, ECG – electrocardiogram, HR – heart rate, LVEF – left ventricle ejection fraction, MI – myocardial infarction, PCI – percutaneous coronary intervention, SBP – systolic blood pressure.

Table II. Baseline characteristics of NSTEMI patients

Parameter	Women			Men		
	2005–2007	2012–2014	*P*-value	2005–2007	2012–2014	*P*-value
	23189 (100%)	25542 (100%)		33148 (100%)	41125 (100%)	
Risk factors:						
Hypertension	17908 (77.2)	20568 (80.5)	< 0.001	22792 (68.8)	31219 (75.9)	< 0.001
Diabetes	8180 (35.3)	9623 (37.3)	< 0.001	7865 (23.7)	11999 (29.2)	< 0.001
Hypercholesterolemia	10182 (43.9)	11264 (44.1)	0.671	14446 (43.6)	18067 (43.9)	0.337
Smoking	2403 (10.4)	3340 (13.1)	< 0.001	10595 (32.0)	10989 (26.7)	< 0.001
Obesity	5879 (25.4)	6391 (25.0)	0.400	5143 (15.5)	7807 (19.0)	< 0.001
Prior MI	5899 (25.4)	5681 (22.2)	< 0.001	10097 (30.5)	10728 (26.1)	< 0.001
Prior PCI	736 (3.2)	4301 (16.8)	< 0.001	1680 (5.1)	8534 (20.8)	< 0.001
Prior CABG	1321 (5.7)	1092 (4.3)	< 0.001	2764 (8.3)	2755 (6.7)	< 0.001
Clinical characteristics on admission:						
SBP < 100 mm Hg	1034 (4.7)	813 (3.4)	< 0.001	1407 (4.5)	1201 (2.9)	< 0.001
SBP 100–160 mm Hg	15744 (71.1)	19698 (77.8)	< 0.001	24468 (77.8)	33140 (81.1)	< 0.001
SBP > 160 mm Hg	5367 (24.2)	4795 (18.9)	< 0.001	5588 (17.8)	6505 (15.9)	< 0.001
HR > 100/min	3713 (16.7)	2501 (9.9)	< 0.001	4402 (13.9)	3470 (8.5)	< 0.001
Killip class 4	662 (2.9)	388 (1.5)	< 0.001	919 (2.8)	659 (1.6)	< 0.001
Killip class 3	1932 (8.3)	995 (4.0)	< 0.001	2052 (6.2)	1231 (3.0)	< 0.001
Killip class 2	4349 (18.8)	3265 (13.0)	< 0.001	5109 (15.4)	4462 (11.0)	< 0.001
ECG: sinus rythm	18667 (83.6)	22072 (87.6)	< 0.001	27506 (86.9)	36102 (88.9)	< 0.001
ECG: atrial fibrilation	2728 (12.2)	2062 (8.2)	< 0.001	2764 (8.7)	2822 (6.9)	< 0.001
ECG: pacemaker	292 (1.3)	293 (1.2)	0.145	419 (1.3)	472 (1.2)	0.051
ECG: ST-segment depression	11124 (48.8)	10361 (40.6)	< 0.001	14564 (43.9)	15200 (37.0)	< 0.001
ECG: T-wave inversion	6778 (29.2)	3795 (14.9)	< 0.001	8798 (26.5)	5559 (13.5)	< 0.001
ECG: other ST-T abnormal.	5957 (14.9)	7725 (30.0)	< 0.001	9802 (21.1)	13542 (32.8)	< 0.001
ECG: normal	1648 (7.1)	3703 (14.5)	< 0.001	2817 (8.5)	6857 (16.7)	< 0.001
LVEF > 50%	5077 (42.0)	8890 (43.3)	0.019	7015 (37.3)	12851 (38.2)	0.043
LVEF 35–50%	5647 (46.7)	9662 (47.1)	0.505	9062 (48.2)	16331 (48.6)	0.437
LVEF < 35%	1370 (11.3)	1973 (9.6)	< 0.001	2706 (14.4)	4421 (13.2)	< 0.001
Time pain to admission 0–2 h	3322 (16.7)	2247 (10.1)	< 0.001	4966 (17.5)	4097 (11.3)	< 0.001
Time pain to admission 2–12 h	9227 (46.7)	10882 (48.7)	< 0.001	13123 (46.2)	17726 (49.0)	< 0.001
Time pain to admission > 12 h	7227 (36.5)	9205 (41.2)	< 0.001	10342 (36.4)	14374 (39.7)	< 0.001
Time pain to admission > 24 h	4850 (24.5)	5818 (26.0)	< 0.001	7115 (25.0)	9157 (25.3)	< 0.001
Prehospital cardiac arrest	360 (1.6)	204 (0.8)	< 0.001	712 (2.1)	389 (0.9)	< 0.001

CABG – coronary artery by-pass graft, ECG – electrocardiogram, HR – heart rate, LVEF – left ventricle ejection fraction, MI – myocardial infarction, PCI – percutaneous coronary intervention, SBP – systolic blood pressure.

Table III. Management of NSTEMI patients (after propensity score matching)

Parameter	Women			Men		
	2005–2007	2012–2014	*P*-value	2005–2007	2012–2014	*P*-value
	17346 (100%)	17346 (100%)		26059 (100%)	26059 (100%)	
Treatment strategy:						
Hospitalisation on cardiology depart.	12000 (69.2)	15420 (88.9)	< 0.001	19222 (73.8)	23982 (92.0)	< 0.001
Conservative treatment	11787 (68.0)	2255 (13.0)	< 0.001	15032 (57.7)	2315 (8.9)	< 0.001
Coronary angiography	5542 (32.0)	15090 (87.0)	< 0.001	10998 (42.3)	23744 (91.1)	< 0.001
Percutaneous coronary intervention	3838 (22.1)	10021 (57.8)	< 0.001	8015 (30.8)	16861 (64.7)	< 0.001
Second PCI (non-IRA) during indx hosp.	612 (3.6)	2268 (13.1)	< 0.001	1149 (4.4)	2849 (10.9)	< 0.001
PCI with stent implantation	3357 (87.5)	9083 (90.5)	< 0.001	7719 (88.9)	15434 (91.3)	< 0.001
PCI with BMS implantation	3192 (83.2)	4115 (41.0)	< 0.001	6808 (85.0)	6618 (39.1)	< 0.001
PCI with DES implantation	165 (4.3)	4968 (49.5)	< 0.001	311 (3.9)	8816 (52.2)	< 0.001
Intra aortic ballon pump	52 (0.3)	88 (0.5)	0.023	105 (0.4)	143 (0.5)	0.016
Medical treatment during hospitalisation:						
Acetlosalycic acid	15974 (92.1)	14271 (82.3)	< 0.001	24244 (93.0)	21671 (83.2)	< 0.001
P2Y12B inhibitor	9041 (52.1)	16096 (92.8)	< 0.001	15581 (59.8)	24281 (93.2)	< 0.001
Clopidogrel	7019 (40.5)	16040 (92.5)	< 0.001	12625 (48.4)	24243 (93.0)	< 0.001
GPIIb/IIIa inhibitor	371 (2.1)	1318 (7.6)	< 0.001	880 (3.4)	2619 (10.1)	< 0.001
Heparin	12949 (74.7)	8919 (51.5)	< 0.001	18988 (72.9)	13152 (50.5)	< 0.001
Beta-adrenolytic	13705 (79.0)	11607 (66.9)	< 0.001	20499 (78.7)	17790 (68.3)	< 0.001
Calcium channel blocker	1664 (9.8)	2228 (12.8)	< 0.001	2032 (7.8)	2878 (11.0)	< 0.001
Statin	13633 (78.6)	12311 (71.0)	< 0.001	21050 (80.8)	19224 (73.8)	< 0.001
ACEI/ARB	13616 (78.8)	10529 (60.7)	< 0.001	20166 (77.4)	16286 (62.6)	< 0.001
Nitrate	9366 (54.0)	2496 (14.4)	< 0.001	13015 (49.9)	3448 (13.2)	< 0.001
Diuretics	6903 (39.8)	5100 (29.4)	< 0.001	8082 (31.0)	6326 (24.3)	< 0.001

ACEI/ARB – angiotensin-converting enzyme inhibitor/angiotensin receptor blocker, BMS – bare metal stent, DES – drug eluting stent, IRA – infarct-related artery.

Table IV. Outcomes of NSTEMI patients (after propensity score matching)

Parameter	Women			Men		
	2005–2007	2012–2014	*P*-value	2005–2007	2012–2014	*P*-value
	17346 (100%)	17346 (100%)		26059 (100%)	26059 (100%)	
Myocardial reinfarction	812 (4.7)	59 (0.3)	< 0.001	1100 (4.3)	82 (0.3)	< 0.001
Stroke	101 (0.6)	54 (0.3)	< 0.001	78 (0.3)	44 (0.2)	< 0.001
Bleeding	145 (0.8)	270 (1.6)	< 0.001	137 (0.5)	270 (1.0)	< 0.001
Cardiovascular mortality in hospital	964 (5.6)	630 (3.6)	< 0.001	1051 (4.0)	717 (2.8)	< 0.001
Other cause of mortality in hospital	54 (0.3)	49 (0.3)	0.622	68 (0.3)	66 (0.3)	0.863
In-hospital mortality	1018 (5.9)	679 (3.9)	< 0.001	1119 (4.3)	783 (3.0)	< 0.001
30-day mortality	1535 (8.8)	1303 (7.5)	< 0.001	1825 (7.0)	1534 (5.9)	< 0.001
6-month mortality	2760 (15.9)	2204 (12.7)	< 0.001	3322 (12.7)	2749 (10.6)	< 0.001
12-month mortality	3474 (20.0)	2812 (16.2)	< 0.001	4293 (16.5)	3544 (13.6)	< 0.001

mortality decreased by fifty percent (from 5.6% in 2005–2007 to 2.8% in 2012–2014; $p < 0.001$, in women from 6.6% to 3.3%; $p < 0.001$ and in men from 4.9% to 2.5%; $p < 0.001$, respectively). Similarly, there was more than 30% decrease in the 12-month mortality (from 19.4% in 2005–2007 to 13.7% in 2012–2014; $p < 0.001$, in women from 21.6% to 15.1%; $p < 0.001$ and in men from 17.8% to 12.8%; $p < 0.001$, respectively). Also in the PSM model the outcomes improved considerably – in hospital mortality rates decreased by thirty percent whereas 12-month mortality decreased by 18% (Table IV).

In the multivariable analysis the invasive strategy appeared to be the strongest factor decreasing mortality. It tripled the in-hospital and doubled the 12-month mortality rate reduction (Table V).

An estimated impact of the treatment improvements on relative risk reduction in in-hospital mortality amounted to 67.8% in women and 61.6% in men, respectively. Similarly changes of the management in the last decade accounted for 63.3% (in women) and 62.6% (in men) of the relative risk reduction in 12-month mortality (Figure 1).

Discussion

The major finding of our study is the confirmation of the progress in therapeutic strategies to outcomes of the management of patients with NSTEMI in the last decade. The propensity score analysis revealed the substantial input (over 60%) of modern treatment into the overall benefit of prognosis. Irrespective of the clinical profile changes the routine invasive approach as well as modern medical therapies resulted in a spectacular mortality rates reduction.

As in many previous reports significant changes in the clinical characteristics, management and treatment outcomes of NSTEMI patients were observed [3–5]. The prevalence of major coronary risk factors like diabetes,

Table V. Multivariate analysis of factors of in-hospital as well as 12-month mortality.

Parameter	In-hospital mortality		12-month mortality	
	RR (95% CI)	*P*-value	OR (95% CI)	*P*-value
Gender – female (vs. male)	1.02 (0.97–1.08)	0.4485	0.94 (0.92–0.97)	< 0.0001
Age (on each decade)	1.63 (1.59–1.68)	< 0.0001	1.57 (1.55–1.59)	< 0.0001
Hypertension	0.73 (0.69–0.78)	< 0.0001	0.85 (0.83–0.88)	< 0.0001
Diabetes	1.09 (1.03–1.15)	0.0021	1.29 (1.26–1.32)	< 0.0001
Hypercholesterolaemia	0.73 (0.69–0.77)	< 0.0001	0.81 (0.79–0.83)	< 0.0001
Smoking	1.02 (0.94–1.10)	0.6776	1.06 (1.03–1.10)	0.0005
Obesity	1.18 (1.10–1.26)	< 0.0001	0.99 (0.96–1.02)	0.37
Previuos MI	1.07 (1.01–1.14)	0.0255	1.12 (1.09–1.15)	< 0.0001
Previous PCI	0.80 (0.73–0.88)	< 0.0001	0.90 (0.87–0.94)	< 0.0001
Previous CABG	0.80 (0.71–0.91)	0.0006	0.84 (0.80–0.88)	< 0.0001
SBP < 100 mm Hg	2.25 (2.08–2.45)	< 0.0001	1.69 (1.62–1.77)	< 0.0001
SBP > 160 mm Hg	0.48 (0.43–0.52)	< 0.0001	0.68 (0.66–0.71)	< 0.0001
HR > 100 /min	1.31 (1.23–1.40)	< 0.0001	1.23 (1.19–1.27)	< 0.0001
Killip 3 class	3.67 (3.41–3.94)	< 0.0001	1.98 (1.91–2.06)	< 0.0001
Killip 4 class	13.2 (12.0–14.4)	< 0.0001	4.48 (4.26–4.71)	< 0.0001
Other than sinus rythm on ECG	1.19 (1.12–1.27)	< 0.0001	1.14 (1.11–1.18)	< 0.0001
ST-T abnormalities on ECG	1.16 (1.07–1.27)	0.0007	1.15 (1.11–1.19)	< 0.0001
LVEF 35–50%	1.10 (1.01–1.20)	0.0240	1.52 (1.47–1.57)	< 0.0001
LVEF < 35%	2.31 (2.11–2.53)	< 0.0001	2.67 (2.57–2.78)	< 0.0001
Time to admission > 12 h	1.09 (1.03–1.16)	0.0030	1.03 (1.00–1.06)	0.022
Prehospital cardiac arrest	2.37 (2.09–2.69)	< 0.0001	1.74 (1.63–1.85)	< 0.0001
Invasive treatment	0.31 (0.29–0.33)	< 0.0001	0.51 (0.49–0.52)	< 0.0001

CABG – coronary artery by-pass graft, ECG – electrocardiogram, HR – heart rate, LVEF – left ventricle ejection fraction, MI – myocardial infarction, PCI – percutaneous coronary intervention, SBP – systolic blood pressure.

obesity, arterial hypertension and chronic kidney disease is still increasing. On the contrary, percentage of smoking habit significantly decreased recently. Additionally, in the years 2005–2014 numerous changes in the clinical profile (mean age, gender, comorbidities and Killip class on admission) that might have impact on prognosis were noted [9–13].

Recently, a significant progress in the medical therapy was achieved, as the vast majority of NSTEMI patients receive double antiplatelet therapy (including P2Y12-receptor blockers). Previously, a significant proportion of patients were administered ticlopidine that was gradually substituted by clopidogrel and later by ticagrelor according to the guidelines of European Society of Cardiology [6–8]. Nevertheless, due to financial issue, the implantation of the novel antiplatelets agents in a routine practice was delayed in Poland compared with other countries.

An invasive approach became a predominant treatment strategy in NSTEMI [7, 8, 14, 15]. Importantly, the CA or PCI rates in Poland are currently equal to those in the Western Europe and United States [3, 4, 5, 16]. A rapid growth in invasive strategy utilization in Poland was distinctively noticeable in 2005–2011 that was mainly related to the opening of new catheterization laboratories. These allowed to follow ECS guidelines of that time on management of acute coronary syndromes in patients presenting without persistent ST-segment elevation from 2002 [6] and 2007 [7].

Multivariable analysis confirmed the significant invasive strategy contribution to outcomes which appear to be continuously better than previously reported [4, 9, 15].

In the last decade a spectacular decrease in mortality rates was observed in Poland which is in line with the reports from France, Sweden, Denmark and Germany [3, 5, 17, 18]. In contrast to the numerous other retrospective studies we applied the propensity score matching method to our analysis. By virtue of PSM the independent impact of the treatment development on outcomes was revealed. Interestingly, that input in prognosis improvements seems to be higher than it could be expected before.

Our study have several limitations. PL-ACS is a voluntary, observational study, and not all hospitals participated in the data collecting. Our analysis has a retrospective nature and some potentially important parameters might not be included. That is a single country study, therefore some trends should be interpreted with caution. Finally, propensity score matching analysis is based on a simplified model, even after data adjustment, the results could be biased by potentially important parameters that were not included.

Conclusions

In Poland, the routine invasive strategy implementation contributed substantially to the outcomes of NSTEMI patients in the last 10 years. The impact of treatment advances on better prognosis was estimated at over sixty percent.

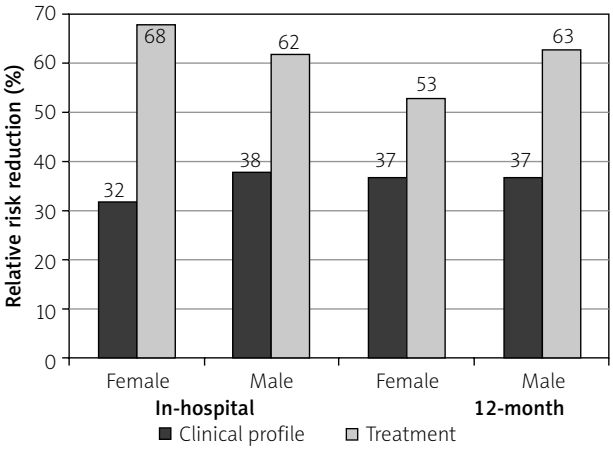

Figure 1. Impact of the treatment improvements and clinical profile changes on mortality reduction in NSTEMI in 2005–2014

Conflict of interest

The authors declare no conflict of interest.

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