e-ISSN 2544-1620

Medical Science Pulse 2020 (14) 3

Original papers

Published online: 3 Sep 2020

DOI: 10.5604/01.3001.0014.3420

SELECTED RISK FACTORS FOR ISCHEMIC HEART DISEASE AND THE SUCCESS OF TREATMENT IN PATIENTS WITH STEMI MYOCARDIAL INFARCTION TREATED WITH PERCUTANEOUS CORONARY INTERVENTION

Marzena Jędrzejczyk-Cwanek[1 A–D]
• ORCID: 0000-0002-7365-3606

Piotr Jerzy Gurowiec[2 E,F]
• ORCID: 0000-0002-2238-2519

Dorota Ozga[1 D–F]
• ORCID: 0000-0002-9457-9388

[1] College of Medical Sciences, Institute of Health Sciences, University of Rzeszow, Rzeszow, Poland

[2] Institute of Health Sciences, University of Opole, Opole, Poland

A – study design, **B** – data collection, **C** – statistical analysis, **D** – interpretation of data, **E** – manuscript preparation, **F** – literature review, **G** – sourcing of funding

ABSTRACT

Background: Coronary heart disease is one of the most common causes of hospitalization and premature deaths in Europe. ST-segment elevation myocardial infarction (STEMI) has been a clinical problem for many years, particularly in the aspect of choosing the optimal treatment method. The success of treatment is determined by many factors, including risk factors for ischemic heart disease, time between onset of symptoms and initiation of treatment, number and degree of coronary stenosis, and many more.

Aim of the study: The aim of the study was to identify risk factors for ischemic heart disease affecting the success of STEMI patients treated with percutaneous coronary intervention (PCI).

Material and methods: A retrospective analysis was carried out on data from medical records of patients treated in the Department of Acute Coronary Syndromes of St. Hedvig Provincial Hospital No. 2 in Rzeszow between 2009 and 2014. The research tool used in this paper was the author's questionnaire. A total of 508 patients with STEMI myocardial infarction treated in the Department of Acute Coronary Syndromes (ACS) between 2009 and 2013 were included in the analysis. The inclusion criteria were the complete and clear files of patient treatment in the ACS department between 2009 and 2013 due to acute coronary syndrome treated invasively by the PCI method.

Results: Majority of the study group, 334 subjects, (65.7%) had hypertension. The most common risk factors for ischemic heart disease were found to be dyslipidemia in 176 subjects (34.6%) and smoking in 163 subjects (32.1%). This paper presents the results of the analysis of the success of treatment in relation to risk factors for ischemic heart disease. There was a statistically significant relationship between hypertension and successful treatment (p=0.0425). More cases in which treatment was unsuccessful were observed in the group of patients who had no previous treatment for lipid disorders (20.2% vs. 4.0%) (p = 0.0000). Significantly more cases of treatment failure were found among people who denied smoking (17.4% vs. 8.6%; p = 0.0087).

Conclusions: Among the analyzed behavioral and somatic risk factors for failure in patients subjected to treatment were untreated hypertension, hyperlipidemia and a negative history of cigarette smoking.

KEYWORDS: myocardial infarction, risk factors, ischemic heart disease

Background

ST-segment elevation myocardial infarction (STEMI) is the most acute manifestation of coronary artery disease and is associated with great morbidity and mortality [1]. STEMI has been a clinical problem for many years, particularly in the aspect of choosing the optimal treatment method. The technique of percutaneous coronary intervention (PCI), introduced in 1977 by Gruentzig, replaced in most cases, the thrombolytic therapy used since the 1970s. Further development of

techniques for the invasive treatment of myocardial infarction has changed the way patients with myocardial infarction are treated. However, despite the great advancements in modern medicine, the treatment of myocardial infarction is still a therapeutic challenge. The success of myocardial infarction treatment is determined by many factors like the risk factors for ischemic heart disease, the time that elapsed since the onset of symptoms, the number and degree of coronary stenosis, and many more.

Risk factors for cardiovascular disease

In Poland, the biggest country in this region, with a population of over 38 million, mortality due to the three leading causes of premature death, namely, cardiovascular disease, cancer, and injuries, are gradually declining, while life expectancy at birth is increasing [2]. In the Polish population, the strongest risk factors for cardiovascular disease include hypercholesterolemia, overweight and obesity, smoking, hypertension, metabolic syndrome and diabetes [3].

Smoking is a potentially reversible risk factor for cardiovascular disease and the components of tobacco smoke, nicotine and carbon monoxide, are known to cause vasoconstriction, lower high-density lipoprotein (HDL) cholesterol levels and increase the levels of low-density lipoprotein (LDL) cholesterol [4]. Smoking can significantly increase morbidity and mortality due to cardiovascular diseases, especially in smokers [5, 6]. According to Maniecka-Bryła and colleagues, smoking among the participants of the "Program for the early detection of cardiovascular disease" study was high, affecting one-third of the general population in Poland. Furthermore, the prevalence of smoking was found to be higher among men (42%) when compared to women (25%) between the ages of 18 and 94 years [7].

Lipid disorders are also risk factors for cardiovascular diseases and therefore, earlier diagnosis and treatment are necessary to prevent lipid abnormalities and to predict emerging risks of various cardiovascular diseases and disorders [8]. Lipid metabolism disorders occur in more than half of adult Poles, and the incidence of hypercholesterolemia increases with age. The most frequent laboratory component of lipid disorders is elevated total cholesterol, found in about 60% of the general population. LDL cholesterol above 115 mg/dl occurs in 55–60% of cases, and decreased HDL cholesterol in 15–17%, while hypertriglyceridemia is found in 30% of the population [9].

According to NATPOL PLUS (Arterial Hypertension in Poland Plus Lipid Disorders and Diabetes), about 1.65 million adults suffer from diabetes. A high prevalence of diabetes occurs people over 50 years old which make up 12.4% of the studied population. Diabetes incidence increases with age and adversely affects other risk factors such as hypertension and dyslipidemia [10].

Overweight and obesity. The NATPOL PLUS study showed that overweight occurs in Poland in about 40% of men and 28% of women, and obesity in 18% of men and 19% of women. Visceral obesity, the most important risk factor for cardiovascular disease, was found in 35% of women and 19% of men [3]. The same study also showed that body mass index (BMI) above 25 kg/m^2 was associated with increased cardiovascular-related mortality. Obesity, especially central, adversely affects other risk factors such as glucose tolerance and insulin resistance, hyperlipidemia and hypertension [10, 11].

Hypertension. Hypertension is another risk factor for cardiovascular disease. It affects more than 8 million adult Poles, and a further 8–9 million have blood pressure values considered to be normal but elevated. Hypertension is undiagnosed in about 30% of patients, and only about 1 million patients with hypertension are treated effectively. Up to 45% of patients, do not obtain satisfactory control of blood pressure (<140/90 mmHg), despite treatment [12]. In many epidemiological studies, elevated blood pressure was shown to be an important risk factor for coronary heart disease [3, 10].

Psychosocial factors. Low socioeconomic status, social isolation, lack of social support, stress at work and in family life, negative emotions and depression affect the risk of developing coronary heart disease, and in patients with diagnosed coronary heart disease, further aggravate its course. These factors are often cumulative and have a demotivating effect on lifestyle change [12].

Low physical activity. In a meta-analysis of several clinical trials, physical training has been shown to improve the reduction of atherosclerotic lesions in vessels and reduces the total mortality by 20–25% [13]. Therefore, one the most important cardio-protective factors is physical activity. In the Polish population, 56% of women and 49% of men aged 20–74 declare having low physical activity [12, 13]. In summary, cardiopulmonary prophylaxis is particularly important in people after cardiac events and changing lifestyle is a process that affects many areas. Therefore, a proper diet, systematic physical activity, cessation of cigarette smoking, stress management, the ability to adapt to the existing situation and managing depression, can bring the desired effects only with consistent and long-term use [14].

Aim of the study

The aim of the study was to identify risk factors for ischemic heart disease affecting the success of with myocardial infarction with STEMI treated with percutaneous coronary intervention (PCI).

Material and method

A retrospective analysis of medical records from patients treated in the Department of Acute Coronary Syndromes of St. Hedvig Provincial Hospital No. 2 in Rzeszow from 2009 to 2014 was carried out. The research tool used in this study was the author's questionnaire, which consisted of socio-demographic data regarding

the time from the onset of symptoms to the first contact with medical staff, data on the patients' parameters on admission, data on coronary heart disease risk factors, previous interventions and cardiological procedures. The medical data entered in the documentation were obtained from the medical history on admission and hospitalization of the patient at the Department of Acute Coronary Syndromes. The medical documentation in use at the department of Acute Coronary Syndromes was standardized, completed by medical staff and subjected to periodic inspection by the quality control team. The study was approved by the Bioethics Committee at the University of Rzeszow No. 13/06/2013.

Data from a total of 508 patients with a history of STEMI myocardial infarction treated in the Department of Acute Coronary Syndromes (ACS) between 2009 and 2013. The inclusion criterion was the complete and clear files of patient treatment in the ACS department between 2009 and 2013 due to ACS treated invasively by the PCI method. Data from patients whose documentation was incomplete and / or illegible were excluded from the analysis.

Statistics

Data analysis consisted of their presentation using selected methods of descriptive statistics and testing of selected hypotheses using statistical inference tools. The description of the data consisted in presenting their percentage distribution for nominal features. The research was focused in the assessment of treatment effectiveness in groups distinguished by the occurrence of ischemic heart disease risk factors. The significance of differences between the groups concerning the participation of successfully treated patients was assessed by means of Chi-square test. A p-value less than 0.05 was considered statistically significant relationship between the analyzed variables.

Results

Sociodemographic characteristics of the studied group

Patients' age ranged from 26 to 99 years, with a mean age of 65 years (SD 12.9) and majority of the surveyed population were men (71.5%). The distribution of the place of residence was almost even, although slightly more patients resided in cities than villages (51.2% vs. 48.6%) (tab. 1).

Risk factors for coronary heart disease

As shown in Tab. 2, majority of patients in the study group had arterial hypertension (334 subjects; 65.7%) and the second most common risk factor for ischemic heart disease was dyslipidemia, seen in 176 subjects (34.6%), followed by smoking (163 subjects; 32.1%). Among the individuals with hypertension, one-third of them were not treated pharmacologically (23.2%).

Table 1. Descriptive statistics sex and place of residence of the respondents.

Variable		N	Percentage
Sex	Male	363	71.5%
	Female	145	28.5%
Place of residence	City	260	51.2%
	Village	247	48.6%
	No information	1	0.2%

Table 2. Prevalence of risk factors for coronary heart disease in the studied group.

Variable		N	Percentage*
Risk factors	Hypertension	334	65.7%
	Dyslipidemia	176	34.6%
	Cigarette smoking	163	32.1%
	Diabetes	125	24.6%
	Obesity	98	19.3%
	No information	64	12.6%
Treatment of hypertension	Hypertension treated with pharmacotherapy	216	42.5%
	Hypertension not treated with pharmacotherapy	118	23.2%
	Without hypertension	174	34.3%
Type of diabetes	Type 2 diabetes	92	18.1%
	De novo diabetes	36	7.1%
	Type 1 diabetes	2	0.4%

* The sum does not have to amount to 100%, as there may be several factors in one person.

Table 3. Success of the treatment in patients with myocardial infarction treated with PCI.

Variable		N	Percentage
Success of the treatment	No	74	14.6%
	Yes	434	85.4%

Correlations of variables influencing the success of the treatment

In the study group, the success of the treatment was defined and was determined by the occurrence of two factors; namely patient survival and thrombolysis in myocardial infarction (TIMI) risk score in the infarction vessel at level 3. In this way, the patients were divided into two groups based on the success of their PCI treatment, as shown in Tab. 3. Treatment success with PCI was achieved in 434 patients (85.4%) but was unsuccessful in 74 patients (14.6%).

Risk factors for ischemic heart disease and the success of the treatment

Tab. 4 presents the results of the analysis of the success of the treatment in relation to risk factors for ischemic heart disease.

The first risk factor analyzed was hypertension. The study group was divided into two groups: subjects with hypertension and subjects without hypertension. In this respect, one can speak of a statistically significant rela-

tionship of hypertension with successful treatment outcome. The success of the treatment in the hypertensive group was statistically significant (p=0.0425). Following the analysis of the success of the treatment in relation to diabetes and obesity, there was no statistically significant relationship between the prevalence of diabetes and obesity and the success of the treatment in patients with a heart attack. A statistically significant effect on treatment success in patients with lipid disorders. More cases in which treatment was unsuccessful were observed in the group of patients who had no previous treatment for lipid disorders (20.2% vs. 4.0%; p=0.0000). Significantly more cases of treatment failure were found among people who were non-smokers (17.4% vs. 8.6%; p=0.0087).

Table 4. Treatment success and hypertension, diabetes, obesity, hyperlipidemia, smoking.

Success of the treatment	Hypertension (p = 0.0425)		
	Yes	No	Total
No	41 (12.3%)	33 (19.9%)	74
Yes	293 (87.7%)	141 (81.0%)	434
Total	334	174	508
	Diabetes (p = 0.8173)		
	No	Yes	Total
No	55 (14.4%)	19 (15.2%)	74
Yes	328 (85.6%)	106 (84.8%)	434
Total	383	125	508
	Obesity (p = 0.4683)		
	No	Yes	Total
No	62 (15.1%)	12 (12.2%)	74
Yes	348 (84.9%)	86 (87.8%)	434
Total	410	98	508
	Hyperlipidemia (p = 0.0000)		
	No	Yes	Total
No	67 (20.2%)	7 (4.0%)	74
Yes	256 (79.8%)	169 (96.0%)	434
Total	332	176	508
	Smoking (p = 0.0087)		
	No	Yes	Total
No	60 (17.4%)	14 (8.6%)	74
Yes	285 (82.6%)	149 (91.4%)	434
Total	345	163	508

p-test probability value calculated using the Chi-square independence test.

Discussion

Among the risk factors studied for ischemic heart disease, hypertension was the most common among the studied patient group (65.7%). A higher mortality rate was observed in patients who had not been diagnosed with hypertension by the time of heart attack and had never been treated for this reason. In this group of patients, death occurred in every sixth case, which translates to approximately 16%. Our data also shows that patients with hypertension had a larger number of significantly narrowed coronary vessels. According to some authors, the importance of hypertension as a risk of cardiovascular events decreases with age, and its impact on the course of acute coronary syndromes is not assessed unambiguously [15]. Similar conclusions arose from the EUROASPIRE II study conducted in 15 European countries, where hypertension was found in 50% of patients after myocardial infarction [16]. The study by Auresus et al., reached a different conclusion however, and showed that in-hospital mortality was significantly higher in patients with normal blood pressure values compared to patients with hypertension [17]. Interesting conclusions regarding the association of hypertension with successful treatment of myocardial infarction are also provided by Jonas et al., who did not observe a difference in in-hospital mortality in three groups of patients (normal blood pressure, elevated blood pressure and hypertension) admitted to hospital due to myocardial infarction. Furthermore, there was also no significant difference during the annual mortality observation in the studied groups [18]. The GUSTO I study also did not confirm the influence of elevated blood pressure on survival [19].

Another analyzed risk factor for ischemic heart disease was obesity. The observations in our study suggest rather surprisingly, that mortality risk as a result of STEMI infarction, was lower in patients with diagnosed obesity. Tomaszuk et al. arrived at a similar conclusion in their study, following the evaluation of the impact of BMI on long-term survival in PCI-treated patients with STEMI infarction [20]. In their study, there were no differences in 30-day and annual mortality between patients with BMI below 25 kg/m^2 and patients with BMI above 25 kg/m^2, but surprisingly patients with BMI above 25 kg/m^2 had better 5 years survival and this was independent of the presence of other risk factors for myocardial infarction [20].

In our study population, diabetes as a risk factor for myocardial infarction constituted 24.6%. Type 2 diabetes predominated (18.1%), *de novo* diabetes was diagnosed in 7.1% of hospitalized patients. The results obtained from the study did not show a statistically significant relationship between the incidence of diabetes and the successful treatment of STEMI myocardial infarction. Based on data from the HCA report, which included 3,139 PCI-treated patients with myocardial infarction, 23.5% of patients were found to have diabetes. There were no significant differences in treatment outcomes during hospitalization and PCI. After a year, patients with diabetes underwent more re-revascularization of the same lesion and more revascularization of coronary vessels [21].

Our findings regarding cigarette smoking as a risk factor for myocardial infarction and the impact on the success of PCI treatment were unexpected. Overall, cigarette smokers accounted for 32.1% of the population surveyed and there were significantly more treatment failures observed among non-smokers (17.4% vs. 8.6%). In addition, there were more cases of significant stenosis of at least one vessel among those who did not smoke, as well as a larger number of vessels with significant nar-

rowing of the lumen. These results are partially by Zębik et al., who showed that patients with STEMI infarction with multivessel disease reported less smoking than in patients with single-vessel disease [22]. In addition, these conclusions were like those of studies carried out by Zielińska et al., the aim of which was to assess the risk factors for death in recent myocardial infarction after reaching the department of interventional cardiology. Among patients who died in the first day of hospitalization, nicotinism was reported less frequently [23].

Another of the risk factors for ischemic heart disease is hyperlipidemia. Based on the analysis of the collected material, it was observed that patients who did not have a history of diagnosed and treated hyperlipidemia were characterized by a higher rate of treatment failure. In addition, significantly fewer deaths were found among people with diagnosed hyperlipidemia. This is probably because people with diagnosed hyperlipidemia are under constant medical supervision and take cholesterol-regulating drugs.

The results of the Multicenter Health Survey (WOBASZ) conducted in Poland in the period from 2000 to 2005 showed lipid disorders in 70% of Poles above 18 years of age [24]. In turn, in studies conducted by Bachórzewska-Gajewska et al., among 200 patients who underwent coronary angiography at the Invasive Cardiology Clinic of the Medical Academy in Bialystok in 2007, 60.8% of the respondents admitted having hypercholesterolemia and 9% of the examined patients were untreated. [25]

The results of the NATPOL 2011 study proved that lipid metabolism disorders are the most frequent risk factor for ischemic heart disease in the general population of adult Poles, and the incidence is nearly twice as high as the prevalence of hypertension and almost three times higher than the incidence of obesity. In addition, the results of the cited study indicate that in as many as 65% of patients' hypercholesterolemia remains undiagnosed and therefore not treated [25].

In conclusion, the treatment of patients with myocardial infarction has been one of the most serious challenges of medicine for many years. The success of treatment is determined by many factors, including the risk factors for ischemic heart disease, the time elapsed from the onset of symptoms to the beginning treatment, number and degree of coronary stenosis. The success of the treatment is also influenced by the activities of the whole group of people, ranging from the patient himself, through the primary care physician, the emergency medical team, to the cardiologist working in the hemodynamic laboratory. For these reasons, it is important to promote all activities within the framework of broadly understood health education aimed at the knowledge of risk factors for myocardial infarction, as well as diagnosing the symptoms of myocardial infarction and the operation of the emergency medical system itself.

Conclusions

Among the analyzed behavioral and somatic factors, the risk factors for treatment failure in PCI patients were untreated hypertension, hyperlipidemia and negative history of cigarette smoking. The analysis of health behaviors and factors considered to be the risk of coronary heart disease requires further research.

References

1. Vogel B, Claessen BE, Arnold SV, Chan D, Cohen DJ, Giannitsis E, et al. ST-segment elevation myocardial infarction. Nat Rev Dis Primers 2019 Jun 6; 5(1): 39.
2. Gańczak M, Miazgowski T, Kożybska M, Kotwas A, Korzeń M, Rudnicki B, et al. Changes in disease burden in Poland between 1990-2017 in comparison with other Central European countries: a systematic analysis for the Global Burden of Disease Study 2017. PLoS One 2020; 15(3): e0226766.
3. Niklas A, Flotyńska A, Puch-Walczak A, Polakowska M, Topór-Madry R, Polak M, et al. Prevalence, awareness, treatment and control of hypertension in the adult Polish population – Multi-center National Population Health Examination Surveys – WOBASZ studies. Arch Med Sci 2018; 14(5): 951–961.
4. DiGiacomo SI, Jazayeri MA, Barua RS, Ambrose JA. Environmental tobacco smoke and cardiovascular disease. Int J Environ Res Public Health 2018; 16(1): 96.
5. Smith CJ, Fischer TH, Sears SB. Environmental tobacco smoke, cardiovascular disease, and the nonlinear dose-response hypothesis. Toxicol Sci 2000; 54(2): 462–472.
6. Conklin DJ, Schick S, Blaha MJ, Carll A, DeFilippis A, Ganz P, et al. Cardiovascular injury induced by tobacco products: assessment of risk factors and biomarkers of harm. A Tobacco Centers of Regulatory Science compilation. Am J Physiol Heart Circ Physiol 2019; 316(4): H801–H827.
7. Maniecka-Bryła I, Maciak A, Kowalska A, Bryła M. Częstość palenia tytoniu wśród uczestników Programu profilaktyki wczesnego wykrywania chorób układu krążenia. [Frequency of smoking among participants of the Prevention Program for Early Detection of Cardiovascular Diseases]. Med Pr 2009; 60(2): 109–115. (In Polish).
8. Upadhyay RK. Emerging risk biomarkers in cardiovascular diseases and disorders. J Lipids 2015; 2015: 971453.
9. Pająk A, Wiercińska E, Polakowska M, Kozakiewicz K, Kaczmarczyk-Chałas K, Tykarski A, et al. Rozpowszechnienie dyslipidemii u mężczyzn i kobiet w wieku 20–74 lat w Polsce: wyniki programu WOBASZ. [Prevalence of dyslipidemia in men and women aged 20-74 in Poland: results of the WOBASZ program]. Kardiol Pol 2005; 63 (suppl. 4); S620–S625. (In Polish).
10. Niklas A, Piekarska A, Zdrojewski T, Pajak A, Topor-Mądry R, Nadrowski P, et al. Trends in hypertension prevalence, awareness, treatment, and control among Polish adults 75 years and older during 2007–2014. Cardiology Journal 2018; 25(3): 333–344.
11. Prasad H, Ryan DA, Celzo MF, Stapleton D. Metabolic syndrome: definition and therapeutic implications. Postgrad Med 2012; 124(1): 21–30.

12. European guidelines for the prevention of cardiovascular diseases in clinical practice – short version. Fourth Joint Working Group of the European Society of Cardiology and other societies for the prevention of cardiovascular diseases in clinical practice. Kardiol Pol 2008; 66 (suppl. 1): S1–S48.

13. Taylor RS, Brown A, Ebrahim S, Jolliffe J, Noorani H, Rees K, et al. Exercise-based rehabilitation for patients with coronary heart disease: systematic review and meta-analysis of randomized controlled trials. Am J Med 2004; 116(10): 682–692.

14. Piepoli MF, Hoes AW, Agewall S, Albus C, Brotons C, Catapano AL, et al. 2016 European Guidelines on cardiovascular disease prevention in clinical practice: the Sixth Joint Task Force of the European Society of Cardiology and Other Societies on Cardiovascular Disease Prevention in Clinical Practice (constituted by representatives of 10 societies and by invited experts) Developed with the special contribution of the European Association for Cardiovascular Prevention & Rehabilitation (EACPR). Eur Heart J 2016; 37(29): 2315–2381.

15. Langer RD, Ganiats TG, Barret-Connor E. Factors associated with paradoxical survival at higher blood pressure in very old. Am J Epidemiology 1991; 134: 29–38.

16. EUROASPIRE II Investigators. Lifestyle and risk factor management and use of drug therapies in coronary patients from 15 countries: principal results from EUROASPIRE II. Heart J 2001; 22: 554–572.

17. Aursens L, Landmark M. More non-wave myocardial infarction but similar infarct size in patients with hypertension. Blood Press 2009; 9(1): 98–103.

18. Jonas M, Grossman E, Boyko V, Behar S, Hod H, Reicher-Reiss H. Relation to early and one-year outcome after myocardial infarction to systemic arterial blood pressure to admission. Am J Cardiology 1999; 84(2): 162–165.

19. Lee KL, Woodlief LH, Topol EJ. Predictors of 30-day mortality in the era of reperfusion for acute myocardial infarction. Result from an international trial of 41021 patients. Circulation 1995; 91: 1659–1668.

20. Tomaszuk A, Kożuch M, Małuszko J, Bachórzewska H, Kosacka U, et al. Czy pacjenci z nadwagą po zawale serca leczonym inwazyjnie mają lepsze rokowanie w 5-letniej obserwacji? [Do overweight patients with invasive heart attack have a better prognosis in 5-year follow-up?]. Kardiol Pol 2012; 70(7): 686–693. (In Polish).

21. Kugelmass AD, Brown P, Simon P, Battaglia S, Tarkington L, Culler S, et al. The influence of diabetes mellitus on the practice and outcomes of percutaneous coronary intervention in the community: a Report from the HCA database. J Invasive Cardiol 2003 Oct; 15(10): 568–574.

22. Zębik T, Gąsior M, Gierlotka M, Lekston A, Wilczek K,Wojnar R, et al.: Wyniki leczenia zawału serca z uniesieniemodcinka ST u chorych z wielonaczyniowąchorobą wieńcową za pomocą wczesnej interwencji wieńcowej [Outcome of patients with ST-segment elevation myocardial infarction andmultivessel coronary artery disease treated by immediate coronary angioplasty]. Folia Cardiologica 2003; 10(5): 565–601. (In Polish).

23. Zielińska M, Kacprzak M, Krekora E, Goch JK. Czynniki ryzyka zgonu w świeżym zawale serca po dotarciu chorego do oddziału kardiologii interwencyjnej – doświadczenia własne. [Risk factors for death in acute myocardial infarction after reaching the interventional cardiology department – own experience]. Pol Prz Kardiol 2007; 9(4): 249–254. (In Polish).

24. Tykarski A, Posadzy-Małaczyńska B, Wyrzykowski B, Kwaśniewska M, Pająk A, Tendera M, et al. Rozpowszechnienie nadciśnienia tętniczego oraz skuteczność jego leczenia u dorosłych mieszkańców naszego kraju. Wyniki programu WOBASZ. [Prevalence of hypertension and the effectiveness of its treatment in adult residents of our country. Results of the WOBASZ program]. Kardiol Pol 2005; 63 (suppl. 4); S614–S619. (In Polish).

25. Bachórzewska-Gajewska H, Serwicka A, Komło A, Dobrzycki S. Znajomość czynników ryzyka choroby wieńcowej wśród pacjnetów hospitalizowanych celem wykonania koronarografii oraz ich oczekiwania po badaniu. [Knowledge of coronary artery disease risk factors among patients hospitalized for coronary angiography and their expectations post-examination]. Prz Kardiodiabetol 2007; 2(1): 35–40. (In Polish).

Word count: 2938 • Tables: 4 • Figures: – • References: 25

Sources of funding:
The research was funded by the authors.

Conflicts of interests:
The authors report that there were no conflicts of interest.

Cite this article as:
Jędrzejczyk-Cwanek M, Gurowiec PJ, Ozga D.
Selected risk factors for ischemic heart disease and the success of treatment in patients with STEMI myocardial infarction treated with percutaneous coronary intervention.
Med Sci Pulse 2020; 14, 3: 49–54. Published online: 3 Sep 2020.

Correspondence address:
Marzena Jędrzejczyk-Cwanek, PhD, RN
Department of Emergency Medicine, College of Medical Sciences,
University of Rzeszow
Aleja Rejtana 16c, 35-959 Rzeszow, Poland
Phone: (+48) 178571955
E-mail: marzena.jd@gmail.com

Received: 2.03.2020
Reviewed: 30.05.2020
Accepted: 31.07.2020