MEDICAL UNIVERSITY – PLEVEN

FACULTY OF MEDICINE

DEPARTMENT OF CARDIOLOGY, PULMOLOGY AND ENDOCRINOLOGY

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ABSTRACT

“Demographic characteristics and prognostic prognosis in patients with acute myocardial infarction treated with primary coronary angioplasty in the Pleven region”

Dissertation for the award of the educational and scientific degree “Doctor”

Scientific supervisor:

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Doctoral program in Cardiology

city of Pleven, Bulgaria 2025

The dissertation is written on 125 standard printed pages, illustrated with 7 tables and 74 figures. The bibliography contains 222 titles, of which 6 in Cyrillic and 116 in Latin. The numbers of the figures and tables in the dissertation correspond to those in the abstract. The dissertation has been discussed and scheduled for defense by the Department of Cardiology, Pulmonology and Endocrinology at the Medical University – Pleven, Faculty of Medicine

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The materials for the defense are available in the office of the Department of Cardiology, Pulmonology and Endocrinology at the Medical University - Pleven, Faculty of Medicine.

The public defense of the dissertation will take place on October 30, 2025 at 1:00 p.m. in hall 220 at the Faculty of Pharmacy, Medical University - Pleven.

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LATIN ABBREVIATIONS USED:

ACS- Acute Coronary Syndrome

AF- Atrial fibrilation

AH- Arterial Hypertension

AMI- Acute Myocardial Infarction

AV block- Atrioventricular block

CABG- Coronary artery bypass graft

CI- Confidence interval

CHD- Coronary Heart Disease

EMD- electromechanical dissociation

ESC- European Society of Cardiology (Европейско общество по Кардиология)

EF- Ejection fraction

HDL-C - High-density lipoprotein cholesterol

HR- Hazard ratio

ICD- International Classification of Diseases

IRA- Infarct related artery

LAD- Left Anterior Descending

LCx- Left Circumflex

LDL-C - Low-density lipoprotein cholesterol

LM- Left Main

LVEDP- Left Ventricle End-diastolic Pressure

MACE- Major adverse cardiac events

MINOCA- Myocardial Infarction with No Obstructive Coronary Artery disease

MI- Myocardial Infarction

MVD- Multi vessel disease

NSTEMI- Non ST- elevation myocardial infaction

OR- Odds ratio

PCI- Percutaneous Coronary Intervention

pPCI- Primary Percutaneous Coronary Intervention

R2- coefficient of determination (R-squared)

RCA- Right Coronary Artery

RF- renal failure

SD- Standard deviation

STEMI- ST- elevation myocardial infaction

TIMI- Trombolysis In Myocardial Infarction

VF- Ventricular fibrilation

I. Introduction

Acute myocardial infarction is still a disease of high social importance due to its high mortality and high rate of disability, despite modern possibilities for successful treatment. This is especially true for patients with AMI in active age. Worldwide, information on the average age and gender distribution of patients with myocardial infarction is known for developed countries, but data for other countries, as well as Bulgaria, are scarce. The development of invasive cardiology and the introduction of primary angioplasty as the gold standard for the treatment of AMI have drastically reduced mortality and disability, including in our country. The factors that worsen the prognosis of patients with AMI have changed, are known, but are not systematized. In-hospital mortality has also not been sufficiently studied in our country. The objectives of this study are to analyze the gender and age distribution of patients with AMI in our country, in-hospital mortality and the factors that influence it. The study is retrospective. In order to analyze the age and gender distribution, a computer database with 4861 patients treated with primary angioplasty from three hospitals serving a large region, including Central Northern and Northwestern Bulgaria, which is about ¼ of the country's territory, was used. A period of 10 years was covered - from 2010 to 2019 inclusive. The epicrisis of 72 patients who died from AMI were analyzed, and in the control group, the epicrisis of 148 patients with AMI, successfully treated with pPCI and discharged from the hospital were analyzed. The risk factors that determine the near-term prognosis and can serve as independent predictors of early death were analyzed. Such factors were defined as: gender, smoking, concomitant diseases and conditions such as hypertension, diabetes, dyslipidemia, low ejection fraction < 35% according to Simpson, renal failure, previous angioplasty or CABG, previous vascular incident, rhythm and conduction disorders, time from the onset of symptoms to recanalization of the artery responsible for the infarction, Killip class, type of coronary artery and which segment is affected, presence of multivessel coronary disease and/or chronic occlusion of another artery, number of implanted stents, final TIMI blood flow, procedural complications (bleeding, electromechanical dissociation, ventricular tachycardia/fibrillation, pulmonary edema, cardiogenic shock, reocclusion of the vessel). The average age for men is 63.2 years (SD 12.1), and for women 70.1 years (SD 10.5) with a slight tendency to increase with age, but about 3 years lower than in developed countries. The relative share of women is 32.9%. In men, the incidence is highest in the age group from 55 to 75 years. Of interest are the age groups 55-64 years and 65-74 years. After the fifth year of the study, the incidence in these groups is significantly redistributed to the older age group (R2 =0.73 for 55-66 years; R2 =0.84 for 65-74 years). In women, a decrease in incidence is observed in the 75-84 year group, with a satisfactory correlation (R2 =0.75), but there is no trend in the 65-74 year group. In-hospital mortality varies between 4% and 7%, with an average of 5.5% in the period 2011-2019. The average age overall is 71.6 years (SD 11.07). There is no difference between genders. There is a direct proportional relationship between the number of patients transferred and mortality. The analysis of early predictors of death yielded expected and surprising, contradictory results. Factors associated with increased risk of CHD such as male gender, diabetes mellitus, dyslipidemia, and smoking did not show significance as predictors of a worse early prognosis. It turns out that non-smokers and people with normal or low cholesterol are at higher risk than others. The data on smoking and dyslipidemia raise many questions and require future studies. However, it is confirmed that non-smokers have a heart attack at an older age 10 years later. Ventricular tachycardias on admission of the patient with AMI do not show significance, but it is possible that the analysis is wrong due to the fact that these patients die early and few manage to reach the catheterization laboratory. Significant (P<0.05) also showed hypertension, the presence of renal failure, atrial fibrillation, right bundle branch block, high-degree AV block, EF<35%, presentation after the sixth hour from the onset of symptoms, culprit arteries LM and LAD, occlusion of the proximal segments, patients with multi-branch involvement and/or the presence of chronic occlusion, final blood flow < TIMI III, Killip class > I, with Killip IV having a much higher mortality rate than Killip II and III. All periprocedural complications except bleeding were also associated with a much higher mortality rate.

II. Aim and objectives

1. Aim

To make a demographic characteristic of patients with ACS and assess the factors determining the short-term prognosis of the studied group.

2. Objectives

2.1 To analyze the average age of patients with AMI for a 10-year period.

2.2 To calculate the age in years and to determine the dynamics in the average age.

2.3 To determine which age group is most affected by AMI in men and women.

2.4 To assess the proportion of women with AMI in the studied population.

2.5 To analyze the in-hospital mortality in the studied population.

2.6 To determine the mortality in different sexes.

2.7 To assess the factors influencing the short-term prognosis.

III. Material and methods

The study is retrospective. A computer database with patients from three hospitals serving a large region, including Central, Northern and Northwestern Bulgaria, which is about ¼ of the country's territory, was used. A period of 10 years was covered - from 2010 to 2019. The database is automatically generated in .xls file format by the hospital software Gamma Codemaster and contains information on accompanying diagnoses and complications, date of hospitalization and discharge of discharged/passed patients (Fig 12). All patients referred for treatment at both hospitals with a confirmed diagnosis of AMI were filtered from the database.

Списък с придружаващи диагнози и услужнения на изписани/преминали болни
от 01/10/2010 00:00 до 01/10/2019 00:00

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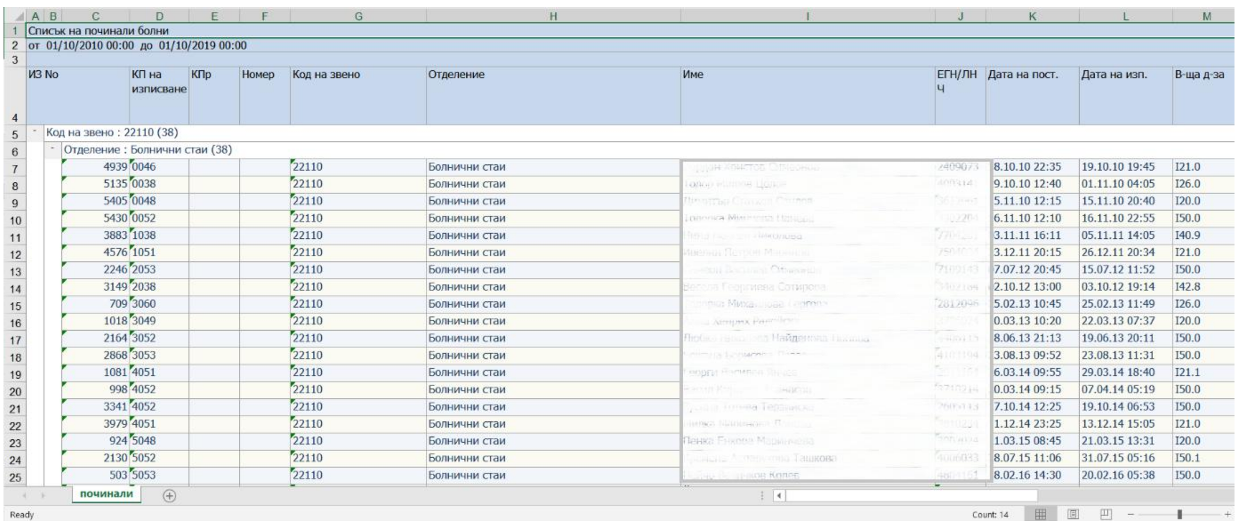
Fig. 12- Database

The sample for the age analysis included all patients, including those without evidence of significant coronary artery disease (MINOCA). All patients were treated according to modern standards set out in the recommendations of the European Society of Cardiology upon admission to the hospitals. All underwent selective coronary angiography, immediately after which over 90% of patients were treated with pPCI. A few cases were referred for cardiac surgery. Patients presenting for the second time with a consecutive MI and those with Takotsubo cardiomyopathy, which is known to mimic acute myocardial infarction by clinical, ECG, and laboratory criteria, were excluded. According to the date of admission, patients are distributed in separate tables for each year, the age (completed years) of each one is calculated according to the date of birth and the date of admission to the hospital. Standard deviation is calculated. Next is a distribution by gender, according to the names and the penultimate digit of the personal identification number. Then, patients of both genders are distributed by number for each year. Next is a distribution by age groups and the share of each group in percentages is calculated so that a comparison can be made with other years (the number of patients who passed is different for each year).

A list of patients who died in the hospital was also extracted from the same hospital software (Fig 13). Patients with a diagnosis of ICD I21 (subcategories I21.0 to I21.9) who died were filtered and compared with the list from the first file. Again, the distribution by sex and age group of the deceased followed. The in-hospital mortality rate for each year was determined.



Списък на починали болни

от 01/10/2010 00:00 до 01/10/2019 00:00

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Fig. 13 List of deceased patients

The epicrisis of 72 patients who died from AMI were analyzed, and in the control group, the epicrisis of 148 patients with AMI, successfully treated with pPCI and discharged from the hospital were analyzed. The risk factors determining the near-term prognosis (in-hospital mortality) were analyzed. They can serve as independent predictors of early death. The data from the epicrisis reports were systematized in statistical tables and analyzed using IBM SPSS Statistics 26 software.

IV. Results and discussion

Task 1: To analyze the average age of patients with AMI over a 10-year period

The analysis was conducted on 4861 patients who had undergone AMI for a period of 10 years.

The age of the patients and the distribution by gender were calculated for each of the ten years of the study ± standard deviation and standard error, and the data are in Tables 4 and 5, Figures 14 and 15. The youngest and oldest patients with AMI were male and were 23 and 98 years old, respectively.

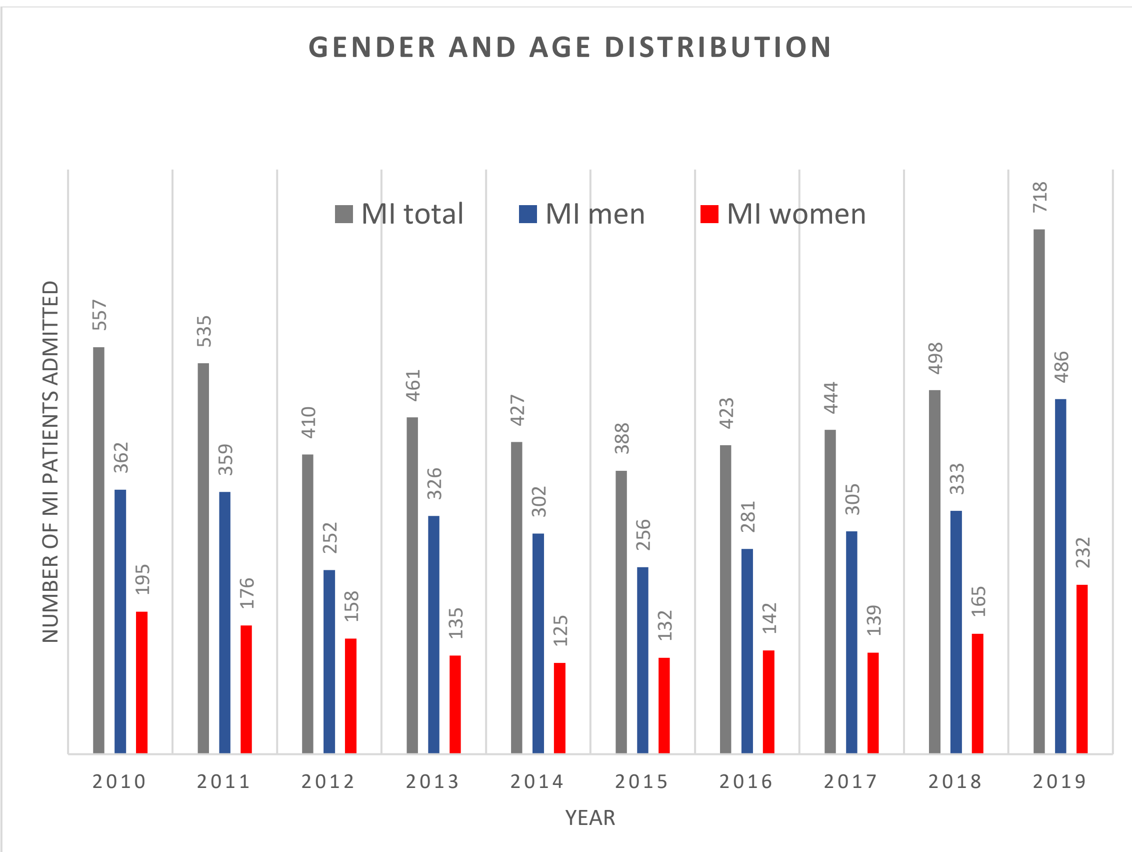


Fig. 14- Distribution by gender, age and years of patients with AMI

YEAR	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Mean age	64,0	64,9	66,6	66,5	66,9	66,3	65,8	67,0	65,5	66,5
± **(SD)**	12,0	12,0	11,6	12,0	11,7	11,8	12,2	12,4	12,3	11,7
n	557	535	410	461	427	388	423	444	498	718
St.error	0,51	0,52	0,57	0,56	0,57	0,60	0,59	0,59	0,55	0,44

Table 4. Average age of patients during the study years

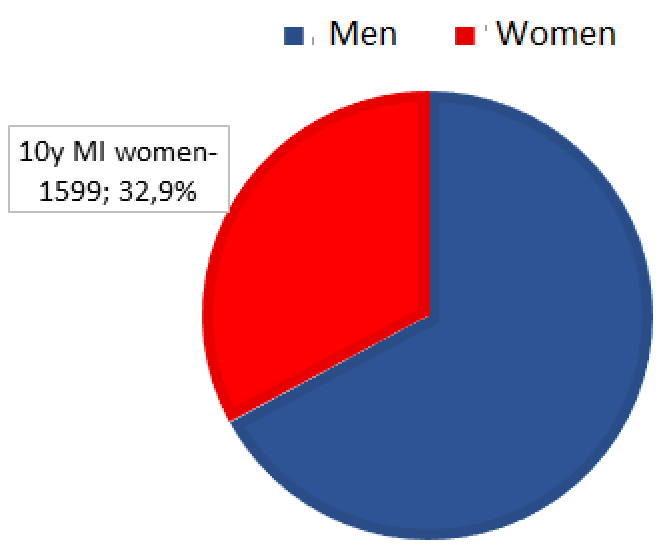


Fig. 15- Relative proportion of patients with AMI of both sexes

Task 2: Calculate age in years and determine the dynamics in average age.

The regression analysis (Fig. 16) shows that there is a slight tendency towards an increase in age after the first years, but then it stops at around 66 years (R2 =0.86). This trend is consistent with the stagnation in the growth of life expectancy in Bulgaria.

The average age by sex for each year is presented in Table 5 and Figure 16.

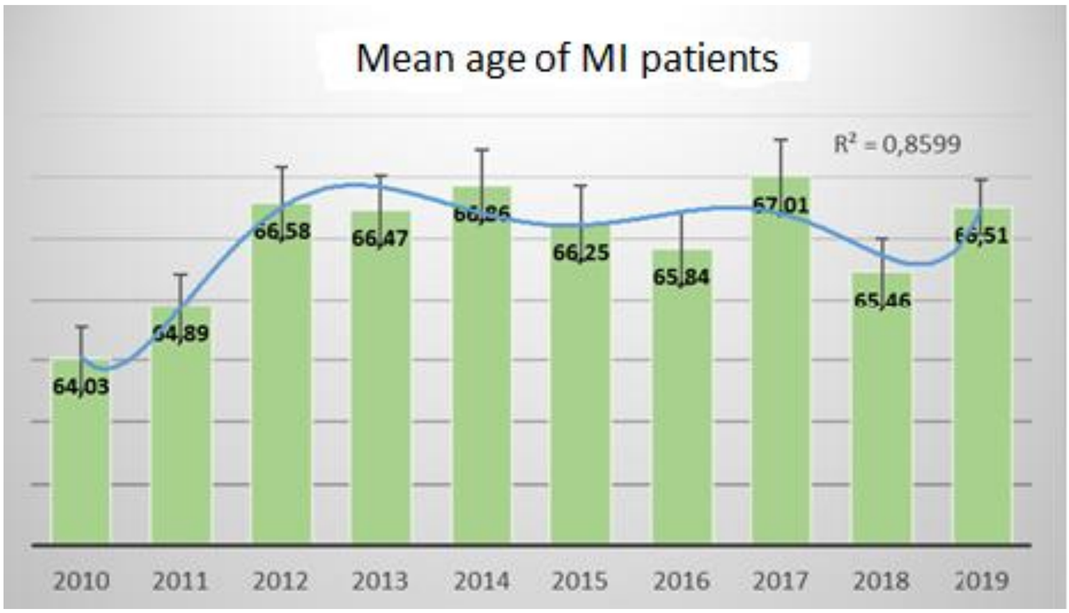


Fig. 16- Fluctuation of the average age of MI during the studied period.

Year	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Men, y	61,6	62,7	63,9	64,6	64,0	63,9	63,2	64,6	62,9	64,7
±(SD)	12,2	12,1	12,0	12,1	11,6	11,4	12,6	12,8	12,3	11,6
n	362	359	252	326	302	256	281	305	333	486
St.error	0,64	0,64	0,75	0,67	0,67	0,71	0,75	0,73	0,67	0,53
Women, y	68,5	69,4	70,8	71,1	70,0	71	71,0	72,2	70,8	70,4
±(SD)	10,3	10,7	9,5	10,4	10,8	11,3	9,7	9,7	11,0	11,1
n	195	176	158	135	125	132	142	139	165	232
St.error	0,74	0,80	0,76	0,89	0,97	0,98	0,81	0,83	0,86	0,73

Table 5. Average age by gender for each year

Overall, for the ten-year period, the average age of patients was calculated as follows:

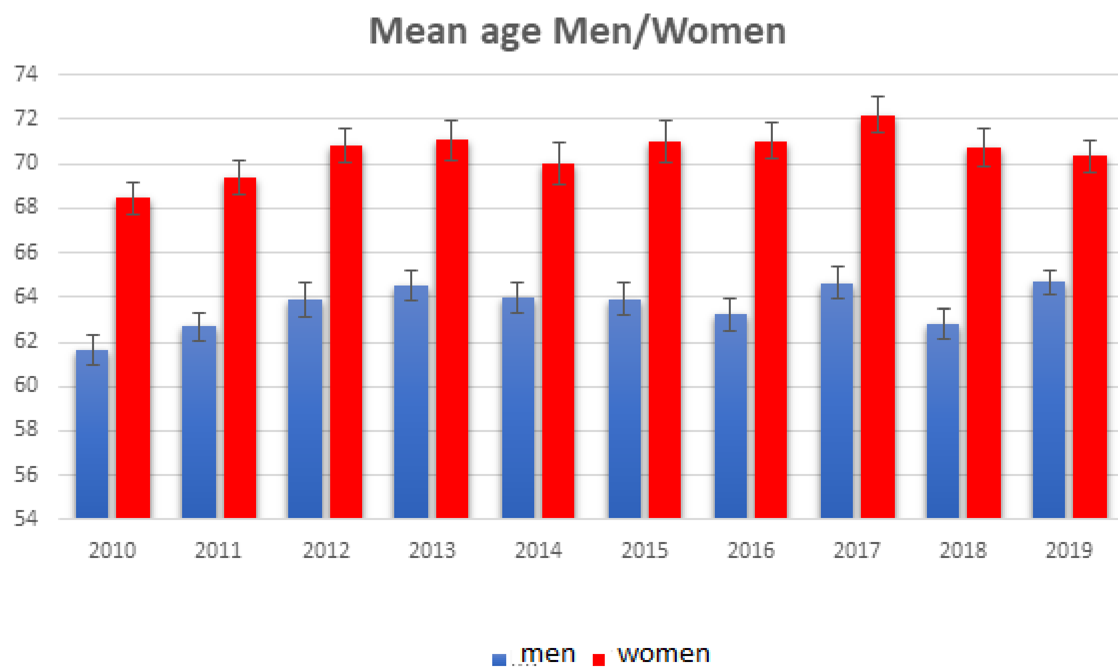


Fig. 17- Average age of men and women with AMI by years

Gender	**Total**	**Men**	**Women**
Age	65,5	63,2	70,1
± (SD)	12,0	12,1	10,5
n	4861	3262	1599
St.error	0,17	0,21	0,26

Table 6. Distribution by gender and age for a 10-year period.

Task 3: To determine which age group is most affected by AMI in men and women

An analysis of the distribution of patients with AMI by age group for each gender for each year was also performed. For this purpose, they were divided into seven age groups: <35 years; 35-44 years; 45-54 years; 55-64 years; 65-74 years; 75-84 years and ⩾85 years. The results are in percentages of the total number of AMI for men and women, respectively (Fig. 18 and 19).

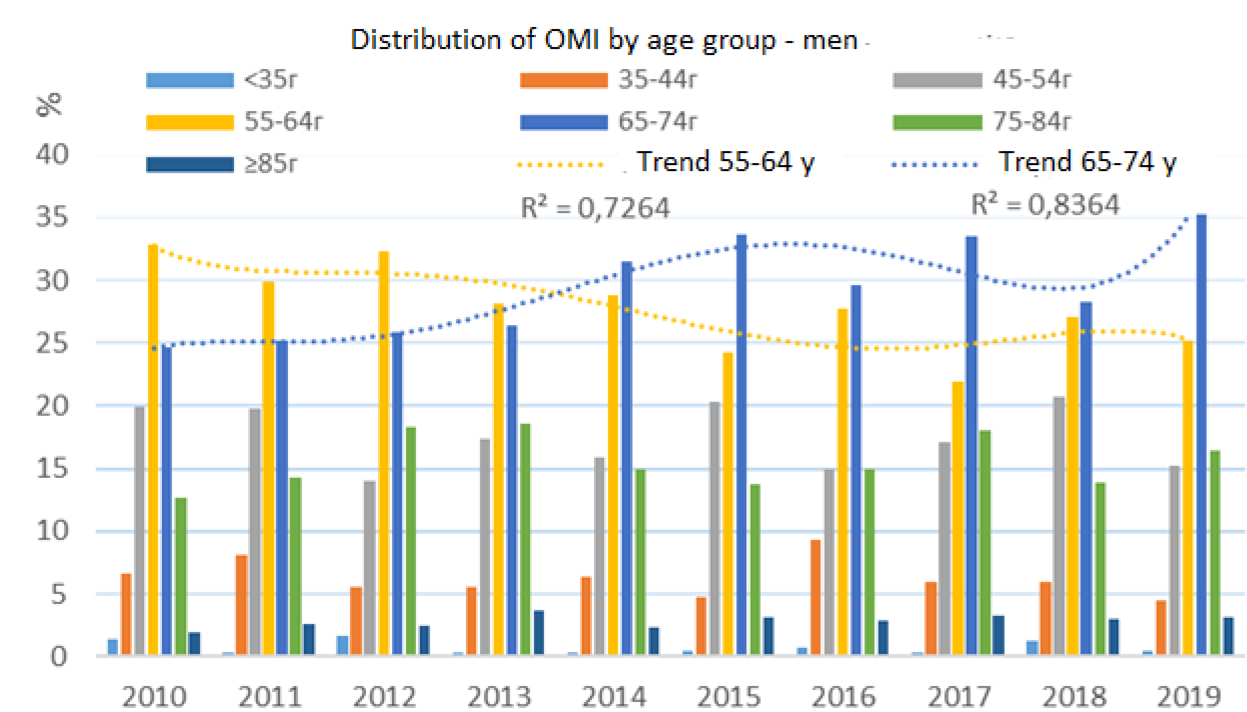


Fig. 18 Distribution of men with AMI by age group

The analysis in the target group found that the incidence of AMI in men increases after the age of 45, being highest in the age group of 55 to 75. Of interest are the age groups 55-64 and 65-74. The graphs and trend curves show that after the fifth year of the study, the incidence in these groups is significantly redistributed to the older age group (R2 =0.73 for 55-66 years; R2 =0.84 for 65-74 years). In women, a decrease in morbidity was observed in the 75-84 year group, with a satisfactory correlation (R2 =0.75), but in the 65-74 year group there was no trend towards a decrease or increase (R2 =0.56). The incidence of AMI by age group is as follows: <35 years =0.51%; 35-44 years =4.75%; 45-54 years =13.91%; 55-64 years =24.46%; 65-74 years =31.72%; 75-84 years =20.88%; ⩾85 years =3.77%. (Fig. 20).

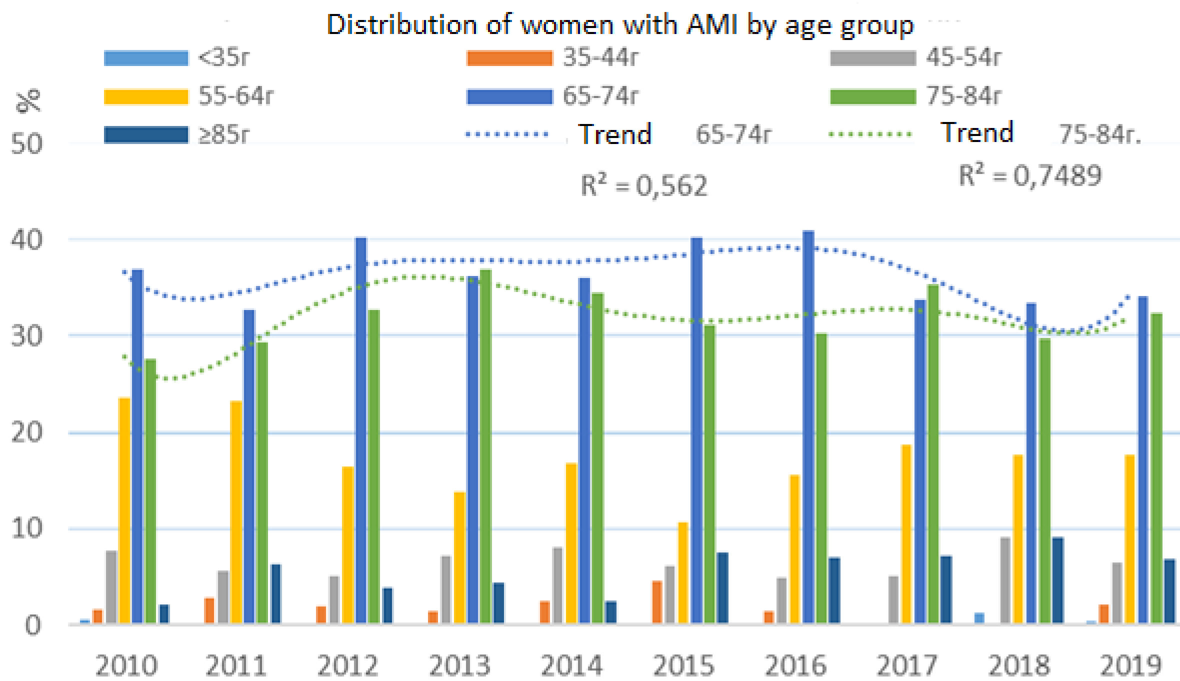


Fig. 19 Distribution of women with AMI by age group

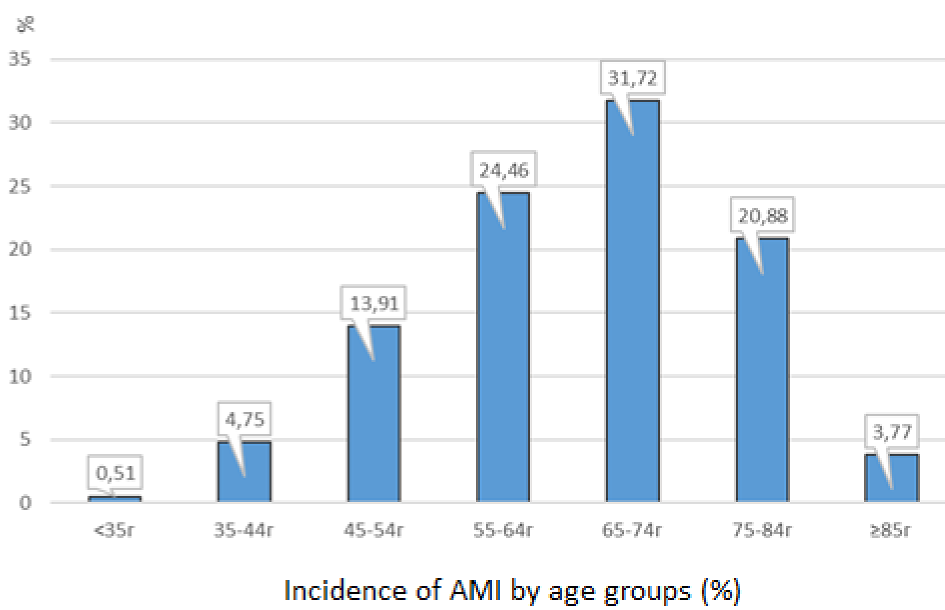


Fig. 20 - Frequency of AMI by age groups

Task 4: To estimate the proportion of women with OMI in the study population

As is known, women suffer heart attacks less often than men. This is also confirmed by our data, with the share of women being approximately 33% (Figs 14 and 15). It is known that women receive AMI at an older age, which is also confirmed by our data. Bulgarian women receive AMI about 7 years later than their male peers (Fig. 16).

Task 5: To analyze in-hospital mortality in the study population.

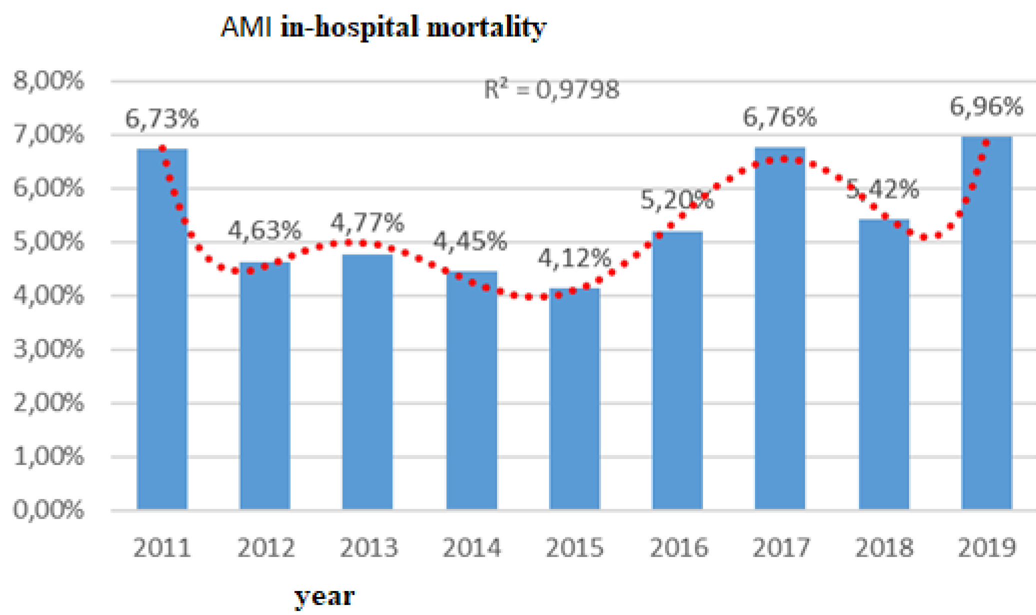


Fig. 21 In-hospital mortality in AMI

Analysis of in-hospital mortality in patients with AMI treated with primary angioplasty shows that mortality varies between 4% and 7%, with an average of 5.5% in the period 2011-2019. The mean age overall is 71.6 years SD 11.07. For women it is 74.7 years SD 8.08, and for men 69.8 years SD 12.09. While 65.5 years is the mean age of patients with first AMI, the mean age of those who died in the hospital is higher by about 6 years (Fig 21).

It is not possible to conclude whether there is a trend towards an increase or decrease in in-hospital mortality by year. It probably needs to be studied over a longer period of time. However, there seems to be a direct relationship between the number of patients who have passed and the mortality rate - with more patients passing, the mortality rate increases, as shown by the diagram comparing the number of patients passing and the mortality rate by year

(Fig. 22).

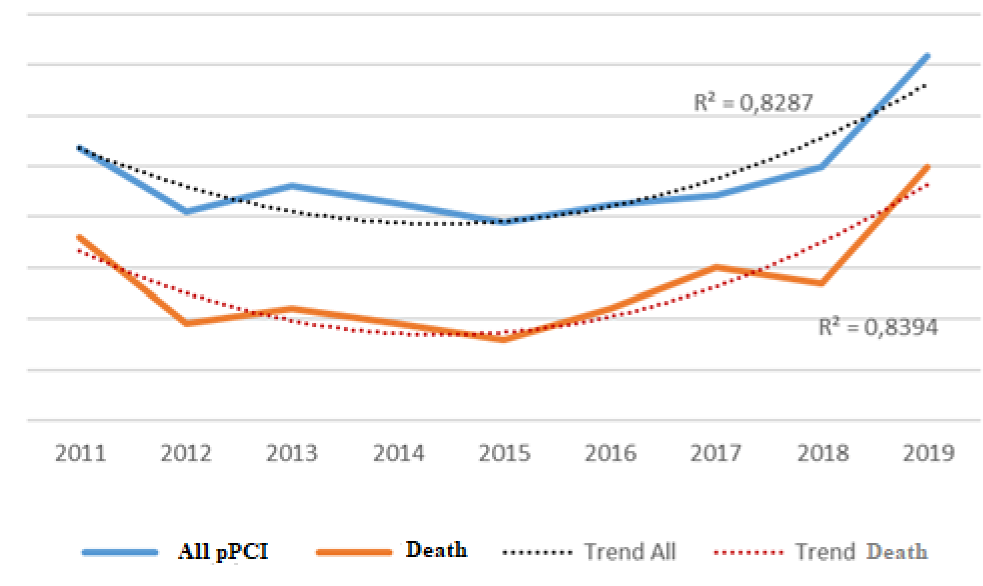


Fig. 22- Diagram comparing the number of people who passed and the mortality rate by year

R2 values (0.83 and 0.84) show a very good correlation and we can accept this statement as true.

Task 6: Determine the mortality rate for different sexes.

Analyses of the influence of gender on in-hospital mortality demonstrate that there is no difference between the genders in the studied population (Fig. 23). The statement that one gender has a worse short-term prognosis than the other cannot be accepted as true. The lack of dependence is also confirmed by the statistical analysis of the factors studied as independent redictors of early death in AMI (Fig. 24).

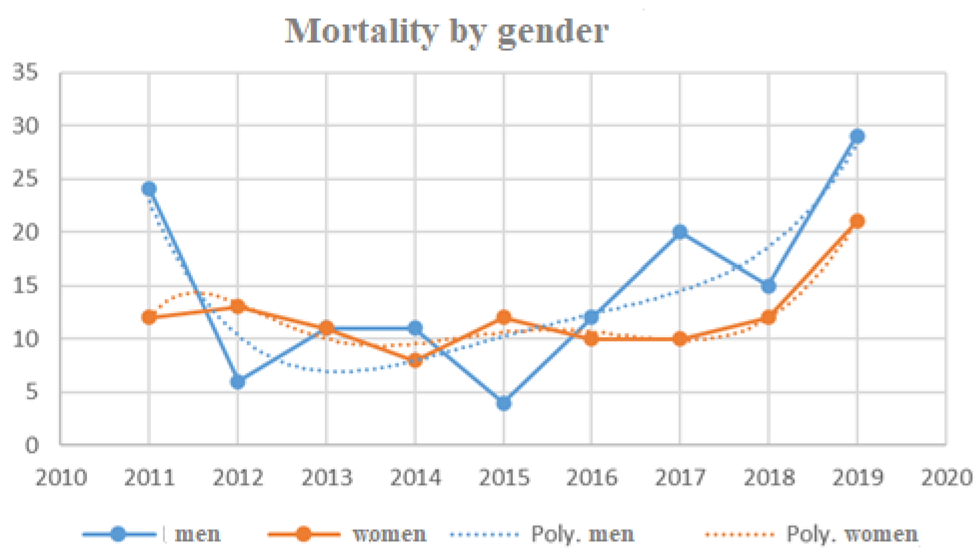


Fig. 23- Mortality by gender

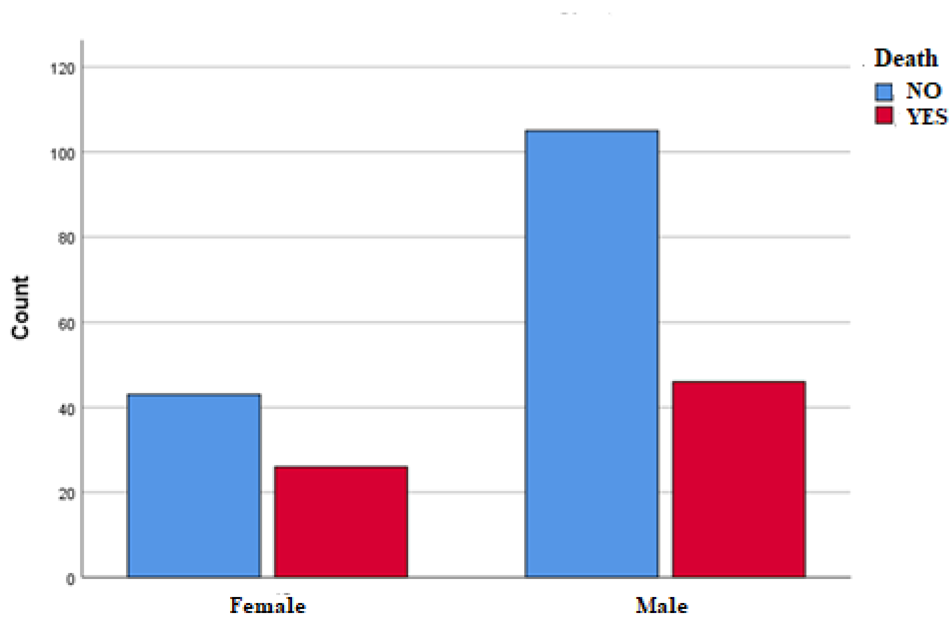


Fig. 24- Mortality probability by gender

The figure appears to show that the probability of death is higher for females, but statistical analysis shows a P value of 0.18, which is not significant.

Task 7: To assess the factors influencing the short-term prognosis.

Regarding the short-term prognosis, a sample of 220 patients with AMI treated with primary angioplasty was taken, 72 of whom died in the hospital.

A statistical analysis was performed on putative independent predictors of poor early prognosis, namely: gender, smoking, hypertension, diabetes mellitus, dyslipidemia, low ejection fraction < 35% according to Simpson, renal failure, previous angioplasty or coronary artery bypass grafting, previous vascular incident (ischemic stroke, AMI or peripheral arterial thrombosis), rhythm and conduction disorders upon admission of the patient (AV-block, LBB, DBP, ventricular tachycardia, atrial fibrillation/flutter, time from the onset of symptoms to recanalization of the artery responsible for the infarction, Killip class, type of coronary artery and which segment is affected - proximal, middle, distal, presence of multivessel coronary disease and/or chronic occlusion of another artery, number of implanted stents, final TIMI blood flow, procedural complications - bleeding, EMD, ventricular tachycardia/fibrillation, pulmonary edema, cardiogenic shock, reocclusion of the vessel.

The factors can be divided into three groups:

I. *Factors that did not show significance (P>0.05) and no conclusions can be drawn about them.*
II. *Factors that worsen the prognosis*
III. *Factors that have no influence do not worsen the prognosis.*

The results are surprising, since factors associated with increased risk of CHD such as male gender and diabetes mellitus did not show significance as predictors of a worse early prognosis. Dyslipidemia and smoking did not have an influence.

I. *Factors that did not show significance (P>0.05) and no conclusions can be drawn about them:*

• Gender
• Diabetes mellitus
• Previous angioplasty or coronary artery bypass grafting
• Previous vascular incident

• Presence of left bundle branch block

• Involvement of middle and distal segments of the coronary arteries

• RCA and LCx

• Number of implanted stents

• Periprocedural complications - bleeding

The above factors have P values > 0.05.

Also, patients with acute myocardial infarction who present with ventricular tachycardia or fibrillation do not have a worse prognosis than the others according to the statistical analysis /Fig 25/. This is probably due to the fact that a large number of them die before reaching the catheterization laboratory and very few are included in the database, which distorts the results. The statistical analysis does not show reliability (P=0.27).

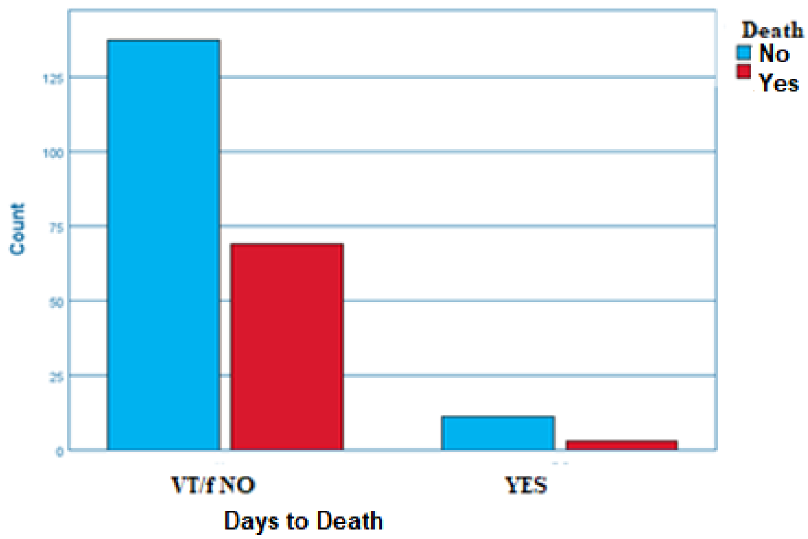


Fig. 25- Probability of death in patients with high-grade VE or VT/f

Analysis of GISSI-2 by Volpi A et al. shows that ventricular fibrillation complicating acute myocardial infarction is a strong predictor of early death. It could be assumed that this is one of the strong predictors of poor early prognosis, although the own data are not convincing.

II. Statistical analysis of the studied group of 220 patients shows the following factors as significant for a higher risk of death in the hospital:

- Patients with arterial hypertension
- Patients with renal failure
- Patients with atrial fibrillation/flutter
- High-degree AV block - Möbitz II or III degree
- Patients with right bundle branch block considered new.
- Patients with Simpson FI < 35%
- Patients presenting after the sixth hour from the onset of symptoms
- Patients with LM and LAD involvement
- Multi-vessel patients
- Patients with chronic occlusion of another coronary artery, except acute
- Patients with involvement of the proximal segment of the coronary artery
- Patients with incompletely restored distal blood flow (< TIMI III)
- Patients with Killip class > I on admission.
- Patients with periprocedural complications - electromechanical dissociation, pulmonary edema, ventricular fibrillation, cardiogenic shock, and mechanical complications.

III. Factors that do not worsen the short-term prognosis (P <0.05):

- Smoking
- Dyslipidemia

Table 7 summarizes the data on the factors that worsen the short-term prognosis that showed significance.

Table 7- Factors worsening the near-term prognosis. The first column is the respective predisposing factor, in white are those that do not worsen the prognosis. The second column is how many patients in the study group do not have it [No] or have it [Yes] (the number of patients is in brackets). The third column is the percentage of deaths during hospitalization from the respective group, the fourth and fifth columns are the odds ratio/coefficient and the confidence level, respectively. In white are the factors that do not worsen the prognosis.

Factor	Patients with the given factor	Death	Odds Ratio	P /Single-side Fisher exact test/
AH	No (50)	22,0%	1,98	0,045
	Yes (170)	35,9%		
RF	No (181)	29,8%	2,02	0,039
	Yes (39)	46,2%		
Smoker	No (152)	39.6%	0,33	0,002
	Yes (68)	17.5%		
Dyslipidemia	No (100)	41,0%	0,50	0,021
	Yes (120)	25,8%		
AF	No (190)	30,0%	2,33	0,037
	Yes (30)	50%		
RBB	No (185)	27,0%	4,57	<0,0001
	Yes (35)	62,9%		
High degree AV block	No (209)	30,6%	6,04	0,006
	Yes (11)	72,7%		
EF Simpson < 35%	No (162)	19,8%	9,03	<0,0001
	Yes (58)	69,0%		
Symptom onset < 6 h	No (109)	38,7%	1,5	0,048
	Yes (111)	26,6%		
Culprit lesion LM	No (210)	30,0%	21,00	<0,0001
	Yes (10)	90,0%		
Culprit lesion LAD	No (103)	23,3%	2,29	0,004
	Yes (117)	41,0%		
Affected proximal segment of the artery	No (114)	25,4%	2,00	0,012
	Yes (106)	40,6%		

Multivessel dicease	No (153)	25,5%	3.82	0,01
	Yes (67)	49,3%		
Presence of chronic occlusion in addition to acute	No (166)	23,5%	5,12	<0,0001
	Yes (54)	61,1%		
Post-procedural blood flow TIMI 0	No (213)	30,5%	34,01	<0.0001
	Yes (7)	100,0%		
Post-procedural blood flow TIMI I	No (212)	30,2%	39,14	<0.0001
	Yes (8)	100,0%		
Post-procedural blood flow TIMI II	No (201)	30,3%	3.16	0.016
	Yes (19)	57,9%		
Post-procedural blood flow TIMI III	No (34)	76,5%	0,94	<0.0001
	Yes (186)	24,7%		
Killip I	No (102)	60,8%	2,30	<0.0001
	Yes (118)	8,5%		
Killip II-III	No (153)	29,2%	1.93	0,033
	Yes (67)	44,2%		
Killip IV	No (185)	21,6%	42,29	<0.0001
	Yes (35)	91,4%		
Periprocedural complications - EMD	No (200)	26%	115,97	<0.0001
	Yes (20)	100%		
Periprocedural complications - VF	No (209)	30,6%	6,04	0,006
	Yes (11)	72,7%		
Periprocedural complications - PE	No (202)	28,2%	12,71	<0.0001
	Yes (18)	83,3%		
Periprocedural complications - Shock	No (172)	14,5%	78,19	<0.0001
	Yes (48)	97,9%		
Periprocedural complications - mechanical	No (209)	29,2%	55,53	<0.0001
	Yes (11)	100%		

The factors that influence the near-term prognosis in AMI are presented and discussed separately below:

7.1 Arterial hypertension

Hypertensive heart disease is a well-known cardiovascular risk factor for the development of atherosclerosis. Data on the prognostic role of an existing hypertensive condition in patients with ACS are currently contradictory.

The result of our own analysis shows that patients with AH are 170, and without AH 50. Hypertensive patients have an early mortality rate in the studied group of 35.9%, and normotensive patients 22%. This means that patients with AH die more, P = 0.045, OR (odds ratio) 1.98, i.e. hypertensive patients with AMI have a worse early prognosis (Fig 26 and 27).

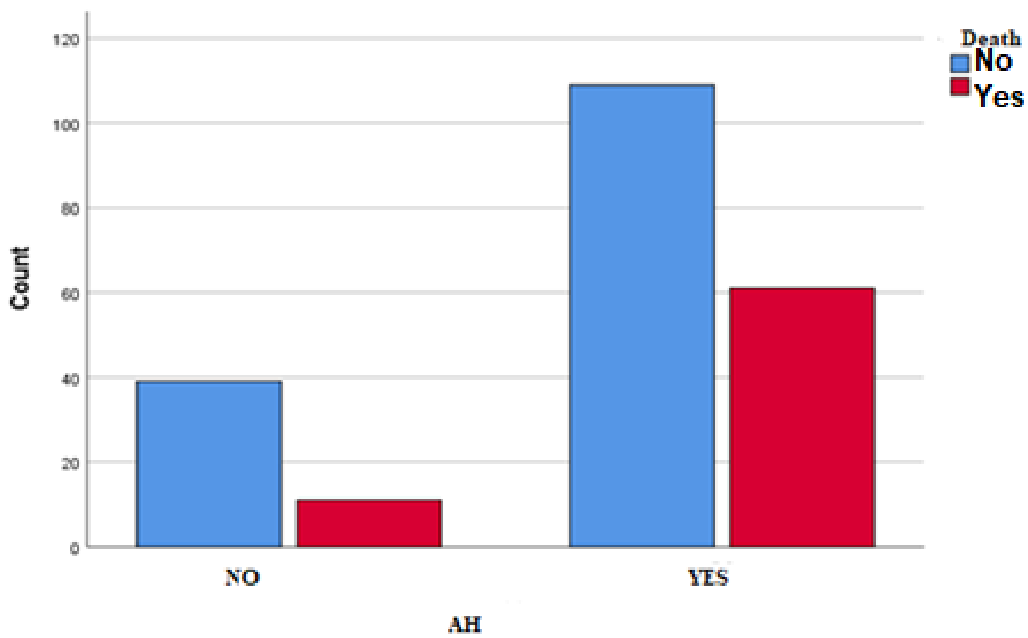


Fig. 26- Mortality from MI in AH

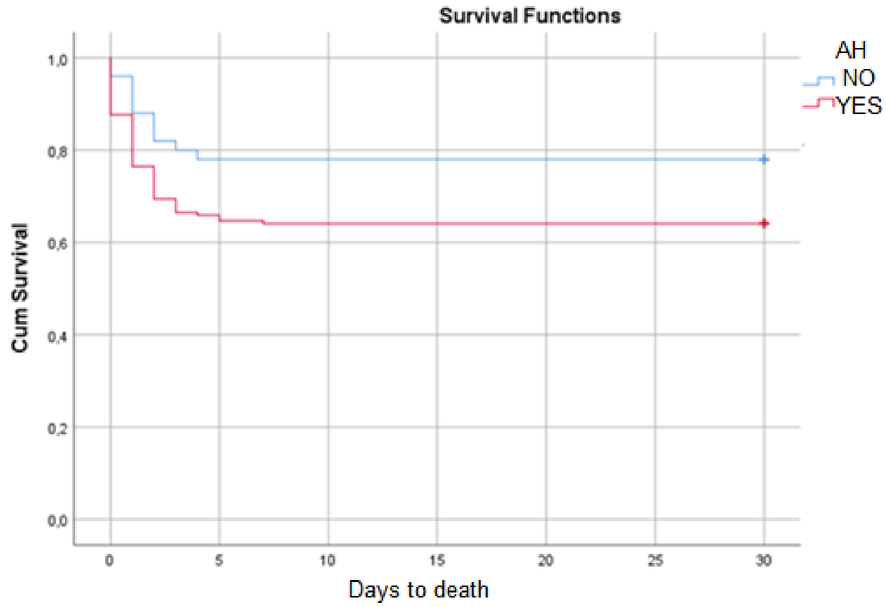


Fig. 27- Mortality in hypertensive patients

7.2 Renal failure

Patients with renal failure were 39, and without 181. Patients with renal failure had an early mortality rate in the studied group of 46.2%, and those with normal renal function 29.8%. This means that patients with RF die more. The confidence level P is 0.039, OR 2.02 (Fig. 28 and 29).

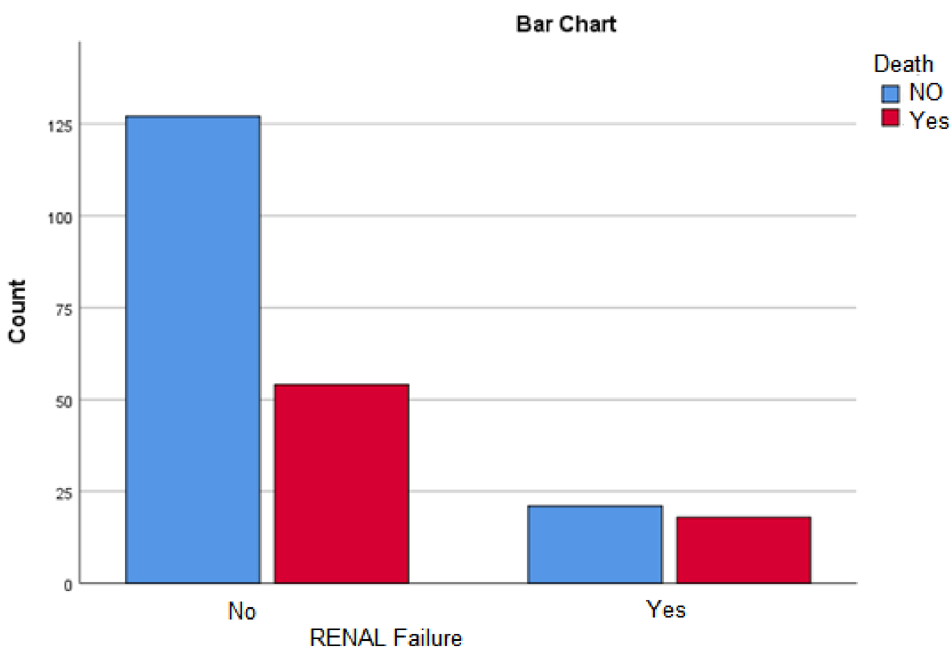


Fig. 28- Moratlity from MI in RF

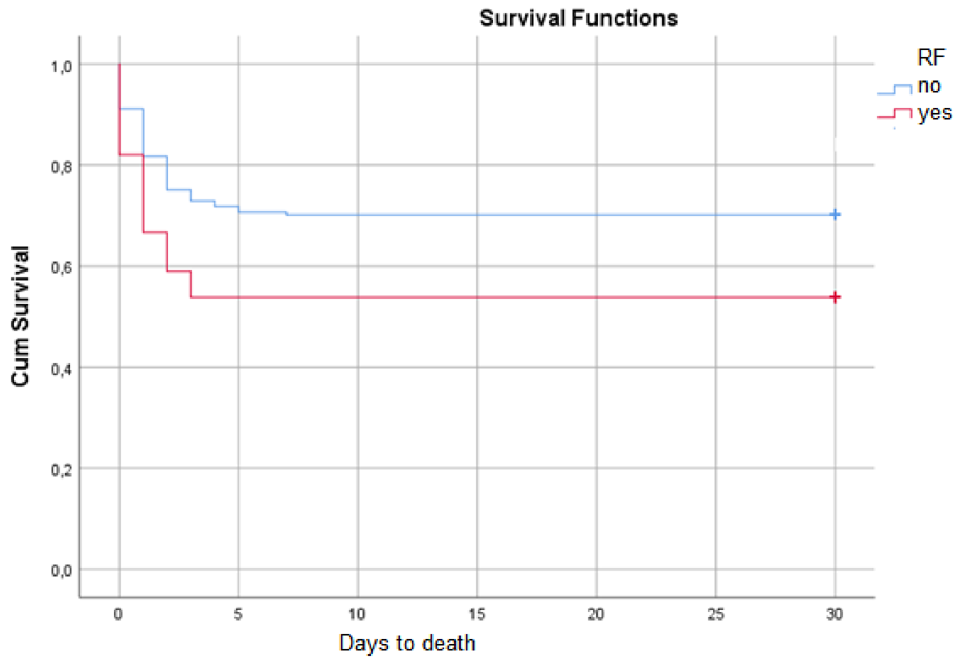


Fig. 29- Prognosis in patients with BN and AMI

Impaired renal function is a risk factor for cardiovascular disease and an adverse prognostic factor in patients with established cardiovascular disease. In addition, with the current widespread use of invasive procedures in the treatment of acute myocardial infarction, contrast-induced nephropathy is an increasing problem in this patient population. Regardless of the cause, impaired renal function in acute myocardial infarction is a significant adverse prognostic factor. Thus, despite some conflicting views regarding the optimal management strategy, intensive diagnostic, preventive, and therapeutic measures are clearly necessary in patients with acute myocardial infarction and impaired renal function.

7.3 Smoking

There were 68 smokers and 152 non-smokers. Smokers had an early mortality rate of 17.5% in the study group, while non-smokers had a 39.6% rate. The confidence level P was 0.002; OR 0.33 (Fig. 31 and 32). The result is surprising, but this is most likely due to the fact that smokers are adapted to chronic ischemia, have a larger amount of active platelets, which are blocked more quickly, and have a heart attack at a much younger age, which is associated with lower comorbidity, i.e. they do not have concomitant diseases that could complicate the condition. Of course, these are only hypotheses that require further study.

Regarding age (Fig. 30), a subanalysis was performed, which showed that the average age of smokers with AMI was 62 years (SD 9.5), and of non-smokers with AMI, the average age was 72 years (SD 11.9). The data that smokers get AMI about 10 years earlier have been known for a long time and are confirmed by numerous studies by other researchers.

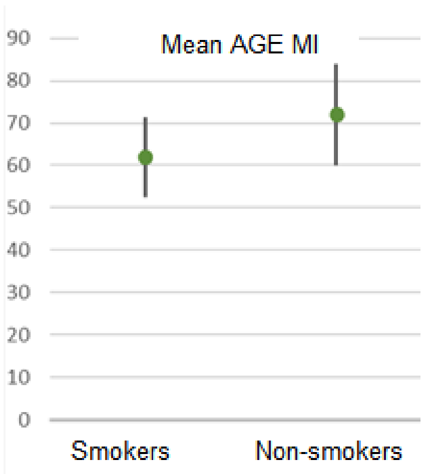


Fig. 30- Comparison of the average age for smokers and non-smokers with OMI

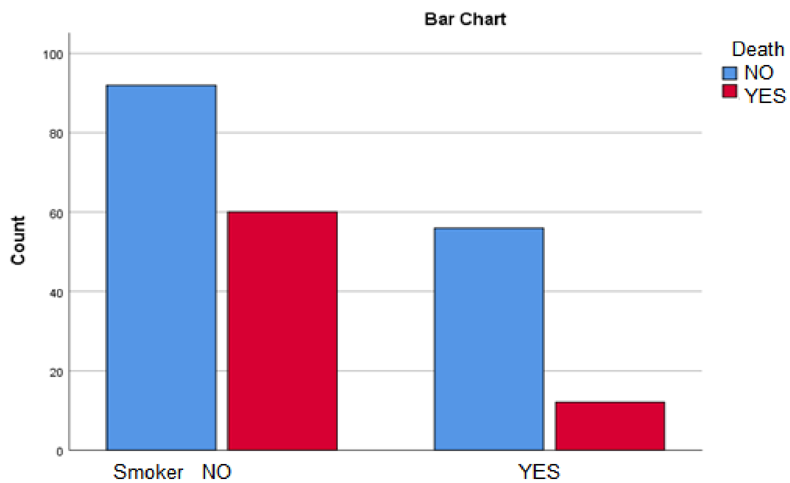


Fig. 31- Mortality in smokers and non-smokers

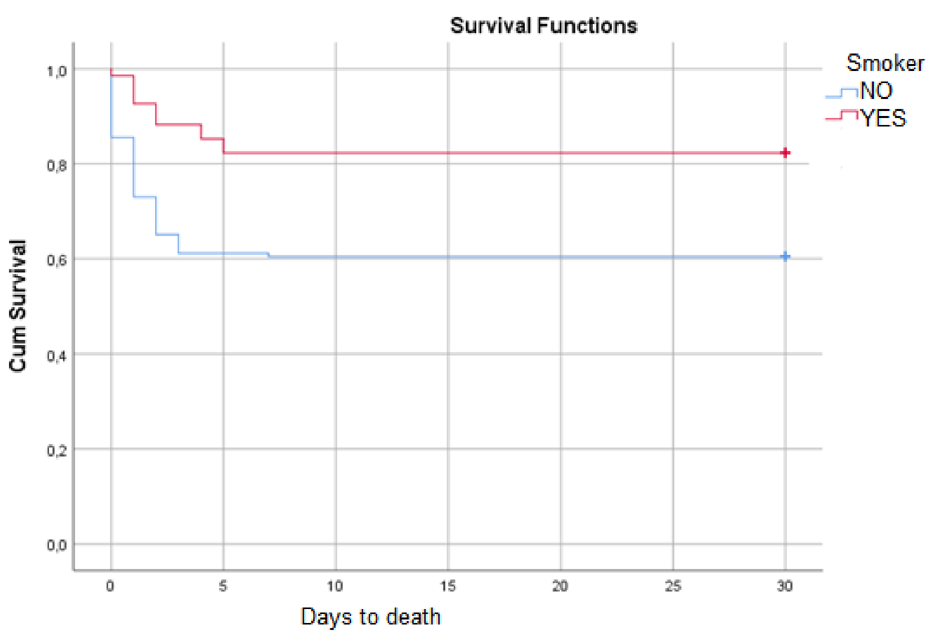


Fig. 32- Early survival in smokers and non-smokers

7.4 Dyslipidemia

Dyslipidemia was defined as those with total cholesterol levels > 5.6 mmol/l; HDL-C < 1; LDL-C > 2.8 mmol/l and/or triglycerides > 1.8 mmol/l, with these limits being determined by the reference values of the clinical laboratory. There were 120 patients with dyslipidemia and 100 without. Patients with dyslipidemia had an early mortality rate in the study group of 25.8% and without dyslipidemia of 41%. This means that patients with normal blood cholesterol levels have a worse short-term prognosis or, in other words, the presence of dyslipidemia does not worsen the short-term prognosis. The confidence level P is 0.021, OR 0.50 (Fig. 33 and 34).

Fig. 33 - Mortality in patients with or without dyslipidemia and AMI

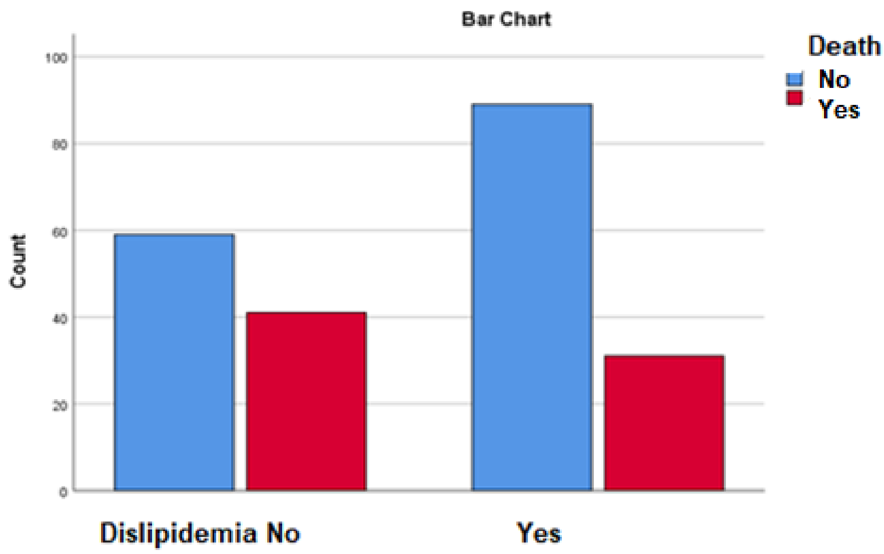
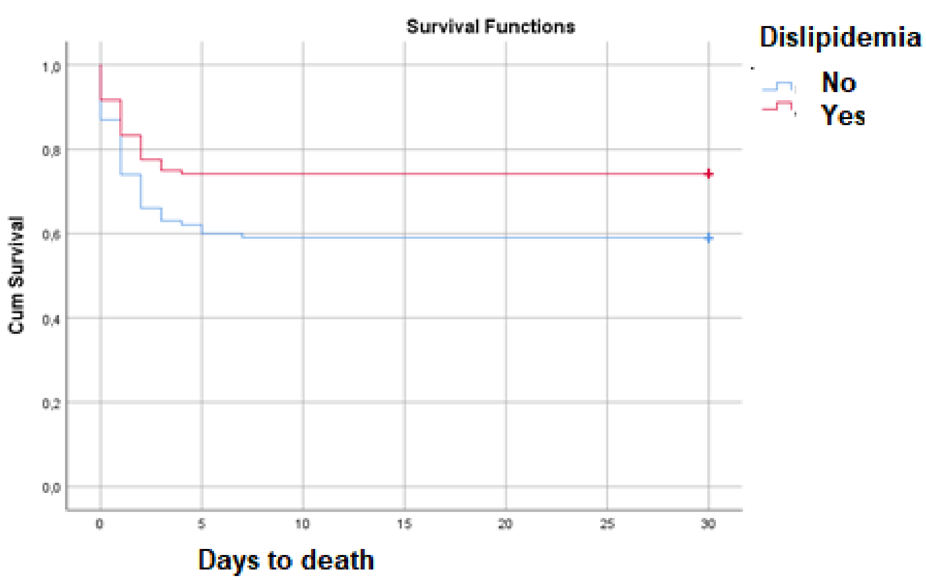


Fig. 34- Early survival in patients with dyslipidemia and AMI and without dyslipidemia and AMI



And this result is surprising and contrary to expectations. The hypothesis for this is that most patients with dyslipidemia are already on statin therapy and although optimal control has not been achieved, the intake of statins has a protective effect - plaques with a smaller and more stable lipid core, which do not cause complete occlusion of the infarct culprit artery or the risk of peripheral embolization during PCI, associated with poor final TIMI blood flow in such patients is lower.

It is possible that, like smokers, those with dyslipidemia are younger with little comorbidity, i.e. they do not have accompanying diseases that could complicate the condition. Similar to smoking, a subanalysis was performed (Fig 35) and it was confirmed that the mean age of the patients was lower in the dyslipidemia group - 67 years (SD 11.6) versus 72 years (SD 12.4) mean age in the OMI group with normal values. The data from the study group's medical records regarding therapy at admission are incomplete and it was not possible to perform a subanalysis of which patients with abnormal lipid levels were taking statins and which were not. The same applies to patients with normal values. Lipoprotein A levels were also not examined, which could explain the result of the analysis. Another disadvantage that could affect the results is that the reference values of the laboratory at that time were taken when distributing the patients into groups. The patients were not distributed into risk groups according to concomitant diseases and the SCORE tables for cardiovascular risk. It is also possible that the values of cholesterol, its fractions and triglycerides are incorrect because it is not known whether the blood samples were taken on an empty stomach or not. These facts raise the question of whether the results of the statistical analysis are correct.

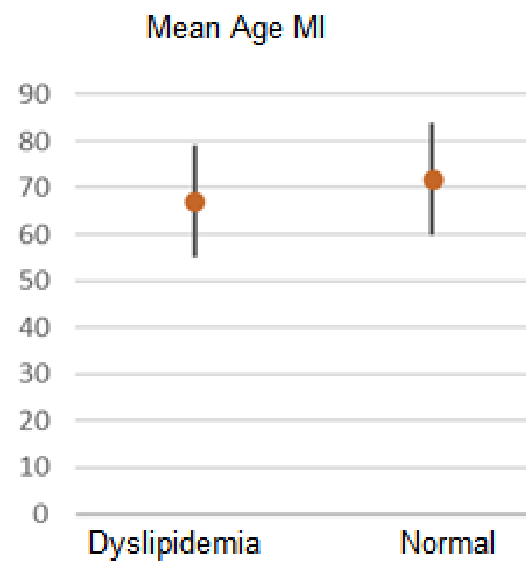


Fig. 35- Comparison of the mean age of patients with AMI with or without dyslipidemia

The fact that dyslipidemia leads to an increased risk of cardiovascular events and worsens the long-term prognosis is undeniable, but the question regarding early survival is not clarified. The above-mentioned hypotheses and facts raise many questions that could be answered with future studies.

7.5 Atrial fibrillation/flutter

Patients with atrial fibrillation or flutter are 30, and without are 190. Patients with AF have an early mortality in the studied group of 50%, and without AF 30%. This means that AF is a poor predictor by itself. The confidence level P is 0.037, OR 2.33 (Fig 37 and 38).

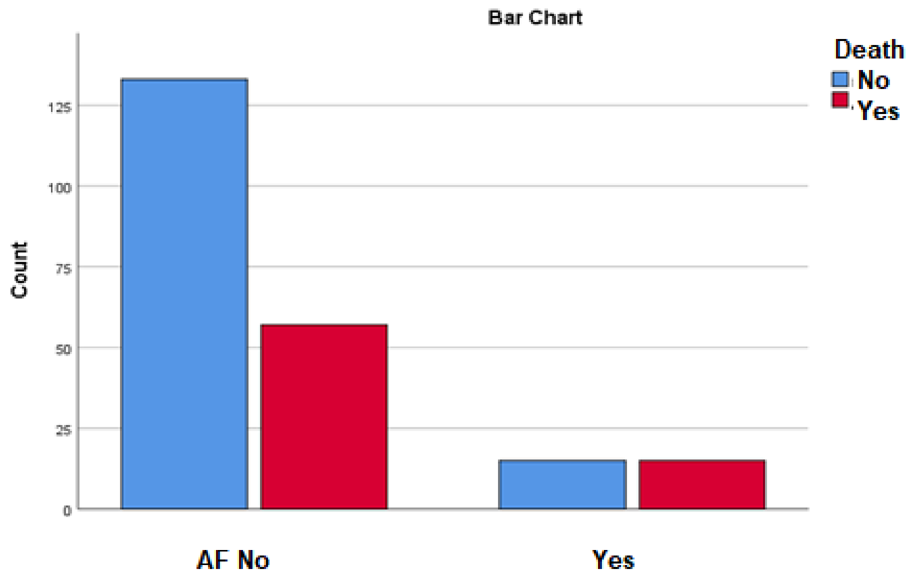


Fig. 37- Mortality in patients with or without atrial fibrillation and ACS

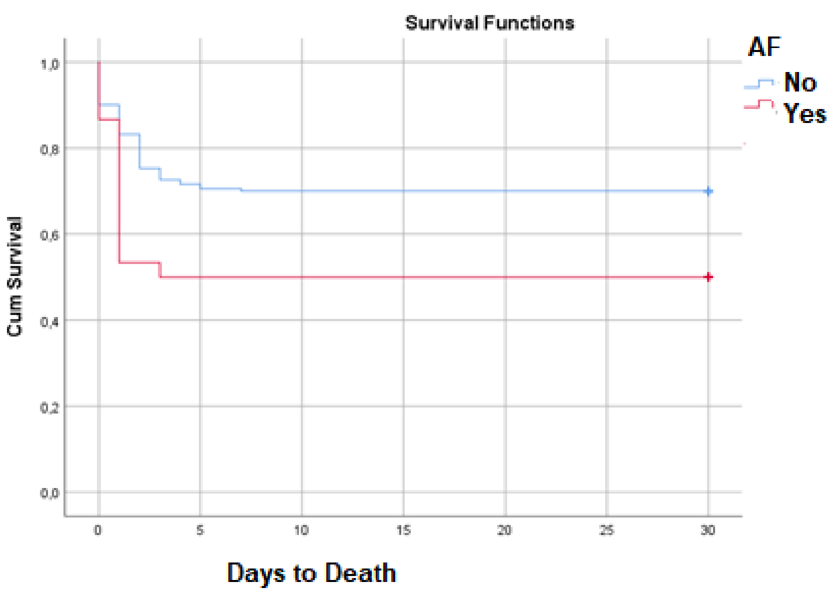


Fig. 38- early survival in patients with ACS with or without atrial fibrillation.

Atrial fibrillation is a common finding in patients with myocardial infarction. Both conditions increase in frequency with advancing age, and AMI is associated with a sharp increase in the occurrence of AF. The incidence of AF among patients with MI ranges from 2% to 22%. Compared with severe complications such as ventricular tachycardia or heart failure, AF is not usually perceived by clinicians as a critical event during the acute phase of MI. However, the prognostic impact of the presence of AF in MI remains controversial in the literature. New-onset AF in the setting of AMI, without a history of prior AF, remains associated with an increased risk of mortality, even after adjustment for several important risk factors for AF. These subsequent increases in mortality suggest that AF can no longer be considered a minor event during AMI.

7.6 Right bundle branch block

There were 35 patients with right femoral block, and 185 without. Patients with RBB had an early mortality rate of 62.9% in the studied group, and 27% without RBB. This means that the presence of RBB is a poor predictor with a very high level of confidence P<0.0001; OR 4.57 (Fig. 39 and 40).

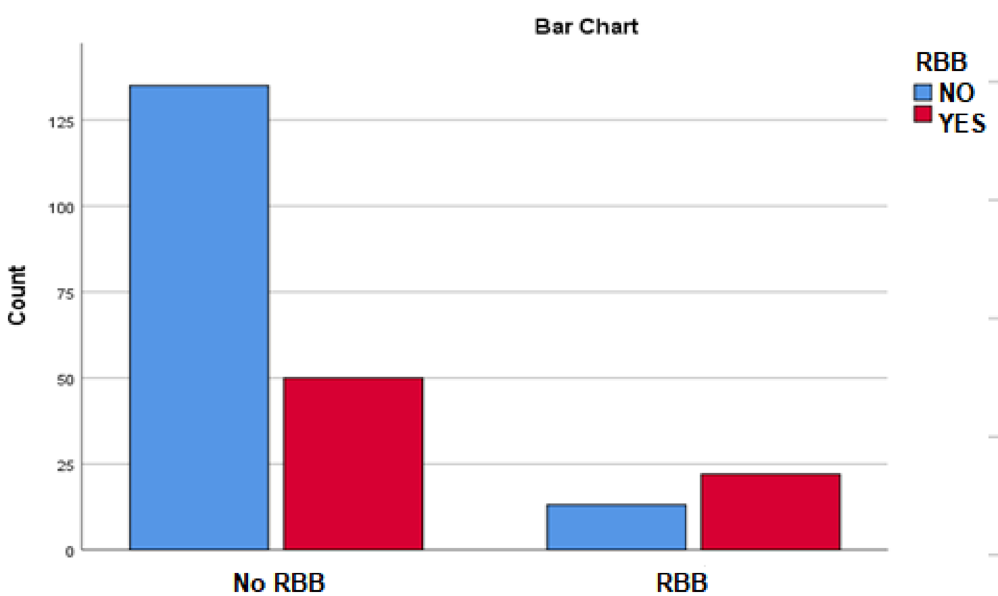


Fig. 39- Mortality in AMI patients with RBB and without RBB 1

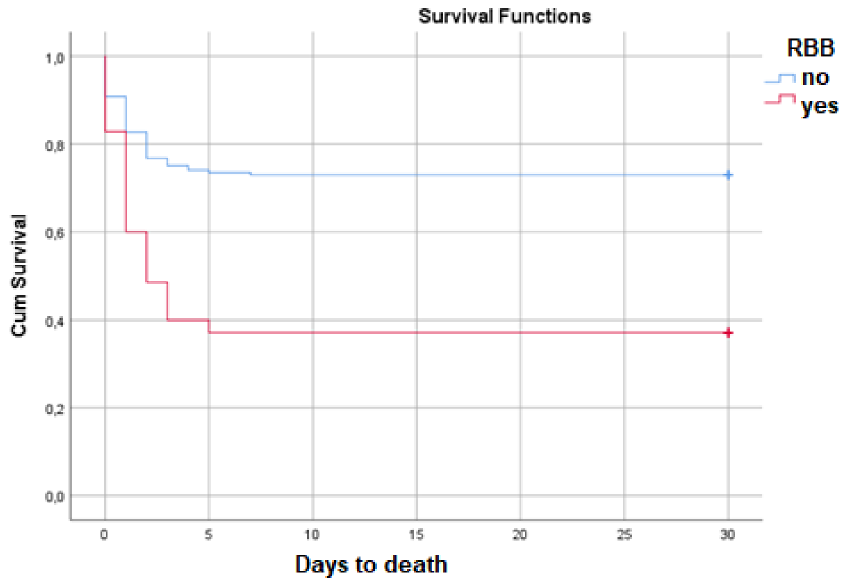


Fig. 40- Early survival in patients with ACS with or without RBB

A large study by Petr Widimsky et al showed that RBB in patients with AMI undergoing pPCI was associated with increased in-hospital mortality. Surprisingly, new-onset right bundle branch block was not listed as an indication for reperfusion therapy until 2012. The study analyzed AMI patients presenting with RBB (with or without left anterior hemiblock or left posterior hemiblock) and compared them with those presenting with LBB or other ECG patterns. The in-hospital mortality of patients with RBB was similar to LBB (14.3 vs 13.1%, P = 0.661). Patients with new or suspected new blocks had the highest (LBB 15.8% and DBP 15.4%) incidence of cardiogenic shock of all ECG subgroups. The in-hospital mortality of patients with AMI and RBB was the highest of all ECG manifestations of AMI. According to Widimsky et all, DBP should be strongly considered for inclusion in future guidelines as a standard indication for reperfusion therapy, in the same way as LBB. This is already a fact in the latest 2023 ESC guidelines for the diagnosis and treatment of ACS.

7.7 High degree Atrioventricular block

There were 11 patients with high-degree AV block and 209 without. Patients with high-degree AV block had an early mortality rate of 72.7% in the study group, while those without such a rate were 30.6%. This means that the presence of high-degree AV block is a poor predictor with a high level of confidence P 0.006; OR 6.04 (Fig. 41 and 42).

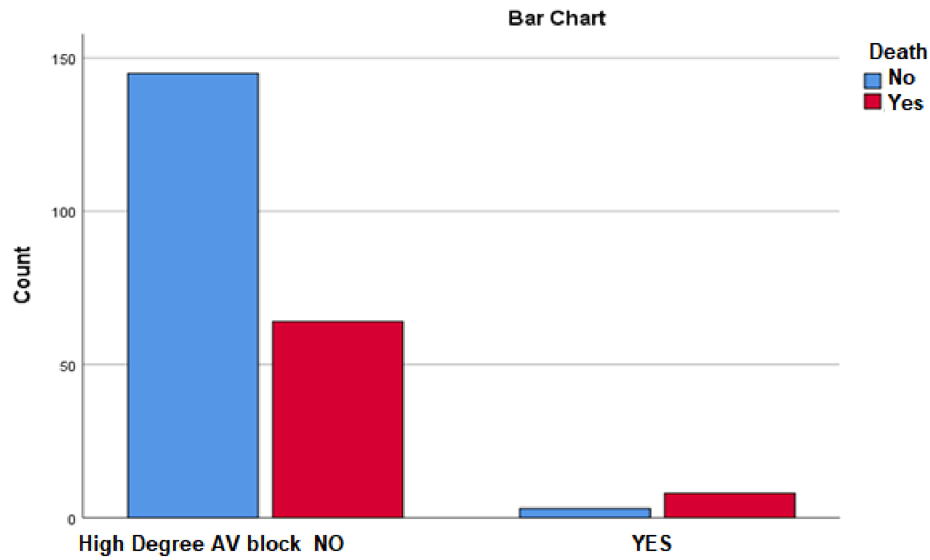


Fig. 41- Mortality in patients with AMI with or without high-degree AV block

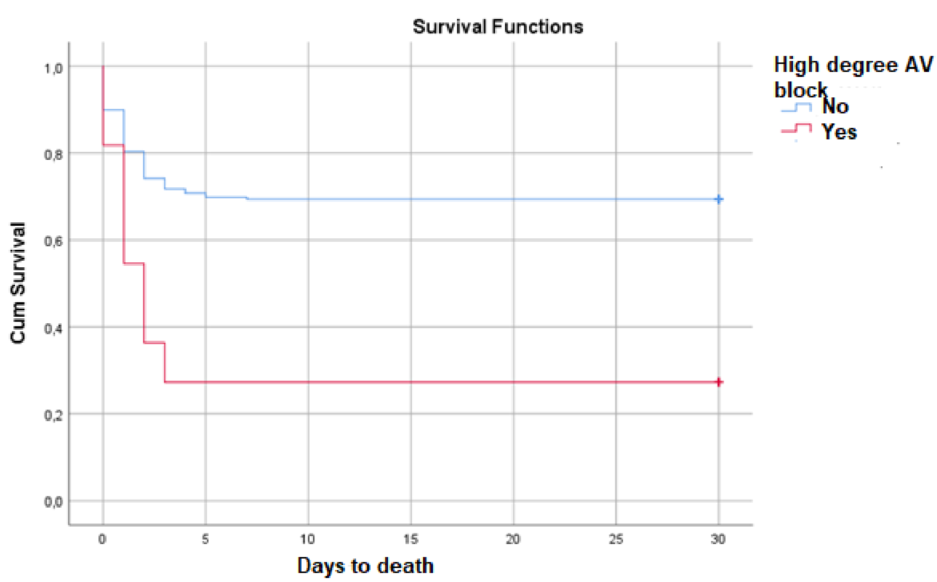


Fig. 42- Early prognosis in patients with AMI with or without high-degree AV block

Pokorney SD, Radder C, Schulte PJ et al. analyzed 29,677 patients with NSTEMI from the EARLY ACS, PLATO, and TRACER trials. Although high-degree AV block, asystole, and electromechanical dissociation are rare complications of NSTEMI, they are associated with significant short-term mortality. Velásquez-Rodríguez J, Vicent L, Díez-Delhoyo F et al analyzed 1,109 patients with STEMI. Of these, 8.6% had high-degree AV block. They concluded that in a contemporary cohort of STEMI patients treated with urgent reperfusion, high-degree AV block occurs in 9% of patients and is particularly common in elderly men with chronic kidney disease. According to these authors, high-degree AV block is not an independent predictor of in-hospital mortality.

Sheldon et al. analyzed the Global Registry of Acute Coronary Artery Disease (GRACE). Patients with high-degree AV block who survived to discharge had similar adjusted survival at 6 months compared with those without high-degree AV block. There was a decrease in the incidence, but not in the level, of in-hospital mortality associated with high-degree AV block during the study period. The conclusion is that the incidence of high-degree AV block is low and decreasing, but this complication continues to carry a high risk of in-hospital death.

7.8 Patients with EF ≤ 35% Simpson

Patients with very depressed systolic function EF < 35% were 58, and those with EF > 35% were 162. Patients with EF < 35% had early mortality in the study group 69%, and with EF > 35% 19.8%. This means that the presence of EF < 35% is a poor predictor with a very high level of confidence P < 0.0001; OR 9.03 (Fig. 43&44).

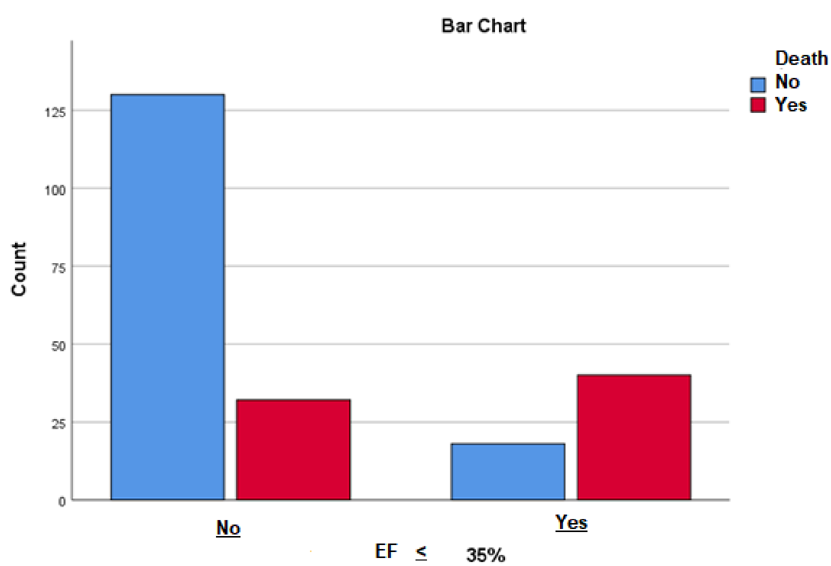


Fig. 43-Mortality in patients with AMI with or without decreased EF

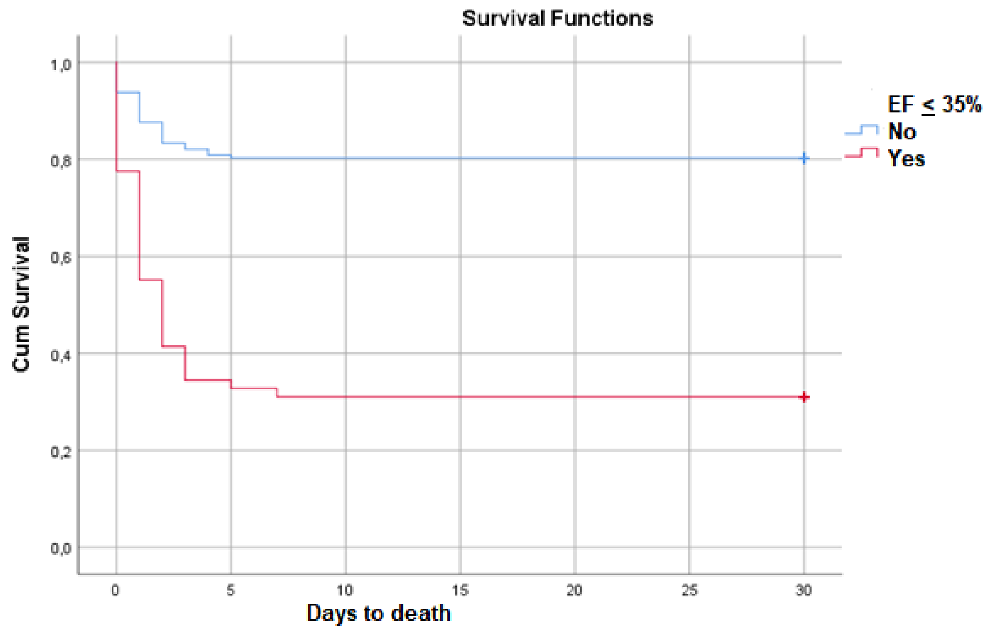


Fig. 44-Early survival in AMI patients with suppressed or preserved EF

Among patients admitted with acute coronary syndrome, left ventricular ejection fraction remains a strong predictor of survival after hospital discharge. Major studies suggest a sharp increase in mortality when EF reaches values equal to or below 40%, with mortality of up to 15% of patients at 6 months after MI. Regarding early mortality, in the own analysis of the studied patient group, the value of EF as an independent predictor of in-hospital death is 35%. Values of 35-40% are not significant. Trygve et all in a meta-analysis of patient data from four studies (CAPRICORN, EPHESUS, OPTIMAAL, VALIANT) examined the relationship between baseline EF in 19,740 patients and types of death during follow-up. With a median follow-up of 707 days, 3,419 deaths occurred. The distribution pattern for the mode of death was similar in the categories of EF<25%, EF 25–35%, and EF >35%. The risk of all types of death increased with decreasing left ventricular EF. EF<35% was associated with a 113% increased risk of sudden death (OR 2.13, 95% CI 1.53–2.98), a 170% increased risk of death from heart failure (HR 2.70, 95% CI 1.83–3.98), a 66% increased risk of other cardiovascular death (HR 1.66, 95% CI 1.14–2.42), and a 90% increased risk of non-cardiovascular death (HR 1.90, 95% CI 1.15–3.14).

7.9 Patients presenting after the sixth hour from symptom onset

The time from the onset of symptoms to revascularization shows that after the 6th hour the prognosis is worse. Patients with the onset of symptoms by the 6th hour are 111, and those who came later are 109. Patients with the onset of symptoms by the 6th hour have an early mortality in the studied group of 26.6%, and those who came after the 6th hour are 38.7%. Confidence level P 0.048; OR 1.05 (fig 45 and 46).

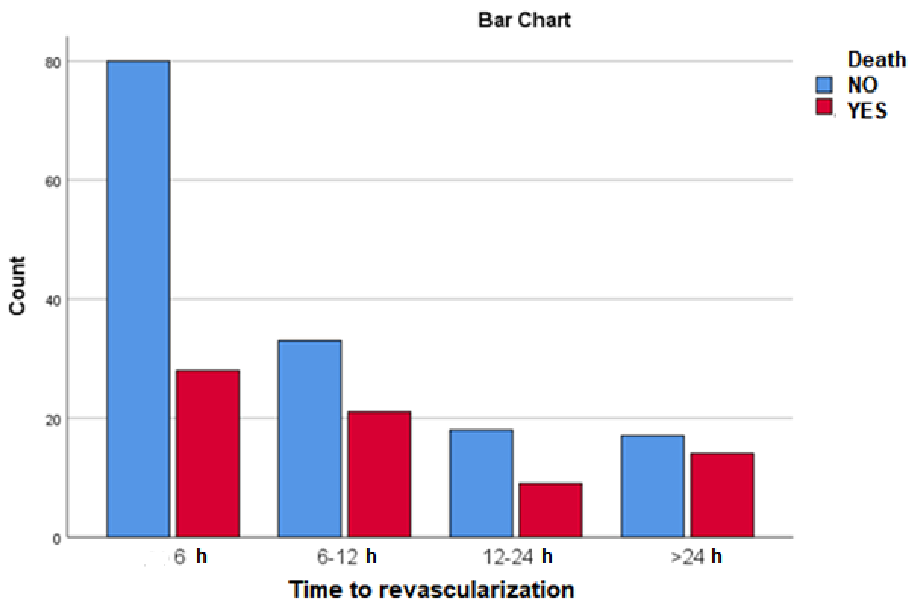


Fig. 45- Mortality in patients with AMI and revascularization. Up to 6 hours or after 6 hours.

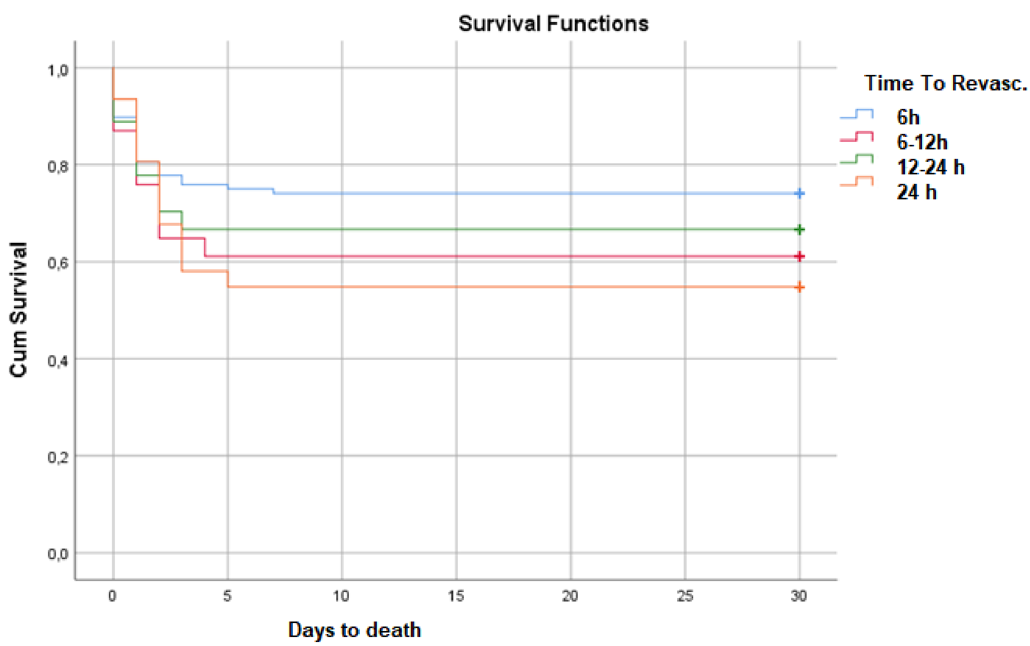


Fig. 46- Early survival in patients with AMI and revascularization. Up to 6 hours or after 6 hours.

It has long been known that the longer the patient is delayed, the worse the prognosis, but our data cannot be used to draw conclusions for the intervals 6-12 hours, 12-24, and after 24 hours from the onset of symptoms, as the level of evidence is P 0.2. The PRAGUE 2 study noted that primary angioplasty significantly reduced mortality in patients presenting >3 hours after the onset of symptoms. For patients presenting within <3 hours of symptoms, the results of thrombolysis were similar to the results of long-distance transport for pPCI. Penkov et al. noted that the mortality in patients with pPCI performed by the end of the 3rd hour and by the end of the 6th hour from the onset of infarction, respectively, surprisingly and in contrast to the CARTIM and Prague-2 studies, did not differ. However, in patients with PCI performed after 6 hours, in-hospital and 6-month mortality increased sharply. In conclusion, the researchers noted that patients hospitalized early and revascularized by 6 hours had lower mortality both in the hospital and by the end of 6 months after MI. The main cause of death during hospital treatment is circulatory and acute left heart failure, and in the post-hospital period- sudden cardiac death. The time intervals for pPCI are known and defined, and are included in all guidelines for myocardial revascularization and ACS. The latest ACS guideline from 2023 summarizes everything learned so far. While routine immediate angiography and PCI are clearly associated with clinical benefit in patients admitted within 12 hours of symptom onset, the benefit of pPCI in patients with STEMI presenting later than 12 hours after symptom onset is less established. A small clinical trial in 347 patients with STEMI presenting 12–48 hours after symptom onset and without persistent symptoms reported that routine pPCI increased the amount of salvaged myocardium and long-term survival compared with patients treated conservatively.

7.10 Patients with LM and LAD involvement

According to the infarct culprit artery, two vessels of great importance are formed - the trunk of the left coronary artery (LM) and the left anterior descending artery (LAD). This has long been known and is confirmed by our data. Patients with affected LAD in the study group are 117, and with other coronary vessels 103. Patients with affected LAD have an early mortality in the study group of 41.0%, and with other coronary vessels 23.3%. Confidence level P 0.004. Patients with left coronary artery trunk in the study group are 10, and with other coronary vessels 110. Patients with affected LM have an early mortality in the study group of 90%, and with other coronary vessels 30%. Confidence level P <0.001; OR for LM 21, for LAD 2.29 (Fig. 47, 48, 49, 50).

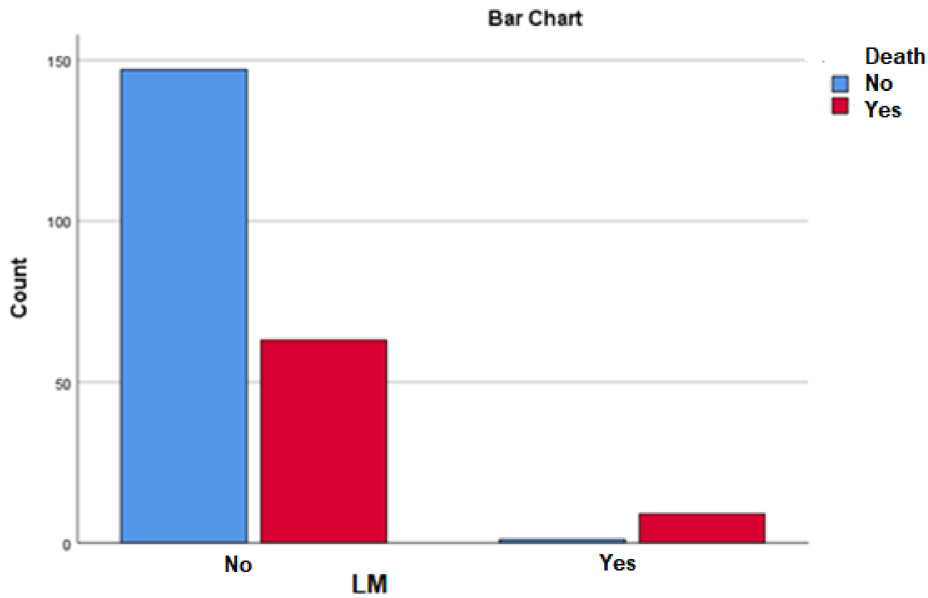


Fig. 47- Mortality in patients with affected LM

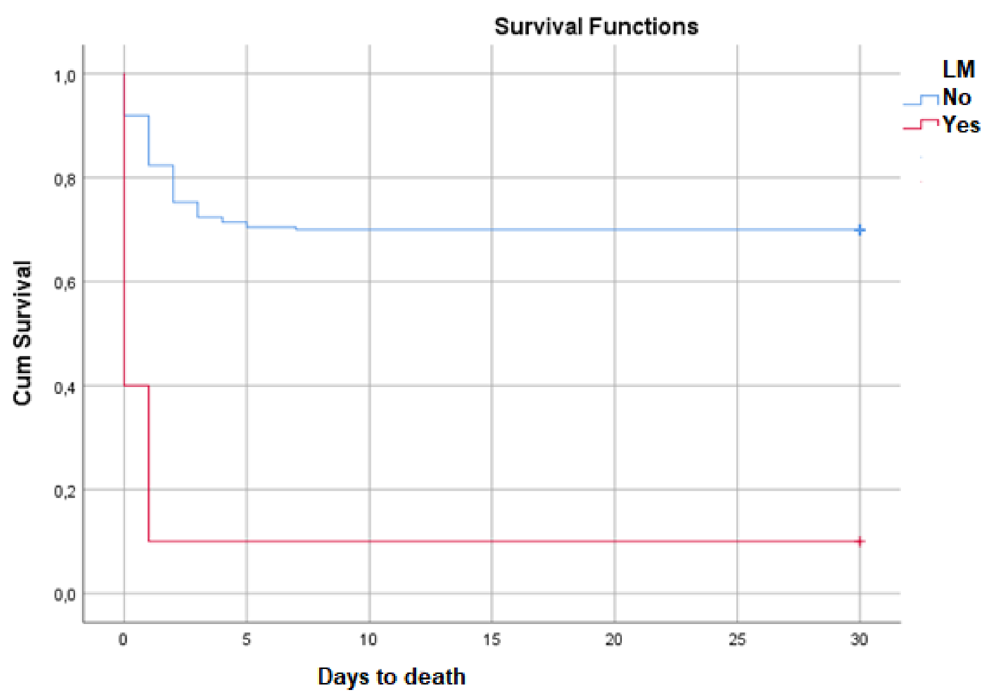


Fig. 48- Early survival in patients with affected LM

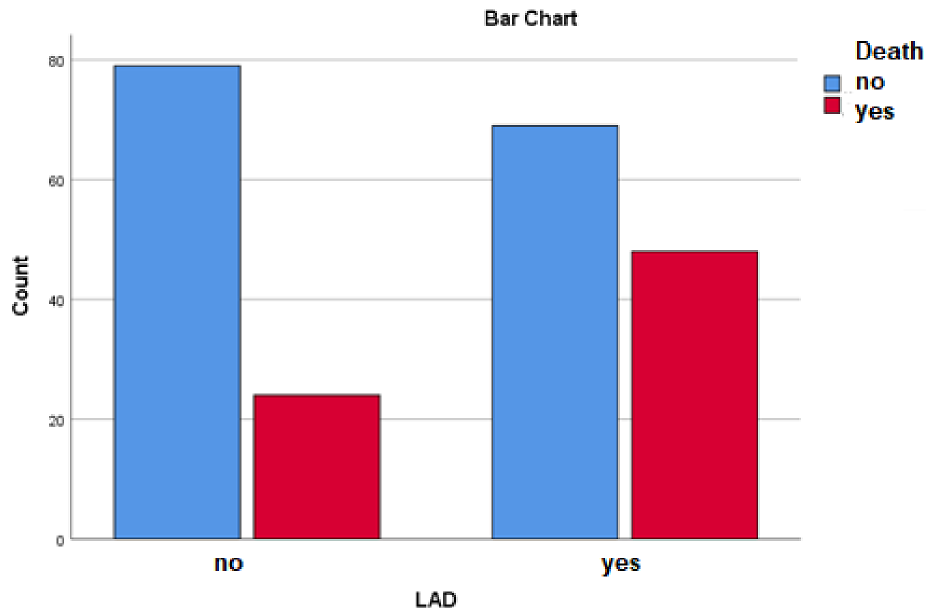


Fig. 49- Mortality in patients with affected LAD or other coronary vessels

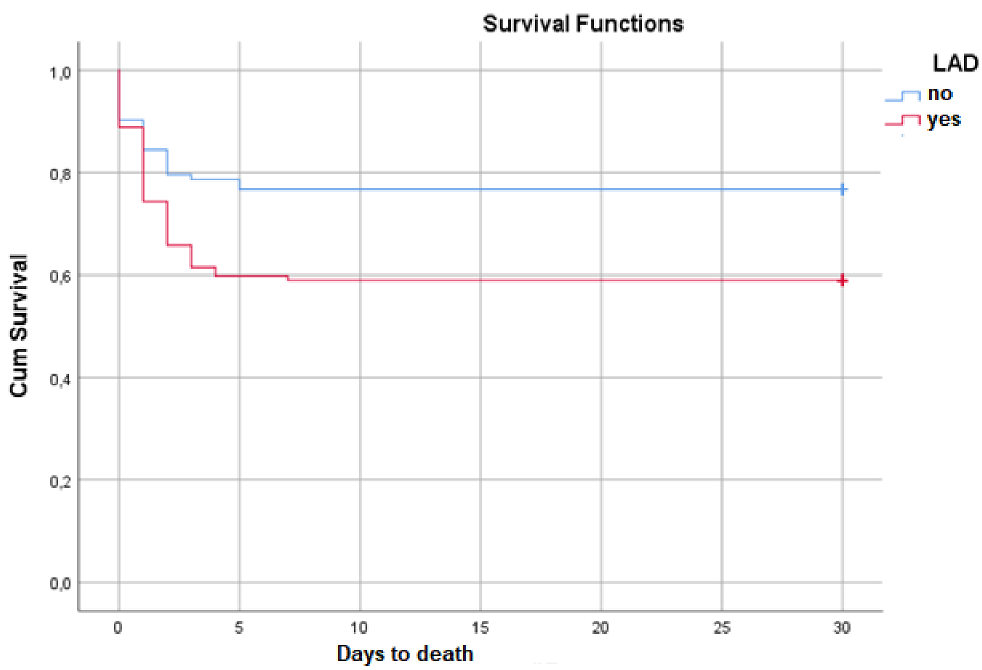


Fig. 50- Early survival in patients with affected LAD or other coronary vessels

Unprotected main occlusion in the setting of ACS is a catastrophic event with limited options for successful treatment. The clinical presentation often includes sudden cardiac death requiring cardiopulmonary resuscitation and overt cardiogenic shock. Optimal treatment includes urgent percutaneous revascularization with restoration of blood flow in the left coronary artery.

Postprocedural TIMI flow has been shown to be the only independent predictor of in-hospital mortality. LAD occlusion, causing extensive left ventricular myocardial ischemia, is also associated with poor early and long-term prognosis. High-risk patient groups include LAD infarctions in women or those with concomitant multivessel disease.

These findings have been confirmed by numerous studies and analyses.

7.11 Patients with multivessel coronary disease

Patients with multivessel coronary disease and those with old, chronic occlusion in addition to acute also have a higher mortality rate than the others. Multivessel coronary patients in the analyzed group are 67, of which 49.3% died. The rest are 153 with a mortality rate of 25.5%.
P 0.01; OR 3.82 (Fig. 51 and 52).

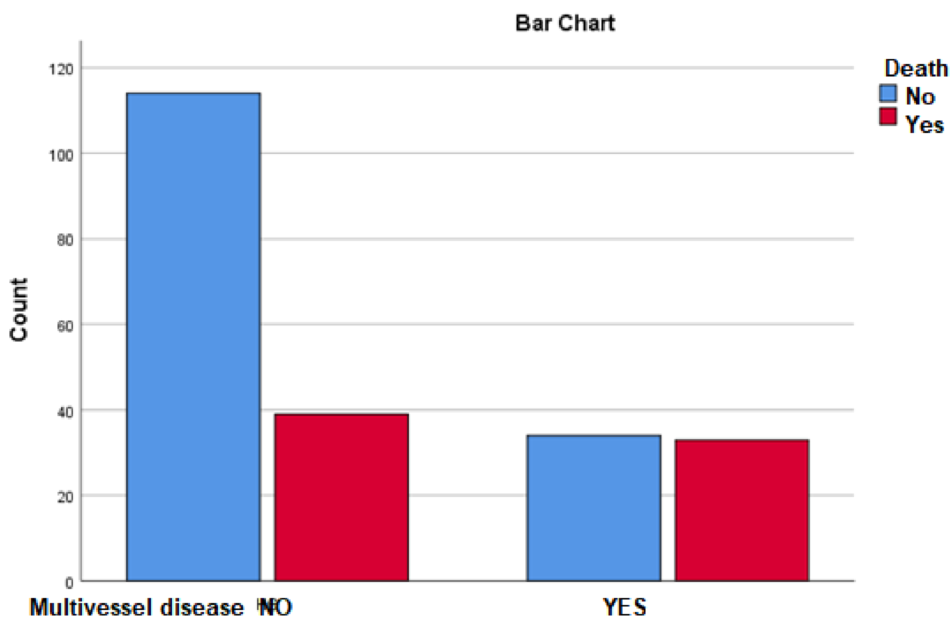


Fig. 51 – Mortality in multi-branch patients and others with AMI

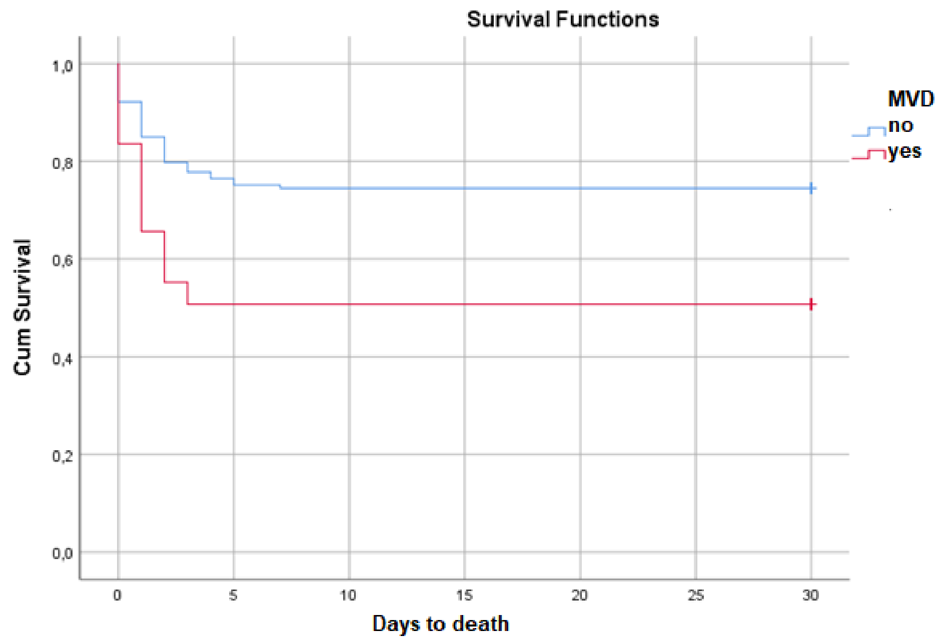


Fig. 52- Early survival in MVD patients and others with AMI

7.12 Patients with chronic occlusion of another coronary artery, except for the acute one

Patients with concomitant chronic occlusion were 54 with a mortality of 61.1%, the remaining 166 had a mortality of 23.5%. P <0.0001; OR 5.12 (Figs 53 and 54).

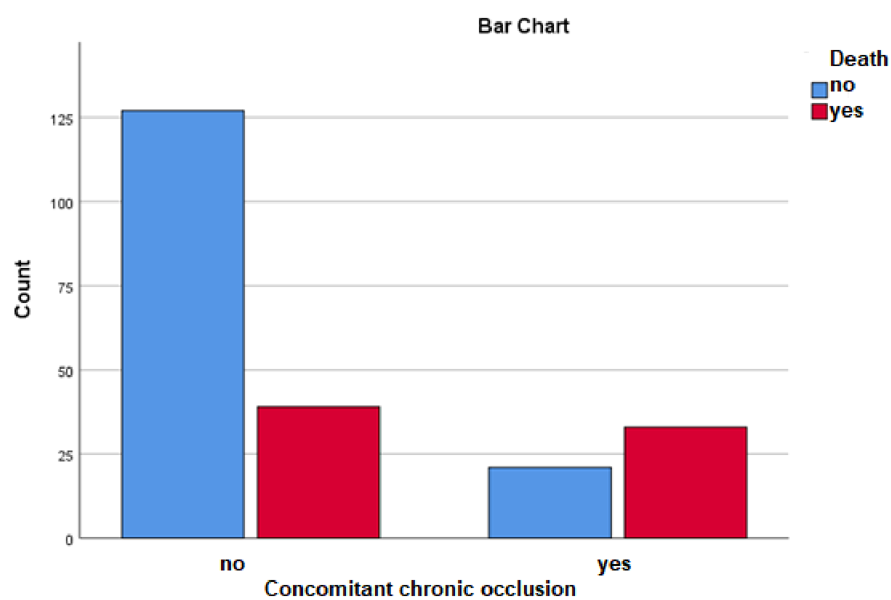


Fig. 53- Mortality in patients with AMI and other chronic occlusion

This division is not very correct, because there are multi-vessel patients with chronic occlusion, and there are those with chronic occlusion of one vessel and acute involvement of a second (bi-vessel). There is an overlap of the two factors, which was not taken into account in the analysis.

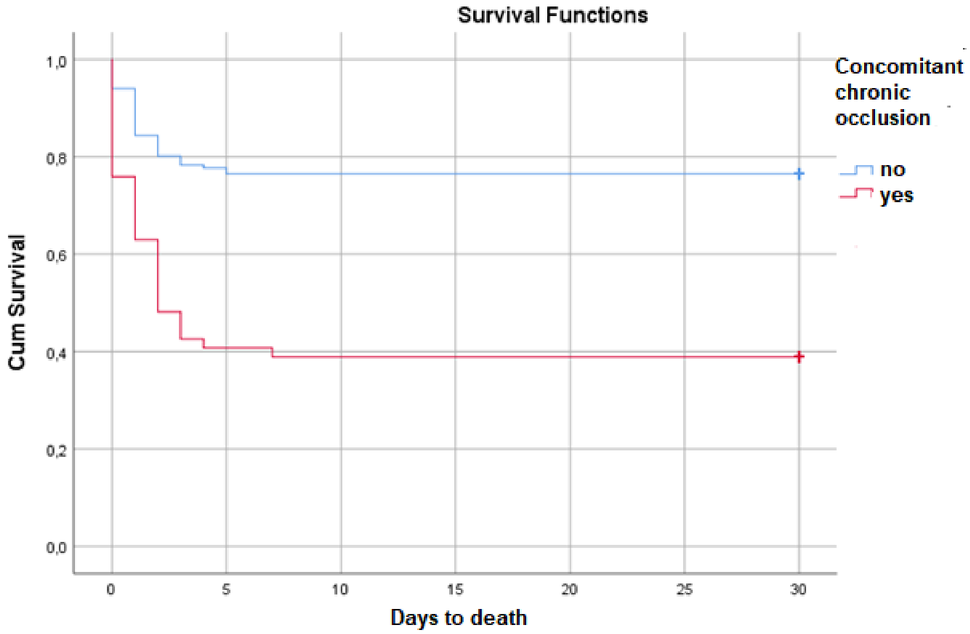


Fig. 54- Early survival in patients with AMI and other chronic occlusion

In both cases, the emergence of a large ischemic zone of the myocardium in the setting of ACS on the terrain of already damaged myocardium, which has chronic ischemia and multiple alternating zones of fibrosis and hibernation, further suppresses cardiac function, creating conditions for contractile failure, shock and life-threatening arrhythmias. The increased fragility in these groups of patients has long been known. In recent decades, numerous studies have been conducted on patients with AMI and multivessel disease. They aimed to answer two main questions: whether performing complete revascularization leads to improved survival and when is the optimal time to perform the procedure. Although the latter question has not yet received a definitive answer, a broad consensus has emerged regarding the former, stating that complete revascularization is better than performing percutaneous coronary intervention only on the culprit lesion. The latest ACS ESC guidelines also clearly recognize this advice and define a class I indication with a level of evidence A. The combination of chronic occlusion of a coronary artery and acute occlusion of a peripherally feeding artery and collaterals also creates a very large ischemic zone, which is often equivalent to LM occlusion. Chronic total occlusion in a noninfarcted artery worsens the immediate clinical outcome in patients with AMI. However, the prognosis of such patients with preserved left ventricular function after successful pPCI is still unclear.

7.13 Patients with involvement of the proximal segment of a main coronary artery

As an independent early poor predictor, involvement of the proximal segment, regardless of which coronary vessel, also emerged. Patients with affected proximal segment in the studied group were 106, and the others 114. Patients with affected proximal segment had an early mortality rate of 40.6% in the studied group, and 25.4% in the others. Confidence level P 0.012; OR 2.0 (Fig. 54 and 55).

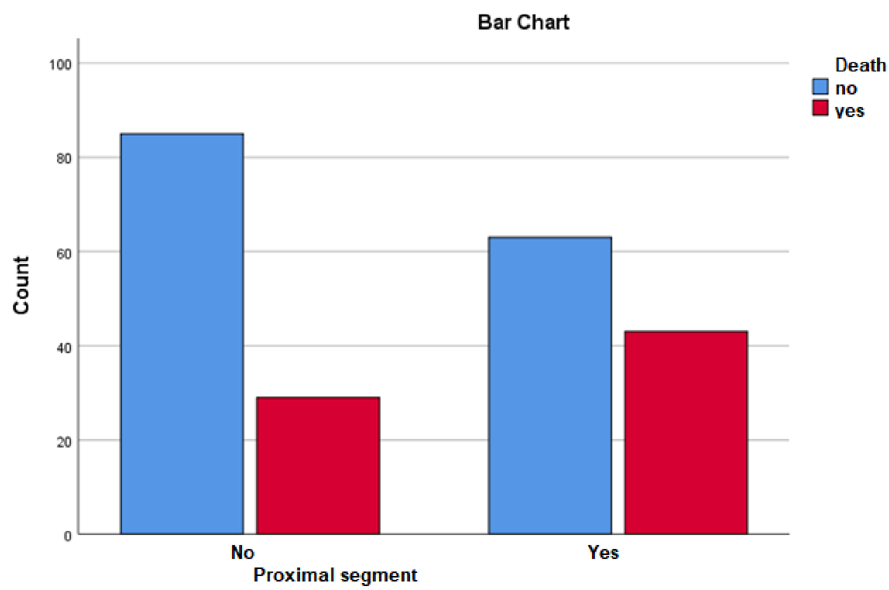


Fig. 55- Mortality in patients with AMI and proximal segment involvement

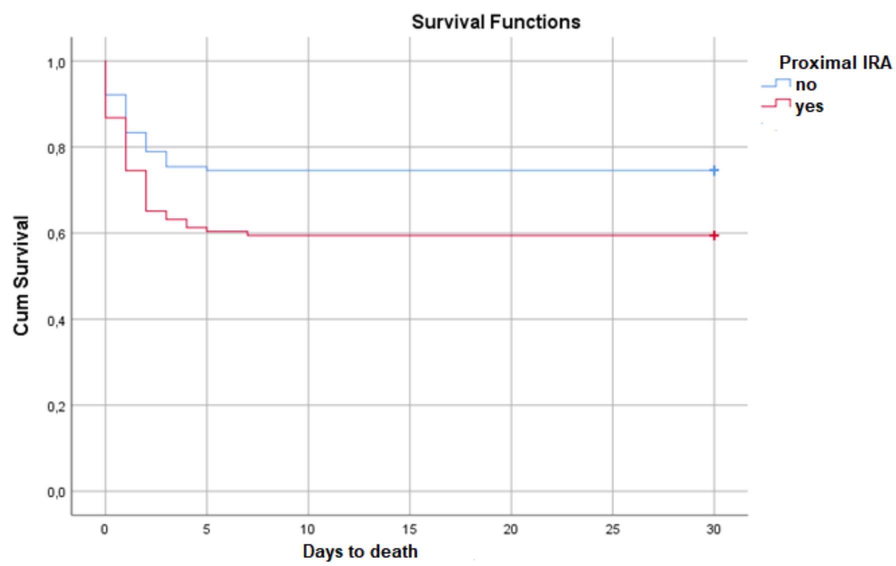


Fig. 56- Early survival in patients with AMI and other chronic occlusion

It has long been known that the more myocardial tissue is involved in acute ischemia, the more severe the clinical presentation and the worse the prognosis for patients with AMI. In acute myocardial infarction treated with thrombolysis, proximal coronary artery occlusion is associated with a worse prognosis, regardless of the infarcted artery. Elsman et al evaluated the prognostic significance of proximal versus distal coronary artery occlusion in patients with AMI treated with pPCI. The left ventricular ejection fraction for proximal LAD lesions was lower than for distal ones. In patients with RCA- or LCx-related infarcts, there was no significant association between lesion location, EF, or mortality. There was no difference in adjusted 3-year mortality between distal LAD and non-LAD-related infarcts (p = 0.145). In conclusion, their analysis showed that even in patients with AMI who were treated with pPCI, infarcts involving the proximal LAD had the worst 3-year survival and the lowest residual EF compared with distal LAD or non-LAD infarcts. Hamaguchi et al showed that proximal RCA occlusion was not associated with MACE after hospital discharge. Our own data (Fig. 58) show that in nearly 83% of deaths from AMI with an affected proximal segment, the culprit artery was the LAD. The total number of deaths from this group is 24, with three deaths from proximal RCA, and two patients with proximal LCx. This suggests that involvement specifically of the proximal segment of the LAD is the poor predictor.

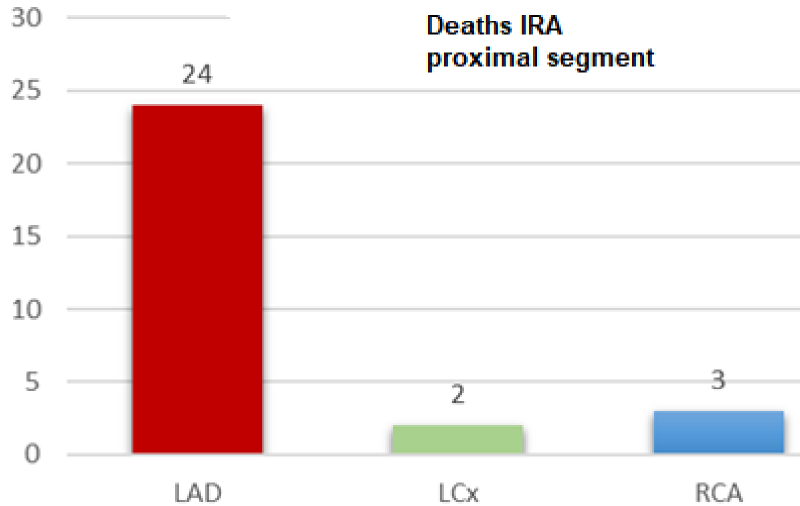


Fig. 58- Number of deaths in the proximal segment

7.14 TIMI flow

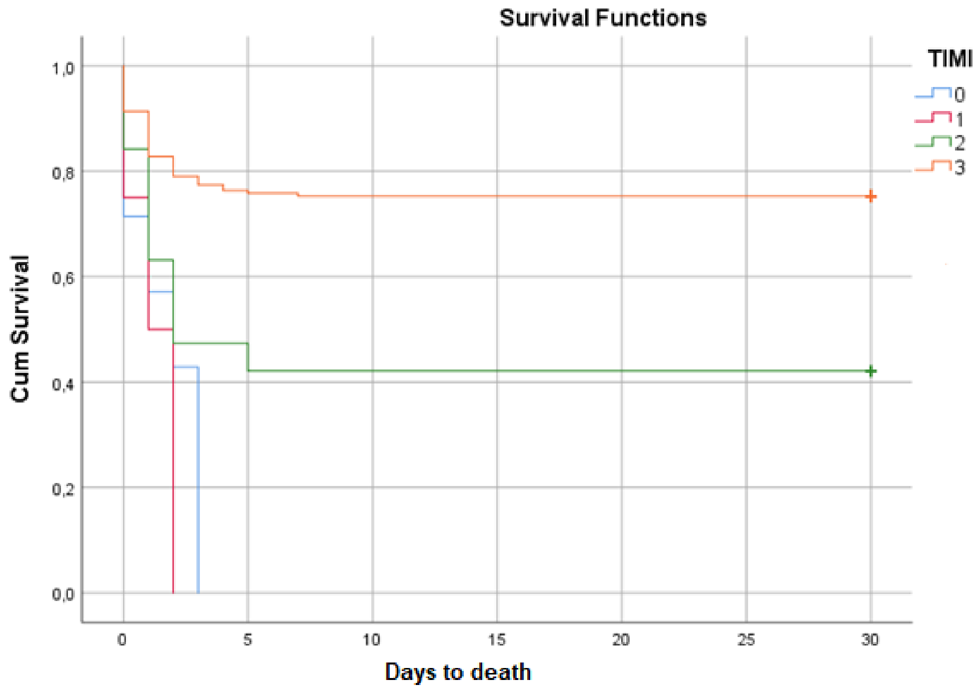


Fig. 59- Early survival in patients with AMI and TIMI 3

Associated with a poor early prognosis is also the delayed blood flow in the periphery of the infarct culprit artery after the end of the percutaneous intervention (Fig. 59). Of the analyzed group, the patients with achieved optimal TIMI 3 blood flow are 186, mortality 24.7% compared to 76.5%. TIMI 3 is associated with a good prognosis $P<0.0001$. Patients with suboptimal final blood flow are 34, respectively TIMI 2 – 19, TIMI 1- 8 and TIMI 0- 7 people. Mortality in the group with suboptimal blood flow for TIMI II is 57.9%, and for TIMI 1 and 0 is 100%. The analysis confirms that the delayed blood flow TIMI<3, especially TIMI 0 and TIMI 1, is a predictor of early death $P<0.0001$; respectively OR 34.01 and 39.14. TIMI 2- P 0.016; OR 3.16.

In a meta-analysis of five studies, researchers from the University of Utah and Duke University suggested that patients with TIMI grade 3 (complete) perfusion would have better outcomes after AMI than those with TIMI grade 2 (partial) perfusion or grades 0 or 1 (occluded arteries). The five prospective studies included over 3,900 patients. Across all five studies, overall mortality was 3.7% for patients with TIMI 3, 7.0% for TIMI 2, and 8.8% for patients with TIMI 1 and TIMI 0. Mortality in patients with TIMI 3 was significantly lower than in patients with grades 0 and 1, grade 2, and all other grades combined. TIMI 2 was associated with only a modest trend toward improved survival compared with TIMI 0 and 1. Also, compared with TIMI 2 patients, TIMI 3 patients had significantly higher ejection fractions, lower rates of heart failure (19% vs. 28%), and fewer reoperations (23% vs. 37%). TIMI 2 and TIMI 1 patients had similar ejection fractions and heart failure.

7.15 Patients with KILLIP class > I in admission

According to the Killip class (Fig. 60 and 61), patients with class I have a good near-term prognosis with a very high level of confidence P<0.0001. The remaining classes are poor predictors (P 0.033 for Killip II and III, OR 1.93), with virtually no difference between Killip II and III. The highest mortality rate is in patients admitted with Killip class IV (cardiogenic shock). The mortality rate in the analyzed group is 91.4%, a very high level of confidence P<0.0001; OR 42.29.

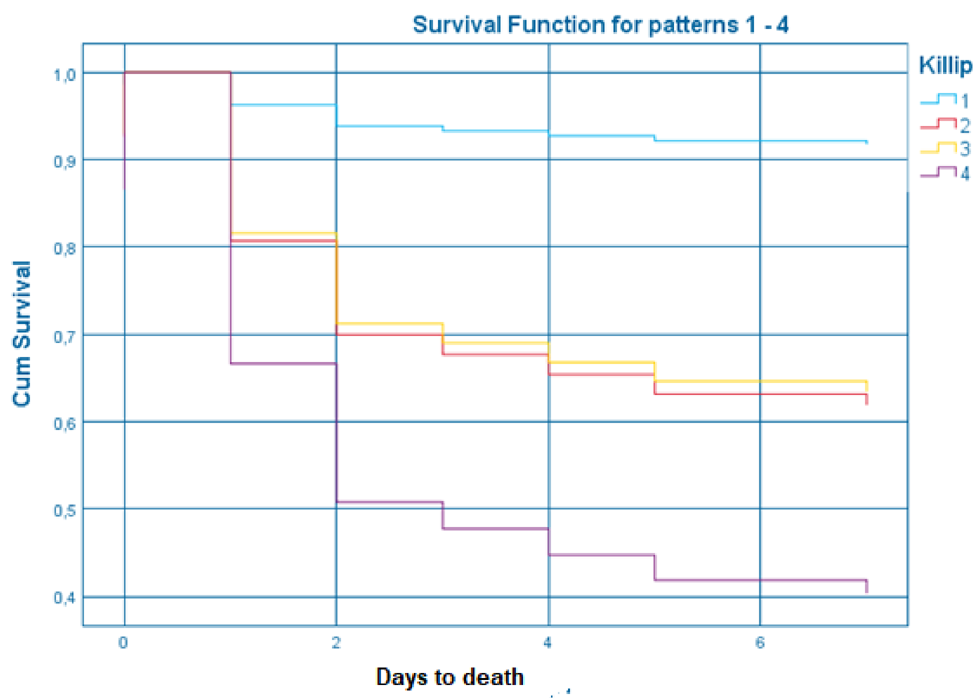


Fig. 60 - Early survival in patients with AMI and in the different KILLIP classes

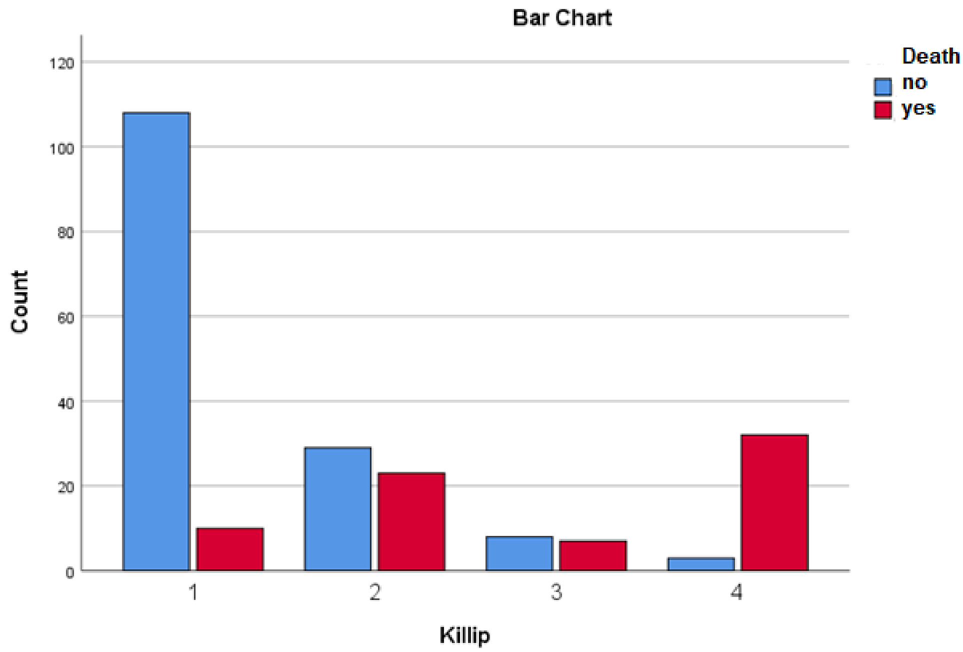


Fig. 61- Mortality in patients with AMI and in the different KilliP classes

Data from the United States and other European countries show a consistent incidence of concomitant AHF (Killip class >I in ~20%), which is similar to data reported from Japan by Fukutomi et al. As predicted by Killip and Kimball more than 60 years ago, the higher the Killip class, the higher the mortality, regardless of the geographical origin of the patient. In addition to its prognostic value in the hospital setting, the Killip class has been shown to predict all-cause mortality in AMI survivors who have survived the acute phase.

7.16 Patients with periprocedural complications - electromechanical dissociation, pulmonary edema, ventricular tachycardia, shock, and mechanical complications

Major peri- and postprocedural complications such as electromechanical dissociation, ventricular tachycardia, development of pulmonary edema and cardiogenic shock, mechanical complications are also associated with poor early prognosis. P 0.006 for ventricular tachycardia, P <0.0001 for the others.

7.16.1 Electromechanical dissociation

EMD is the most common mechanism of fatal cardiac arrest in patients with AMI. It may be due to free wall rupture or may affect patients with severe systolic dysfunction, but not necessarily in shock. In patients without free wall rupture, EMD is due to contractile failure leading to hypoperfusion and to the myocardium unaffected by acute ischemia. Additional aggravating factors may be acidosis and electrolyte imbalance. In cases of pulmonary edema, severe hypoxia may lead to EMD. Our own data (Figs 62 and 63) indicate that all patients in the sample in whom EMD was detected, died ($P < 0.0001$; OR 115.97):

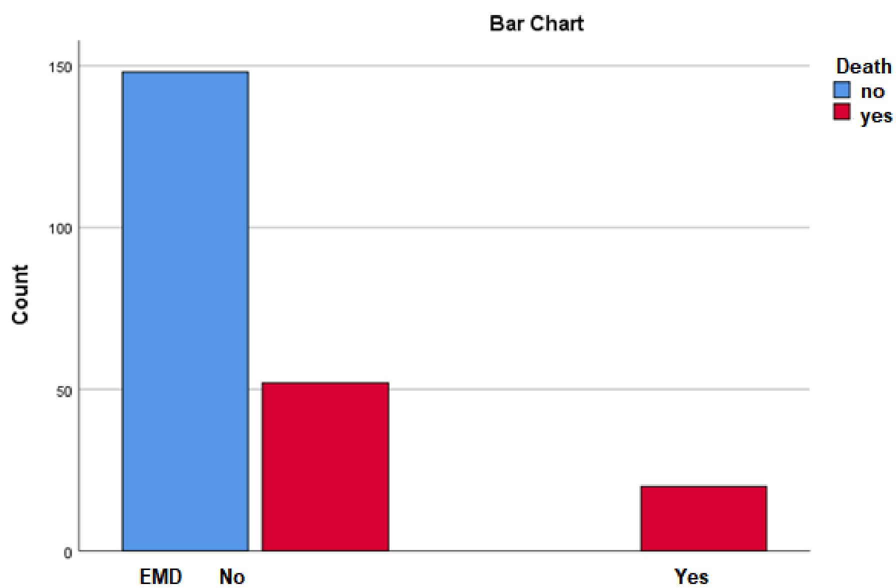


Fig. 62- Mortality in patients with AMI and EMD

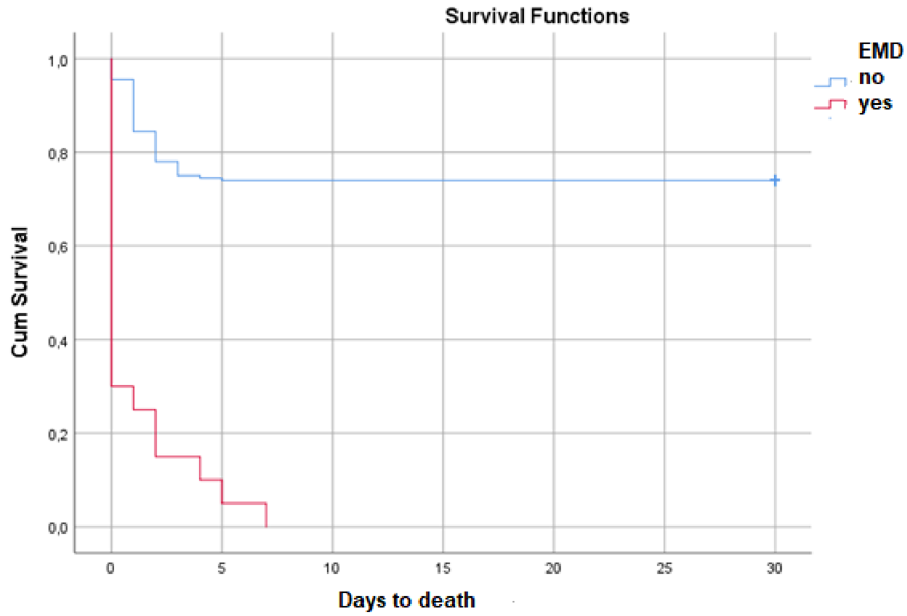


Fig. 63- Early survival in patients with AMI and EMD

7.16.2 Ventricular fibrillation

Patients with ventricular fibrillation in the sample, during or in the postoperative period were 11, died in the hospital 72.7%, the remaining without ventricular fibrillation were 209 with a mortality of 30.6%. This means that the newly appeared ventricular fibrillation is a poor early prognostic sign, P 0.006; OR 6.04 (Fig. 64 & 65).

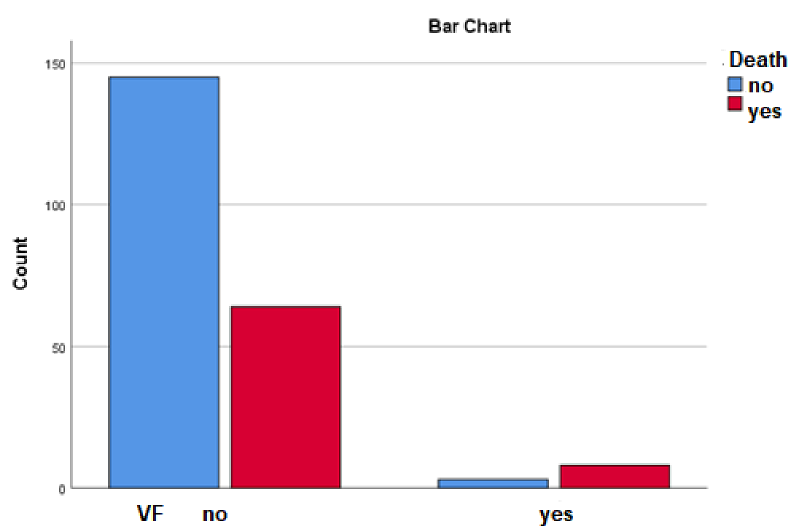


Fig. 64- Mortality in patients with AMI and Ventricular Fibrillation

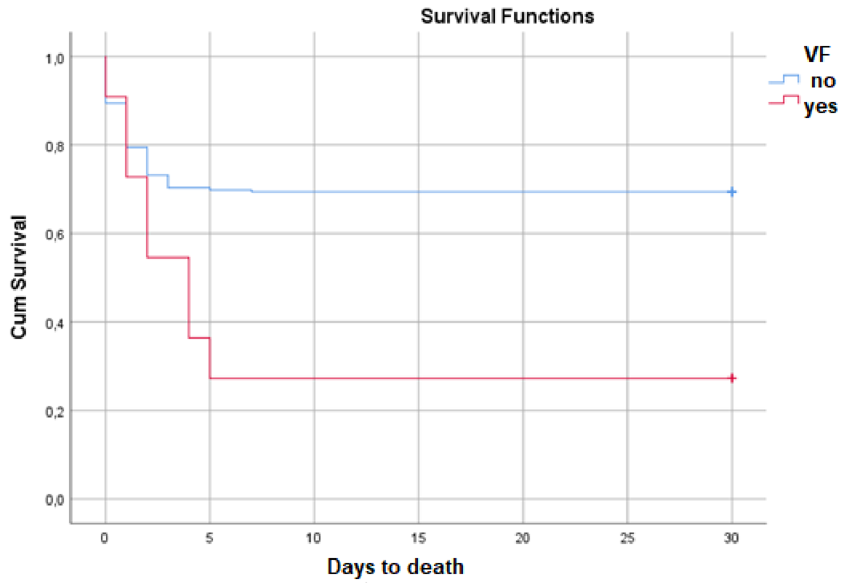


Fig. 65- Early survival in patients with AMI and ventricular fibrillation

In-hospital morbidity and mortality from VF in the setting of AMI have decreased significantly over the past 20 years. Nevertheless, VF remains consistently associated with an approximately 10-fold increased relative risk of in-hospital mortality, with no effect on post-discharge mortality. Beyond the long-term strategy of cardioverter defibrillator implantation, these results highlight the need to identify in-hospital interventions to further reduce mortality in patients with VF.

7.16.3 Pulmonary edema

There were 18 patients with AMI who developed pulmonary edema during or after pPCI, of whom 83.3% died. The remaining 202 patients in the analyzed group had a mortality rate of 28.2%. P<0.0001; OR 12.71 (Figs 66 and 67).

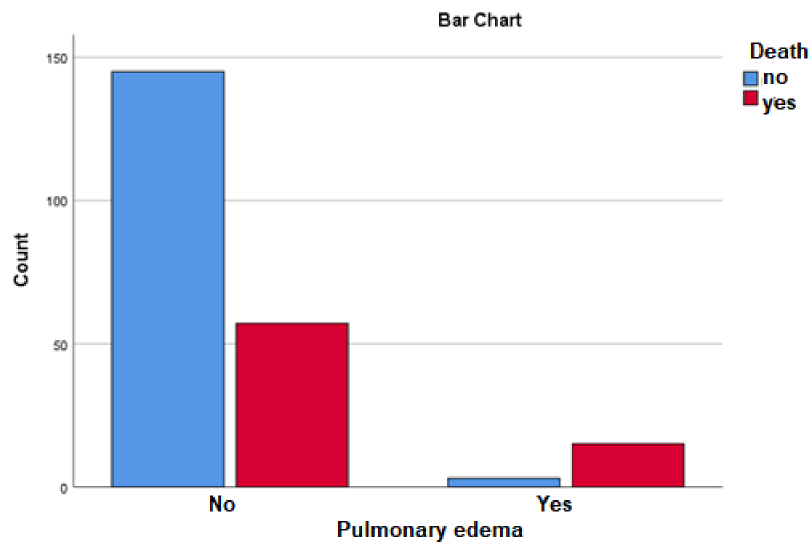


Fig. 66- Mortality in patients with AMI and pulmonary edema

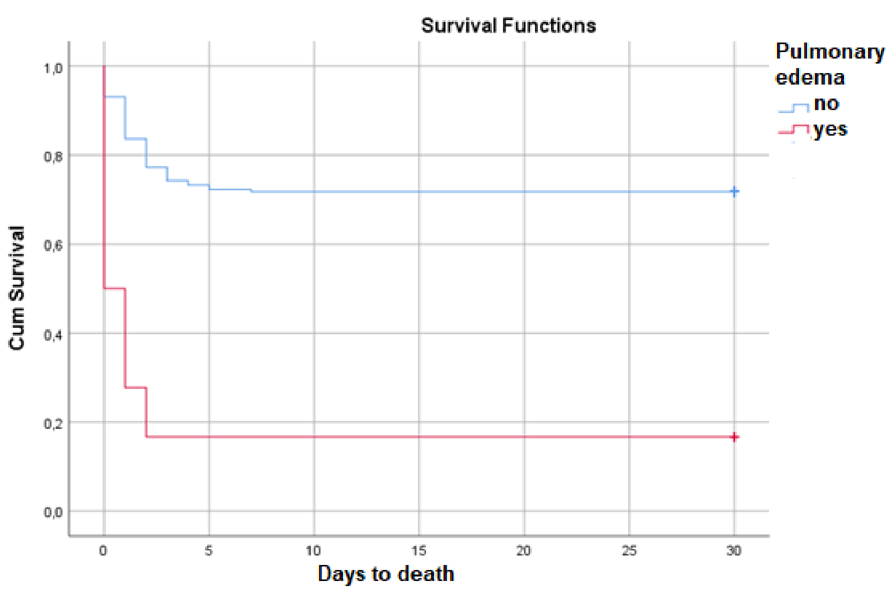


Fig. 67- Early survival in patients with AMI and pulmonary edema

The causes of cardiogenic pulmonary edema are systolic and/or diastolic dysfunction of the left ventricle with an acute increase in LVEDP or acute mitral regurgitation in a non-adapted atrium as a result of dysfunction or rupture of the papillary muscle. In fact, peri- and post-procedural pulmonary edema according to the Killip scale is a transition to a higher (III) class than the Killip class before admission. This confirms that the Killip classification is a good universal tool for assessing the prognosis of patients with AMI.

However, when comparing our own data (Fig. 68) of the mortality of patients with pulmonary edema on admission to the hospital and those who developed edema during or after PCI, it seems that patients with AMI who have pulmonary edema on admission have a relatively better prognosis than those who developed edema during treatment and stay. To prove this, targeted studies should be conducted.

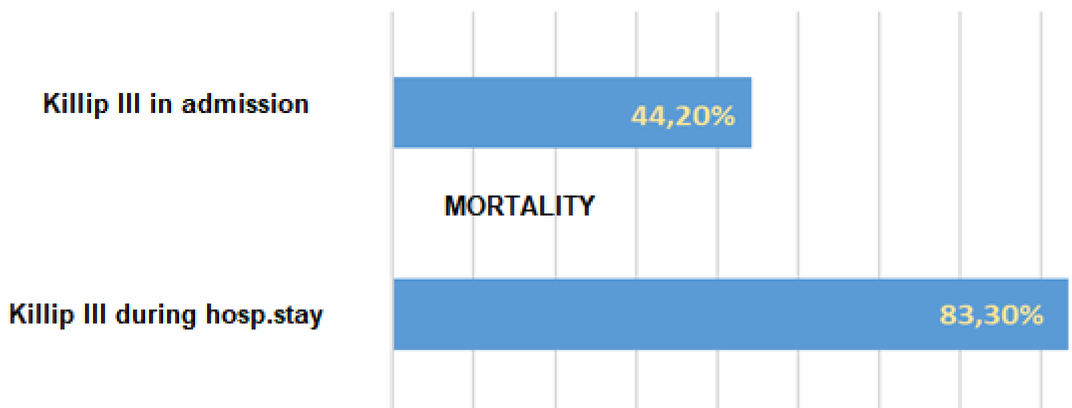


Fig. 68- Mortality in Killip III patients who are in this status at hospitalization or post-procedure

7.16.4 Cardiogenic shock

There were 48 patients with AMI who developed cardiogenic shock during or after pPCI, of whom 97.9% died. The remaining 172 patients in the analyzed group had a mortality rate of 14.5%. The age of the patients with cardiogenic shock did not differ from the overall age of the deceased. Most of the patients who developed cardiogenic shock had involvement of two or more branches, in most cases with concomitant chronic occlusion, and the single-branch patients who developed cardiogenic shock had predominantly involvement of the LAD. P<0.0001; OR 78.19 (Fig. 69 and 70).

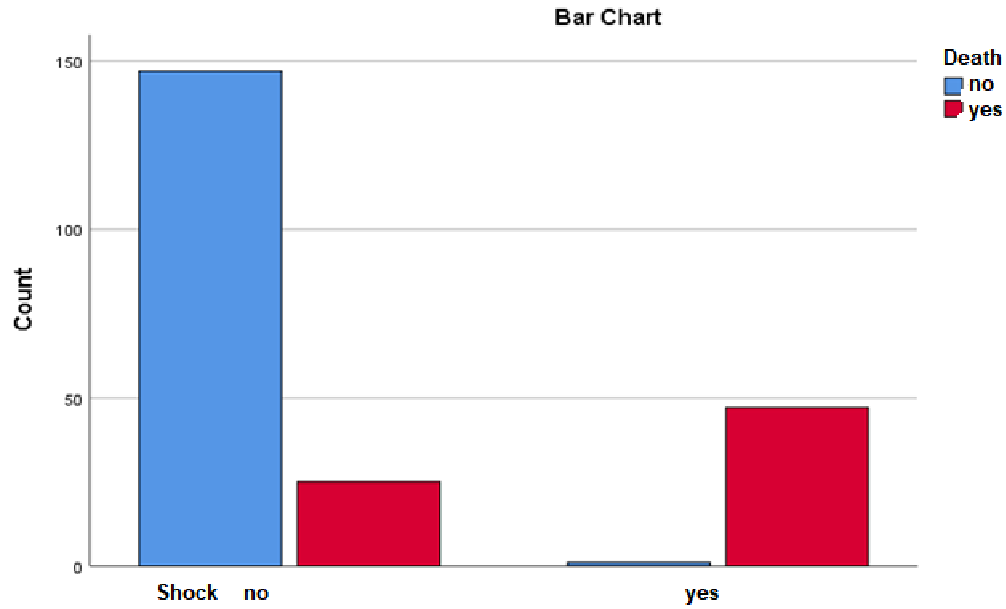


Fig. 69- Mortality in patients with AMI and cardiogenic shock

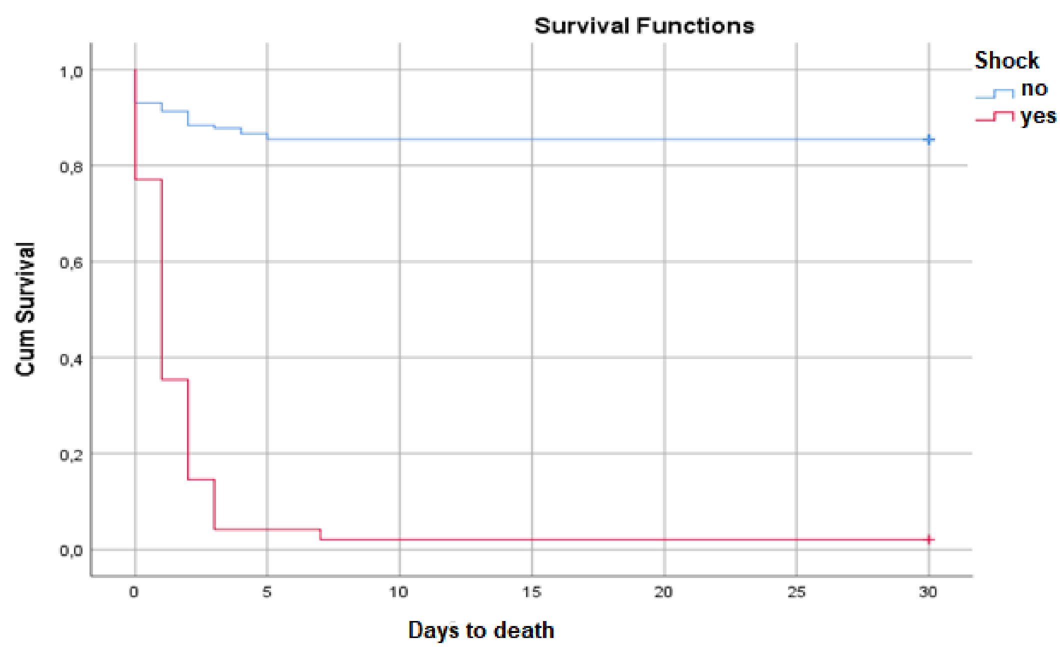


Fig. 70- Early survival in patients with AMI and cardiogenic shock

Similar to pulmonary edema, peri- and postprocedural shock according to the Killip scale is a transition to a higher class - IV, compared to the Killip class at admission. However, unlike patients with Killip III at admission, who have a better prognosis than those with edema that occurred during or after PCI, the prognosis of patients with Killip IV at admission and those who developed shock later is equally poor (Fig. 71).

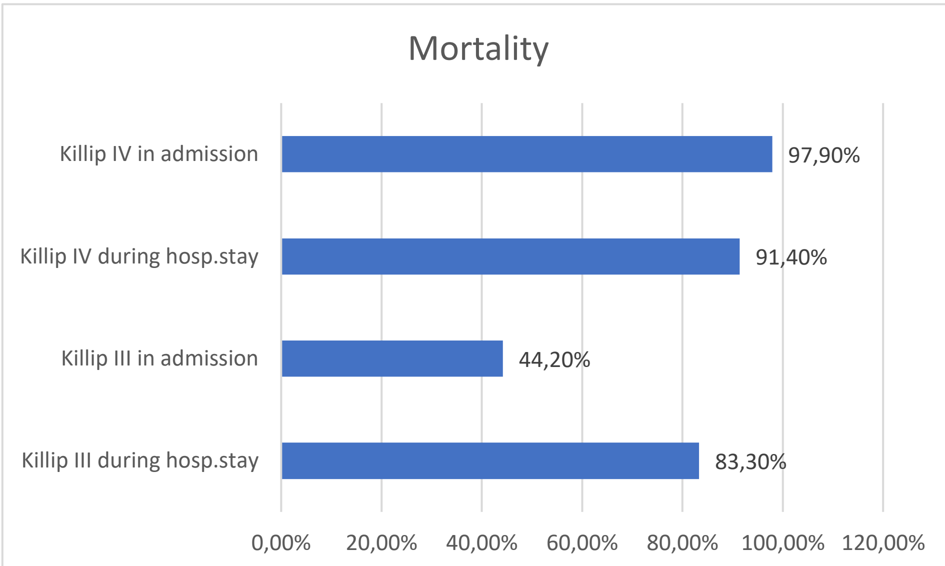


Fig. 71- Mortality in Killip IV patients who are in this status at hospitalization or post-procedure

7.16.5 Mechanical complications

Mechanical complications of acute myocardial infarction include rupture of the left ventricular free wall, rupture of the interventricular septum, rupture of the papillary muscle, pseudoaneurysm, and true aneurysm. All of them are associated with a very poor prognosis, especially if patients are treated conservatively. P <0.0001; OR 55.53. Data from the study group show 100% mortality by the fifth day of hospitalization (Figs 72 and 73).

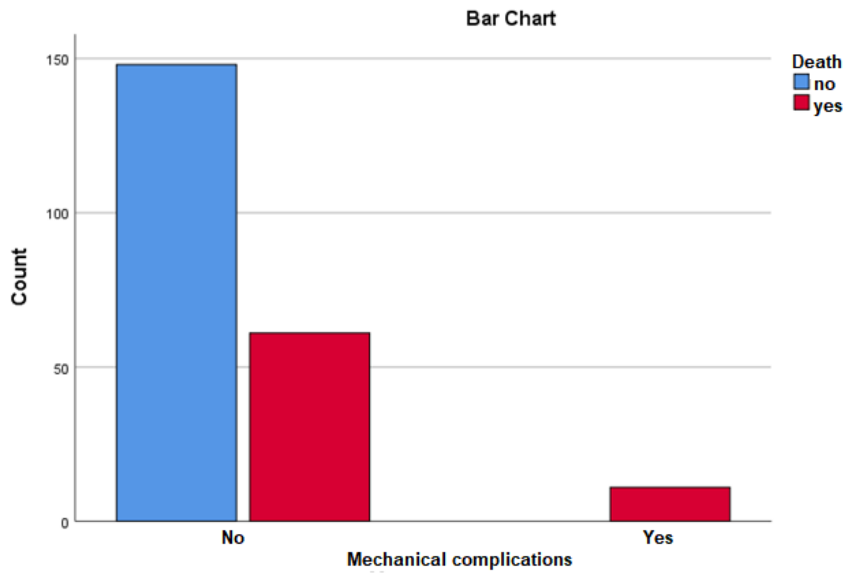


Fig. 72 Mortality in patients with AMI and mechanical complications

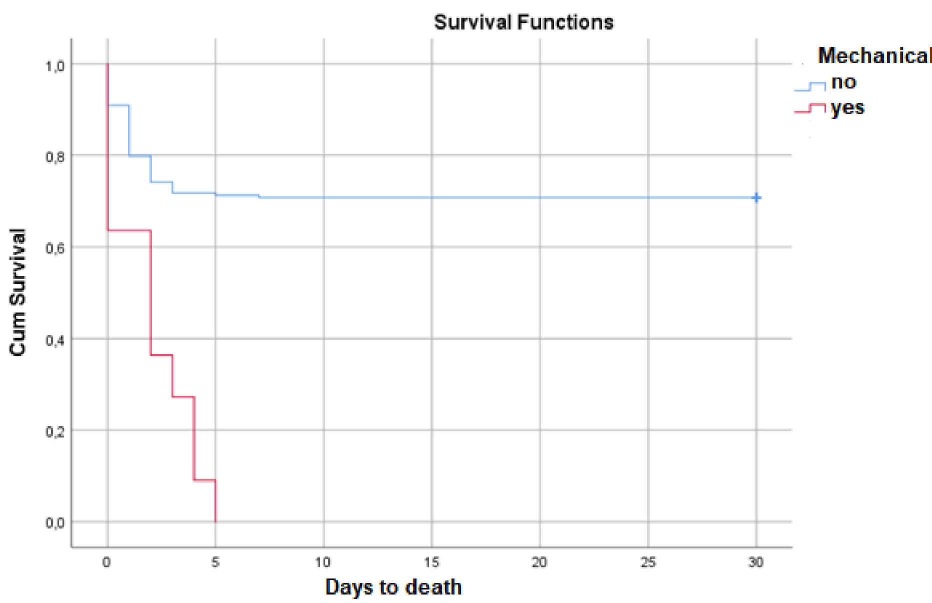


Fig. 73- Early survival in patients with AMI and mechanical complications

Since the introduction of primary percutaneous coronary intervention as the main strategy for reperfusion after AMI, the incidence of mechanical complications has decreased significantly to less than 1%, including left ventricular free wall rupture (0.52%), papillary muscle rupture (0.26%), and ventricular septal rupture (0.17%). However, mortality rates have not decreased in parallel, and mechanical complications remain an important determinant of outcomes after myocardial infarction. Mechanical complications most commonly occur in the first week after myocardial infarction. Cardiogenic shock or acute pulmonary edema are common manifestations. Echocardiography is usually the first test used to identify the type, location, and hemodynamic consequences of the mechanical complication. Hemodynamic stabilization often requires a combination of medical therapy and mechanical circulatory support. In many cases, emergency cardiac surgery is delayed because necrotic tissue is difficult to correct and is waited for to organize and fibrosis to develop. Percutaneous therapies are emerging as an alternative treatment option for patients with prohibitively high surgical risk. Mechanical complications present with acute and dramatic hemodynamic deterioration that requires rapid stabilization. A cardiac team is needed to determine appropriate treatment strategies for patients with mechanical complications after acute myocardial infarction. The development of mechanical complications after AMI is associated with significantly reduced short- and long-term survival (Fig. 74).

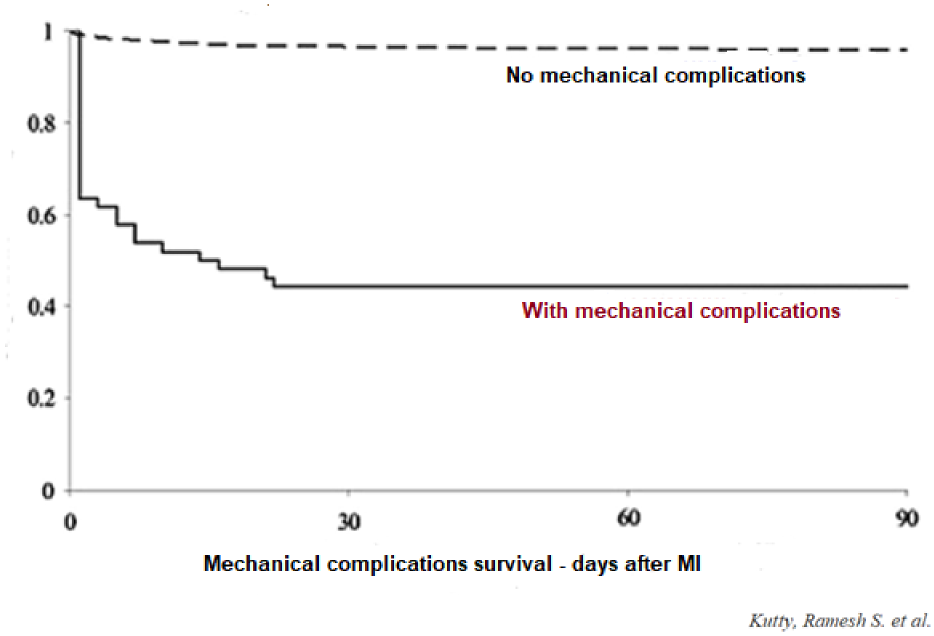


Fig. 74- Early survival in patients with AMI and mechanical complications

Mechanical complications after AMI are surgical emergencies that require rapid diagnosis and intervention for optimal outcomes. Diagnosis in the emergency setting can be difficult in patients with dyspnea and shock. Echocardiography is vital for rapid diagnosis, followed by urgent surgical treatment if possible. Preoperative stabilization with intra-aortic balloon counterpulsation and vasodilators may help reduce afterload on the compromised ventricle after AMI and improve cardiac output in the short term. Despite the high operative mortality, the lack of an effective medical alternative makes surgical repair the mainstay of current management of these patients.

V. Conclusions:

1. The average age of patients with AMI is 65-66 years, in men about 63 years, and in women 70 years. In the studied cohort, the average age of patients with AMI is close to the average age in Western countries and is much higher than that in India and Pakistan.

2. For the studied period, a slight increase in the age of patients with AMI is observed. Men receive AMI about 7 years earlier than women.

3. The incidence of AMI in men is highest in the age group from 55 to 75 years. For the 10-year study period, the incidence is redistributed at the expense of the elderly. In women, a decrease in the incidence is observed in the group 75-84 years.

4. The proportion of women with AMI is approximately 1/3. Bulgarian women receive AMI about 7 years later than their male peers, their age is similar to that of women in developed European countries and the USA, but 6 years earlier than Japanese women.

5. In-hospital mortality in patients treated with pPCI is comparable to mortality in PCI centers in developed countries. The average age of the deceased is about 72 years. For women it is approximately 75 years, and for men 70 years.

6. The average age of the deceased in the hospital is about 6 years higher than the age of all those treated. No trend towards an increase or decrease was found. There is a direct proportional relationship between the number of patients transferred and mortality. Analyses of the influence of gender on in-hospital mortality demonstrate that there is no difference between the sexes in the studied population.

7. In the studied cohort, we found that independent predictors of poor early prognosis are:

• Arterial hypertension

• Renal failure

• AF

• High-degree AV block - Möbitz II or III degree

• Right bundle branch block considered new.

• Simpson EF < 35%

• Patients presenting after the sixth hour from the onset of symptoms

• Involvement of LM and LAD

• Multivessel patients

• Existing chronic occlusion of another coronary artery, except the acute one

• Involvement of the proximal segment of the main coronary artery

• Incompletely restored distal blood flow (< TIMI III)

• Killip class > I on admission.

• Periprocedural complications - electromechanical dissociation, pulmonary edema, ventricular fibrillation (fibrillation), shock, and mechanical complications.

VI. Contributions:

Of a scientific and theoretical nature:

1. For the first time, such a comprehensive analysis of the factors determining short-term survival in a representative sample of the population treated with interventional treatment for ACS in the Pleven region has been made.
2. A demographic characteristic of the study participants has been made, which has undergone change over the last 10 years in Bulgaria.
3. An age assessment has been made for women and men and the peak age in both groups has been established, emphasizing that in both groups there is an increase in age compared to the data in the literature sources.
4. It is proven that women have a lower frequency of heart attacks and suffer them 7 years later than men.
5. The original contribution is due to the assessment of the factors for in-hospital mortality. The assessment emphasizes the need to assess a large number of factors playing a role in

in-hospital mortality. It has been proven that there is no significant difference in in-hospital mortality between the two sexes.

Contributions of a scientific and practical nature:

6. The very detailed analysis outlines factors with their own contribution to in-hospital mortality.

7. The AMI patient at high risk for in-hospital death is described:

A man or woman between 70 and 75 years with AH and high creatinine levels, coming after the 6th hour from the onset of symptoms, admitted with high-degree AV block or PM/t or DBP. Killip class > I on admission and FI < 35%. Coronary angiography reveals multivessel coronary disease, chronic occlusion of another vessel and most often the culprit artery - proximal segment of LAD or LM. Patients with incompletely restored distal blood flow, patients who moved to a higher Killip class during hospitalization and those who developed complications such as ventricular fibrillation/flutter, EMD or mechanical complications are automatically included in the high-risk group.

Publications with own participation, related to the dissertation work:

1. P. Widimsky, F. Roháč , J. Štásek, P. Kala, R. Rokyta, **B. Kuzmanov**, M. Jakl, M. Poloczek, J. Kaňovský, I. Bernat, O. Hlinomaz, J. Bělohlávek, A. Král, V. Mrázek, V. Grigorov, S. Djambazov, R. Petr, J. Knot, D. Bílková, M. Fischerová, K. Vondrák, M. Malý, A. Lorencová. *Primary angioplasty in acute myocardial infarction with right bundle branch block: should new onset right bundle branch block be added to future guidelines as an indication for reperfusion therapy?* European Heart Journal, 2012, 33(1): 86-95; ISSN: 0195-668X; Web of Science, Scopus

2. J. Knot, P. Kala, R. Rokyta, J. Stasek, **B. Kuzmanov**, O. Hlinomaz, J. Bělohlavek, F. P. Rohac, R. Petr, D. Bilkova, S. Djambazov, M. Grigorov, P. Widimsky. *Comparison of outcomes in ST-segment depression and ST-segment elevation myocardial infarction patients treated with emergency PCI: data from a multicentre registry*. Cardiovascular Journal of Africa, 2012, 23(9): 495-500; ISSN: 1995-1892; Web of Science, Scopus

3. **Kuzmanov, B.**, Marchev, S. *Gender and Age of Patients with Acute Myocardial Infarction in North-Western and Central North Bulgaria*. General Medicine, 2020, 22(6): 52-58; ISSN: 1311-1817; Web of Science, Web of Science, Scopus