ISSN: 2457-0400

Impact Factor: 7.675

WORLD JOURNAL OF ADVANCE HEALTHCARE RESEARCH

www.wjahr.com

Volume: 10, Issue: 5

Page N. 247-252

Year: 2026

Original Article

Coden USA: WJAMA3

FREQUENCY OF ARRHYTHMIA AFTER ACUTE MYOCARDIAL INFARCTION

Ghaith Hamid Hameed[1]*, Hashim Mahdi Hashim Ali- Kadhimi

*[1]Imamain Kadhimain Teaching Hospital.

Article Received: 05 April 2026 **Article Revised:** 25 April 2026 **Article Published:** 01 May 2026

***Corresponding Author: Ghaith Hamid Hameed**

Imamain Kadhimain Teaching Hospital.

DOI: https://doi.org/10.5281/zenodo.20019807

How to cite this Article: Ghaith Hamid Hameed[1]*, Hashim Mahdi Hashim Ali- Kadhimi. (2026) Frequency Of Arrhythmia After Acute Myocardial Infarction. World Journal of Advance Healthcare Research, 10(4), 247–252.

ABSTRACT

Background: Acute Myocardial Infarction is one of the most serious and common diagnoses that necessitate admission to the Coronary Care Unit with prompt management, and about 90% of cases may develop different types of Arrhythmia that may require careful attention and immediate intervention. ***Methodology:*** This is a retrospective cross sectional study for 118 patients with Acute Myocardial Infarction admitted to the Coronary Care Unit of Al-Imamain Al-Kadhimain Medical City for eight months, starting from March 2013 to the end of October 2013, through reviewing patients case sheets and ECG records. ***Results:*** 67 patients out of 118 Acute Myocardial Infarction cases (56.7%) had developed one or more type of arrhythmia within their Coronary Care Unit stay, including 41 male (52.6% of all males with Acute Myocardial Infarction) and 26 female (65% of all females with Acute Myocardial Infarction), with age distribution (4.47%) 40-50 years, (32.83%) 50-60 years, (52.2%) 60-70 years and (10.44%) above 70 years, The types of arrhythmias found in the patients included in this study were as the following 36 cases with Premature Ventricular Contraction (30.5% of all patients with Acute Myocardial Infarction), 13 cases of Ventricular Tachycardia (11.01%), 8 cases with Ventricular Fibrillation (6.77%), 2 cases of Supraventricular Tachycardia (1.69%), 7 cases of premature Atrial Contraction (5.93%), 3 cases of Atrial Fibrillation (2.54%), 27 cases of Sinus Tachycardia (22.88%), 16 cases of Sinus Bradycardia (13.55%), 8 cases of first degree A-V Block (6.77%), 2 cases with Complete Heart Block (1.69%), 11 cases of Right Bundle Branch Block (9.32%) and 13 cases with Left Bundle Branch Block (11.01%) ***Conclusion:*** The frequency of arrhythmias and particularly ventricular arrhythmias, brady-arrhythmias following acute myocardial infarction was significantly high in Iraqi patients sample. Increasing with age in both sexes. More common in extensive infarctions, while Diabetes Mellitus, Hypertension, previous ischemic heart disease and smoking are the commonest associated risk factors, thrombolysis is under used and had no great impact.

KEYWORDS: Increasing with age in both sexes.

INTRODUCTION

Acute myocardial infarction (AMI) is one of the most common diagnoses in hospitalized patients in the developed and developing countries, The early (30-day) mortality rate from AMI is 30%, with more than half of these deaths occurring before the stricken individual reaches the hospital.[1] Although the mortality rate after admission for AMI has declined by 30% over the past two decades, approximately 1 of every 25 patients who survives the initial hospitalization dies in the first year after AMI.[1] Mortality is approximately fourfold higher in elderly patients (over age 75) as compared with younger patients.[1,2]

About 90% of patients who have an Acute Myocardial Infarction (AMI) develop some form of cardiac arrhythmia during or immediately after the event. In 25% of patients, such rhythm abnormalities manifest within the first 24 hours. In this group of patients, the risk of serious arrhythmias, such as ventricular fibrillation, is greatest in the first hour and declines thereafter. The incidence of arrhythmia is higher with an ST-elevation myocardial infarction (STEMI) and lower with a non–ST-elevation myocardial infarction (NSTEMI).[3,4] This study aims to know the frequency of arrhythmias in a sample of Iraqi patients that occur following Acute Myocardial Infarction during admission in the Coronary Care Unit.

METHODOLOGY

This is a retrospective cross sectional study for 118 patients admitted to the CCU of Al-Imamain Al-Kadhimain Medical City for eight months, starting from March 2013 to the end of October 2013.

The diagnosis of patients relied on the presence of two out of three criteria, these are:

1. The Clinical Symptoms of MI (severe central chest pain at rest with radiation, with or without nausea, vomiting and sweating).
2. ECG changes (ST elevation, recent LBBB) or NSTEMI.
3. Positive results of Troponin Test.[1,2]

Data were collected by reviewing the patients case sheets, looking for the diagnosis criteria listed above, age, sex, past medical history (Diabetes and Hypertension, Ischemic Heart Disease), smoking History, review of ECG records to specify the site of infarction, the occurrence of any type of arrhythmia (Atrial, Supraventricular, Ventricular, and AV block).

Any patient who developed any type of arrhythmia within the CCU admission days, had been regarded as a case for this study, we have adopted the daily 12 leads ECG records and doctors notes.

All the data collected had been analyzed and demonstrated in numbers, tables and percentage.

RESULTS

Of the 118 patients with AMI included in the study, 78 (66.1%) were males, and 40 (33.8) were females, with age distribution of (1.6%) less than 40 years, (9.3%) 40-50 years, (32.2%) 50 – 60 years, (46.6) 60-70 years, and (10.1%) above 70 years (Table 1).

Table 1: Age and sex distribution of patients with Acute Myocardial Infarction March 2013 – October 2013.

Sex	Below 40 years	40-50 years	50-60 years	60-70 years	Above 70 years	Total
Male	2	9	24	36	7	78
Female	0	2	14	19	5	40
Total	2	11	38	55	12	118

The Medical History of the 118 patients revealed that 73 Patients (61.8%) are diabetic, 89 patients (75.4%) are hypertensive, 42 cases of Ischemic Heart Disease (35.5%) , 60 smoker patients (50.8%) and 21 (17.7%) ex-smoker (Table 2).

Table 2: Risk factors for all cases with AMI.

Risk Factor	Male	Female	Both sexes	Percentage
Diabetes Mellitus	47	26	73	61.8%
Hypertension	61	28	89	75.4%
Smoker patients	53	7	60	50.8%
Previous Ischemic Heart Disease	29	13	42	35.5%
Ex-smoker patients	13	8	21	17.7%

Out of the 118 patients, 67 patients (56.7%) developed one type or more of arrhythmia, including 41 male (52.6% of all males with AMI) and 26 female (65% of all females with AMI), with age distribution (4.47%) 40-50 years, (32.83%) 50-60 years, (52.2%) 60-70 years and (10.44%) above 70 years (Table 3).

Table 3: Age and sex distribution of patients with arrhythmia following Acute Myocardial Infarction March 2013 – October 2013.

Sex	Below 40 years	40-50 years	50-60 years	60-70 years	Above 70 years	Total	Percentage Out of the Total Number of patients
Male	0	3	13	21	4	41	52.6%
Female	0	0	9	14	3	26	65%
Total	0	3	22	35	7	67	56.7%

Reviewing the main risk factors in the past Medical History of the 67 patients who developed arrhythmia following AMI, regarding Diabetes, Hypertension and smoking, the results were as the following for both sexes, 33 (49.2%) diabetic, 59 (88%) hypertensive, 39 cases with previous history of IHD (58.2%), 36 (53.7%) smokers, and 12 (17.9%) ex-smokers (Table 4).

Table 4: Risk factors of 67 cases with AMI who had developed Arrhythmia.

Risk Factor	Male	Female	Both sexes	Percentage
Diabetes Mellitus	18	15	33	49.2%
Hypertension	37	22	59	88%

Previous Ischemic Heart Disease	25	14	39	58.2%
Smoker patients	30	6	36	53.7%
Ex-smoker patients	7	5	12	17.9%

Studying the site of infarction for cases with AMI demonstrated that there are 20 patients with Anterior MI (including 10 patients developed Arrhythmia, 50%), 24 patients with Anteroseptal MI (15 patients of them developed arrhythmia (62.5%), 17 patients with Anterolateral MI (11 of them had arrhythmia 64.7%), 19 patients with Inferior MI (11 of them developed arrhythmia 57.8%), 9 patients with extensive MI (including 8 patients with arrhythmia 88.8%) and 29 patients with NSTEMI (including 12 patients with arrhythmia 41.3%) and no case recorded with posterior MI (Table 5).

Table 5: Distribution of patients according to the site of infarction.

Site of Infarction	Total Number of MI Patients	Patients who developed Arrhythmia	Percentage
Anterior	20	10	50%
Anteroseptal	24	15	62.5%
Anterolateral	17	11	64.7%
Inferior	19	11	57.8%
Posterior	0	0	0
Extensive	9	8	88.8%
NSTEMI (Subendocardial)	29	12	41.3%
Total	118	67	56.7%

The types of arrhythmias found in the patients included in this study were as the following 36 cases with Premature Ventricular Contraction (30.5% of all patients with AML), 13 cases of Ventricular Tachycardia (11.01%), 8 cases with Ventricular Fibrillation (6.77%), 2 cases of Supraventricular Tachycardia (1.69%), 7 cases of premature Atrial Contraction (5.93%), 3 cases of Atrial Fibrillation (2.54%), 27 cases of Sinus Tachycardia (22.88%), 16 cases of Sinus Bradycardia (13.55%), 8 cases of first degree A-V Block (6.77%), 2 cases with Complete Heart Block (1.69%), 11 cases of Right Bundle Branch Block (9.32%) and 13 cases with Left Bundle Branch Block (11.01%) as in Table 6.

Table 6: frequency and percentages of Arrhythmias recorded in patients with AMI.

Type of Arrhythmia	Number	Percentage out of the 67 Patients who developed arrhythmia	Percentage out of the Total Number of Patients with AMI
Premature Ventricular Contraction	36	53.73	30.5%
Ventricular Tachycardia	13	19.4%	11.01%
Ventricular Fibrillation	8	11.94%	6.77%
Supraventricular Tachycardia	2	2.98%	1.69%
Premature Atrial Contraction	7	10.44%	5.93%
Atrial Flutter	0	0	0
Atrial Fibrillation	3	4.47%	2.54%
Sinus Tachycardia	27	40.29%	22.88%
Sinus Bradycardia (not drug induced)	16	23.88%	13.55%
First Degree Block	8	11.94%	6.77%
Second Degree Block	0	0	0
Third Degree Block	2	2.98%	1.69%
RBBB	11	16.41%	9.32%
LBBB	13	19.4%	11.01%

A total number of 39 patients (33%) had received Thrombolytic Therapy, with 23 cases reported of arrhythmia (58.9%) as in Table 7.

Table 7: Patients with AMI who had received Thrombolytic Therapy versus those without Thrombolytic Therapy.

	Total Number	Patient who developed Arrhythmia	Percentage
Patients with AMI who had received Thrombolytic	39	23	58.9%
Patients with AMI Who did not receive Thrombolytic	79	44	55.6%

DISCUSSION

Out of the 118 Iraqi Patients presented with Acute Myocardial Infarction included in this study, males patients were about twice the females (66.1% versus 33.8%) (table 1, figure 1) which is consistent with previous similar studies and literature,[1,2,5,6] A male predominance in the incidence of cardiovascular disease exists up to approximately age 70 years, when the sexes converge to equal incidence.[7] Premenopausal women appear to be somewhat protected from atherosclerosis, possibly owing to the effects of estrogen, Women, however, follow men by 10 years, especially after menopause, the presence of diabetes, as well as tobacco use, eliminates the protection from heart disease associated with female sex.[5,8,9]

The incidence of AMI increases with age for both sexes, (Table 1, Figure 1) with the highest incidence above 60 years, which is mainly explained by the increased risk factors and atherosclerotic changes of coronary arteries with age, Age is the strongest risk factor for the development of CAD.[1,5,2] Most cases of CAD become clinically apparent in patients aged 40 years or older, but elderly persons experience higher mortality and morbidity rates from it. (9)Approximately 82% of people who die of CAD are 65 years or older.[10,3] although we did not have many patients above 70 years, since the patient may die even before reaching hospital or for other reasons rather than AMI, and this is a well known fact in the developing countries like Iraq in comparison to developed countries with higher life expectancy.[10,3,4]

In this study, we have concentrated on three main risk factors (Diabetes Mellitus, Hypertension and smoking) for precipitating AMI (Table 2, Figure 2) and its Arrhythmic complications (table 4, Figure 4), and we have found that 61.8% of the total number of cases were diabetic, since. Diabetes causes endothelial dysfunction, decreases endothelial thromboresistance, and increases platelet activity, thus accelerating atherosclerosis.[1,11,9]

Hypertension was a major risk factor for 75.4% of overall patients (Table 2, Figure 2) and 88% of those who developed arrhythmia following AMI (Table 4, Figure 4), it is well known that Uncontrolled and prolonged elevation of BP can lead to a variety of changes in the myocardial structure, coronary vasculature, and conduction system of the heart.[1,12] These changes in turn can lead to the development of left ventricular hypertrophy (LVH), coronary artery disease (CAD), various conduction system diseases, and systolic and diastolic dysfunction of the myocardium, complications that manifest clinically as angina or myocardial infarction, cardiac arrhythmias (especially atrial fibrillation), and congestive heart failure (CHF).[13]

In the Framingham Heart Study, even high-normal blood pressure (defined as a systolic blood pressure of 130-139 mm Hg, diastolic blood pressure of 85-89 mm Hg, or both) increased the risk of cardiovascular disease 2-fold, as compared with healthy individuals.[12]

Smoking was a significant risk factor for development of AMI and the followed arrhythmia (50.8% of overall patients were smokers and 17.7% were ex-smokers) (Table 2, Figure 2), while in those patients who developed arrhythmias (53.7% smokers and 17.9% ex-smokers), (Table 4, Figure 4) and this is an expected result since the studies reported a strong association between cigarette smoke exposure and heart disease. Persons who consume more than 20 cigarettes daily have a 2- to 3-fold increase in total heart disease, and continued smoking is a major risk factor for recurrent heart attacks.[14,15]

Other risk factors like obesity, metabolic syndrome, lack of physical activity, stress, depression, positive family history and other factors were not included in this study because of limitations in time and resources, and poor medical documentation.[5,8]

Although we did not have full reports about ECG monitoring for our patients within their CCU stay, but the repeated ECG records and Doctors daily notes had shown that 67 patients (56.7% of AMI Patients) (Table 3, Figure 3), had developed some type of arrhythmia, which is less than expected, since similar studies had documented that about 90% of patients with AMI may have arrhythmia, especially during the first few hours after AMI, and we contribute our results because of the methodology used relying on case sheets review rather than continuous ECG monitoring reports.[16,17]

Researches explain the occurring Arrhythmias to the direct effects of ischemia and tissue hypoxia, decreased removal of noxious metabolites, including potassium, calcium, amphophilic lipids, and oxygen-centered free radicals, also impair ventricular performance.[1,6]

The highest incidence of arrhythmia was in patients with extensive AMI (88.8%) followed by patients with Anterolateral AMI (64.7%), Anteroseptal AMI (62.5%), Inferior AMI (57.8%), Anterior AMI (50%), and the least was in the NSTEMI (41.3%) (table 5), and all these results are consistent with other similar studies which states that arrhythmia incidence increase with the increase of infarction size and especially in patients with history of previous ischemic heart disease, because of hypoxia and involvement of conductive cardiac tissues and the reasons mentioned above.[16,18]

The most common recorded arrhythmia in our patients (Table 6) was the Premature ventricular Contractions (30.5%), which may precedes more serious ventricular arrhythmias like Ventricular Tachycardia (11.01%) or Ventricular Fibrillation (6.77%), the latter two complications are more serious and require immediate treatment while the former PVCs did not require intervention in most of cases, this result is consistent

with similar studies, which had emphasized on the ventricular tachyarrhythmias that may occur in up to 10% of cases especially in the first few hours, the relatively low incidence in our patients may be related to the timing of admission to the CCU, since those who develop serious ventricular arrhythmias may die even before their admission.[17,19,20,18]

Sinus Tachycardia recorded in 22.8% of cases, possibly due to pain, anxiety, Hypoxia, Anemia, Heart failure and less commonly to Hypovolemia, Pericarditis and Pulmonary embolism, and it was not associated with serious complications.[1] (Table 6, Figure 6)

While Sinus Bradycardia occurred in 13.55% of cases and mostly in patients with Inferior AMI, possibly due to involvement of the AV Node and right ventricular infarction, this percent in our study is less than what had been mentioned in previous studies (40%), may be because of the late diagnosis and admission of our patients and low percent of inferior AMI (16.1%).[21]

Premature Atrial Contractions were detected in 5.93% of cases (Table 6), either alone or preceding other supraventricular arrhythmias like atrail fibrillation, this percent is lower than similar studies, and this may be explained because of the methodology of our study did not rely on continuous monitoring reports, The usual cause of these extra impulses is atrial distention due to increased left ventricular (LV) diastolic pressure or inflammation associated with pericarditis.[17,2]

We did not record any case of atrial flutter and there was only 2.54% of patient who developed Atrial Fibrillation, and this is much lower than other studies (10-15%) for Atrial Fibrillation and 5% for Atrial Flutter.

AV Block incidence was low in our study (6.77% for first degree block, 0% for second degree block and 1.6% for complete heart block), (table 6, figure 6) may be due to lack of documentation and the low number of inferior AMI cases, compared to 15% for first degree block, 10% second degree block and 5-15% for complete heart block in other studies.[3,21,18]

The RBBB (9.32%) in our patients may not reflect the real percentage of incidence since most of patients do not bring their old ECG records, so we were not sure about this new change, and our results may include many patients who have RBBB before infarction, however, the occurrence of RBBB suggest wide infracted areas.[1]

LBBB appeared in 11.01% of patients, which is close to the results of similar studies (15%), and also it had been reported in patients with big infracted areas or those with previous history of ischemic heart disease.

Out of the total number of patients with AMI, 33% received thrombolytic therapy, with 58.9% developed some form of arrhythmia (mostly ventricular premature beats and other non serious arrhythmias); (Table 7, Figure 7), and this was expected and consistent with similar studies, which had also emphasized that the occurrence of arrhythmias is neither sensitive nor specific to the success of reperfusion therapy.[22,23]

CONCLUSION

The frequency of arrhythmias and particularly ventricular arrhythmias, brady-arrhythmias following acute myocardial infarction was significantly high in Iraqi patients. Increasing with age in both sexes. More common in extensive infarctions, while Diabetes Mellitus, Hypertension, previous ischemic heart disease and smoking are the commonest associated risk factors, thrombolysis is under used and had no great impact.

REFERENCES

1. Wiener C, Fauci AS, Braunwald E, Kasper DL, Hauser S, Longo D, et al. Harrisons principles of internal medicine self-assessment and board review 18th Edition. McGraw Hill Professional, 2012.
2. EM A. ST-elevation myocardial infarction: pathology, pathophysiology, and clinical features. Braunwald's Hear Dis., 2005; 1141–66.
3. (CDC C for DC and P. State-specific mortality from sudden cardiac death--United States, 1999. MMWR Morb Mortal Wkly Rep., 2002; 51(6): 123–6.
4. Goldberg RJ, Yarzebski J, Lessard D, Gore JM. A two-decades (1975 to 1995) long experience in the incidence, in-hospital and long-term case-fatality rates of acute myocardial infarction: a community-wide perspective. J Am Coll Cardiol., 1999; 33(6): 1533–9.
5. Pencina MJ, D'Agostino Sr RB, Larson MG, Massaro JM, Vasan RS. Predicting the 30-year risk of cardiovascular disease: the Framingham Heart Study. Circulation, 2009; 119(24): 3078–84.
6. Deo R, Vittinghoff E, Lin F, Tseng ZH, Hulley SB, Shlipak MG. Risk factor and prediction modeling for sudden cardiac death in women with coronary artery disease. Arch Intern Med., 2011; 171(19): 1703–9.
7. Bennett G, O'Donnell CJ, Coady S, Robinson J, D'Agostino Sr FRB, Schwartz FJS, et al. 2013 ACC/AHA guideline on the assessment of cardiovascular risk, 2013.
8. Greenland P, Alpert JS, Beller GA, Benjamin EJ, Budoff MJ, Fayad ZA, et al. 2010 ACCF/AHA guideline for assessment of cardiovascular risk in asymptomatic adults: a report of the American College of Cardiology Foundation/American Heart Association task force on practice guidelines developed in collaboration with the American Society of Echocardiography, American Society of Nuclear Cardiology, Society of Atherosclerosis Imaging and Prevention, Society for Cardiovascular Angiography and Interventions, Society of Cardiovascular Computed Tomography, and Society for Cardiovascular Magnetic Resonance. J Am Coll Cardiol., 2010; 56(25): e50–103.

9. Howard B V, Rodriguez BL, Bennett PH, Harris MI, Hamman R, Kuller LH, et al. Prevention conference VI: diabetes and cardiovascular disease: writing group I: epidemiology. Circulation, 2002; 105(18): e132–7.
10. Hjalmarson Å, Herlitz J, Holmberg S, Ryden L, Swedberg K, Vedin A, et al. The Göteborg metoprolol trial. Effects on mortality and morbidity in acute myocardial infarction. Circulation, 1983; 67(6): I26–31.
11. Paynter NP, Mazer NA, Pradhan AD, Gaziano JM, Ridker PM, Cook NR. Cardiovascular risk prediction in diabetic men and women using hemoglobin A1c vs diabetes as a high-risk equivalent. Arch Intern Med., 2011; 171(19): 1712–8.
12. Allen N, Berry JD, Ning H, Van Horn L, Dyer A, Lloyd-Jones DM. Impact of blood pressure and blood pressure change during middle age on the remaining lifetime risk for cardiovascular disease: the cardiovascular lifetime risk pooling project. Circulation, 2012; 125(1): 37–44.
13. Wu AH, Parsons L, Every NR, Bates ER. Hospital outcomes in patients presenting with congestive heart failure complicating acute myocardial infarction: a report from the Second National Registry of Myocardial Infarction (NRMI-2). J Am Coll Cardiol., 2002; 40(8): 1389–94.
14. Rea TD, Heckbert SR, Kaplan RC, Smith NL, Lemaitre RN, Psaty BM. Smoking status and risk for recurrent coronary events after myocardial infarction. Ann Intern Med., 2002; 137(6): 494–500.
15. Huxley RR, Woodward M. Cigarette smoking as a risk factor for coronary heart disease in women compared with men: a systematic review and meta-analysis of prospective cohort studies. Lancet., 2011; 378(9799): 1297–305.
16. Singh S, Loke YK, Spangler JG, Furberg CD. Risk of serious adverse cardiovascular events associated with varenicline: a systematic review and meta-analysis. Cmaj., 2011; 183(12): 1359–66.
17. Bloch Thomsen PE, Jons C, Raatikainen MJP, Moerch Joergensen R, Hartikainen J, Virtanen V, et al. Long-term recording of cardiac arrhythmias with an implantable cardiac monitor in patients with reduced ejection fraction after acute myocardial infarction: the Cardiac Arrhythmias and Risk Stratification After Acute Myocardial Infarction (CARISMA) study. Circulation, 2010; 122(13): 1258–64.
18. Mansour Eltahir F, Osama Saleh M, Samira Mohamed M, Mohamed Osman El Hassan G, Mohammed Saeed A. Incidence of ventricular arrhythmias, brady-arrhythmias and sudden cardiac death in Sudanese patients with acute myocardial infarction, 2008.
19. Thompson CA, Yarzebski J, Goldberg RJ, Lessard D, Gore JM, Dalen JE. Changes over time in the incidence and case-fatality rates of primary ventricular fibrillation complicating acute myocardial infarction: perspectives from the Worcester Heart Attack Study. Am Heart J., 2000; 139(6): 1014–21.
20. Sala MF, Barcena JP, Rota JIA, Roca JV, Lopez AC, Puigdevall JMR, et al. Sustained ventricular tachycardia as a marker of inadequate myocardial perfusion during the acute phase of myocardial infarction. Clin Cardiol An Int Index Peer-Reviewed J Adv Treat Cardiovasc Dis., 2002; 25(7): 328–34.
21. Goldberg RJ, Zevallos JC, Yarzebski J, Alpert JS, Gore JM, Chen Z, et al. Prognosis of acute myocardial infarction complicated by complete heart block (the Worcester Heart Attack Study). Am J Cardiol., 1992; 69(14): 1135–41.
22. Kleiman NS, Terrin M, Mueller H, Chaitman B, Roberts R, Knatterud GL, et al. Mechanisms of early death despite thrombolytic therapy: experience from the Thrombolysis in Myocardial Infarction Phase II (TIMI II) study. J Am Coll Cardiol., 1992; 19(6): 1129–35.
23. Osmancik PP, Stros P, Herman D. In-hospital arrhythmias in patients with acute myocardial infarction—the relation to the reperfusion strategy and their prognostic impact. Acute Card Care, 2008; 10(1): 15–25.