

World Journal of *Experimental Medicine*

Quarterly Volume 14 Number 1 March 20, 2024



Contents

Quarterly Volume 14 Number 1 March 20, 2024

EDITORIAL

Casu C, Orrù G. Potential of photodynamic therapy in the management of infectious oral diseases. *World J Exp Med* 2024; 14(1): 84284 [DOI: [10.5493/wjem.v14.i1.84284](https://doi.org/10.5493/wjem.v14.i1.84284)]

FIELD OF VISION

Kelleni MT. COVID-19 mortality paradox (United States vs Africa): Mass vaccination vs early treatment. *World J Exp Med* 2024; 14(1): 88674 [DOI: [10.5493/wjem.v14.i1.88674](https://doi.org/10.5493/wjem.v14.i1.88674)]

OPINION REVIEW

Milionis C, Ilias I, Lekkou A, Venaki E, Koukkou E. Future clinical prospects of C-peptide testing in the early diagnosis of gestational diabetes. *World J Exp Med* 2024; 14(1): 89320 [DOI: [10.5493/wjem.v14.i1.89320](https://doi.org/10.5493/wjem.v14.i1.89320)]

MINIREVIEWS

Cotterell A, Griffin M, Downer MA, Parker JB, Wan D, Longaker MT. Understanding wound healing in obesity. *World J Exp Med* 2024; 14(1): 86898 [DOI: [10.5493/wjem.v14.i1.86898](https://doi.org/10.5493/wjem.v14.i1.86898)]

Sridhar GR, Gumpeny L. Emerging significance of butyrylcholinesterase. *World J Exp Med* 2024; 14(1): 87202 [DOI: [10.5493/wjem.v14.i1.87202](https://doi.org/10.5493/wjem.v14.i1.87202)]

ORIGINAL ARTICLE

Retrospective Cohort Study

Senchukova MA, Kalinin EA, Volchenko NN. Predictors of disease recurrence after radical resection and adjuvant chemotherapy in patients with stage IIb-IIIa squamous cell lung cancer: A retrospective analysis. *World J Exp Med* 2024; 14(1): 89319 [DOI: [10.5493/wjem.v14.i1.89319](https://doi.org/10.5493/wjem.v14.i1.89319)]

Clinical Trials Study

Saeed EN, Faeq AK. Impact of primary percutaneous coronary intervention on ST-segment elevation myocardial infarction patients: A comprehensive analysis. *World J Exp Med* 2024; 14(1): 88541 [DOI: [10.5493/wjem.v14.i1.88541](https://doi.org/10.5493/wjem.v14.i1.88541)]

Observational Study

Stasi C, Pacifici M, Milli C, Profili F, Silvestri C, Voller F. Prevalence and features of SARS-CoV-2 infection in prisons in Tuscany. *World J Exp Med* 2024; 14(1): 87551 [DOI: [10.5493/wjem.v14.i1.87551](https://doi.org/10.5493/wjem.v14.i1.87551)]

Clinical and Translational Research

Garg G, Bharadwaj A, Chaudhary S, Gupta V. Chemical profiling of bioactive compounds in the methanolic extract of wild leaf and callus of *Vitex negundo* using gas chromatography-mass spectrometry. *World J Exp Med* 2024; 14(1): 88064 [DOI: [10.5493/wjem.v14.i1.88064](https://doi.org/10.5493/wjem.v14.i1.88064)]

Basic Study

Lesser T, Wolfram F, Braun C, Gottschall R. Effects of unilateral superimposed high-frequency jet ventilation on porcine hemodynamics and gas exchange during one-lung flooding. *World J Exp Med* 2024; 14(1): 87256 [DOI: [10.5493/wjem.v14.i1.87256](https://doi.org/10.5493/wjem.v14.i1.87256)]

Medanki S, Dommati N, Bodapati HH, Katru VNSK, Moses G, Komaraju A, Donepudi NS, Yalamanchili D, Sateesh J, Turimerla P. Artificial intelligence powered glucose monitoring and controlling system: Pumping module. *World J Exp Med* 2024; 14(1): 87916 [DOI: [10.5493/wjem.v14.i1.87916](https://doi.org/10.5493/wjem.v14.i1.87916)]

Mohd Nasir S, Ismail AF, Tuan Ismail TS, Wan Abdul Rahman WF, Wan Ahmad WAN, Tengku Din TADAA, Sirajudeen KNS. Hepatic and renal effects of oral stingless bee honey in a streptozotocin-induced diabetic rat model. *World J Exp Med* 2024; 14(1): 91271 [DOI: [10.5493/wjem.v14.i1.91271](https://doi.org/10.5493/wjem.v14.i1.91271)]

ABOUT COVER

Peer Reviewer of *World Journal of Experimental Medicine*, Ramya Badrachalam, MBBS, MD, Assistant Professor, Department of Biochemistry, Sri Manakula Vinayagar Medical College & Hospital, Puducherry 605107, India. drramya830@gmail.com

AIMS AND SCOPE

The primary aim of the *World Journal of Experimental Medicine* (WJEM, *World J Exp Med*) is to provide scholars and readers from various fields of experimental medicine with a platform to publish high-quality basic and clinical research articles and communicate their research findings online.

WJEM mainly publishes articles reporting research results and findings obtained in the field of experimental medicine and covering a wide range of topics including clinical laboratory medicine (applied and basic research in hematology, body fluid examination, cytomorphology, genetic diagnosis of hematological disorders, thrombosis and hemostasis, and blood typing and transfusion), biochemical examination (applied and basic research in laboratory automation and information system, biochemical methodology, and biochemical diagnostics), etc.

INDEXING/ABSTRACTING

The WJEM is now abstracted and indexed in PubMed, PubMed Central, Scopus, Reference Citation Analysis, China Science and Technology Journal Database, and Superstar Journals Database. The WJEM's CiteScore for 2022 is 1.0 and Scopus CiteScore rank 2022: Internal medicine is 106/140.

RESPONSIBLE EDITORS FOR THIS ISSUE

Production Editor: *Ying-Yi Yuan*, Production Department Director: *Xu Guo*, Editorial Office Director: *Ji-Hong Lin*.

NAME OF JOURNAL

World Journal of Experimental Medicine

ISSN

ISSN 2220-315x (online)

LAUNCH DATE

December 20, 2011

FREQUENCY

Quarterly

EDITORS-IN-CHIEF

Leonardo Roever, Jian Wu

EXECUTIVE ASSOCIATE EDITORS-IN-CHIEF**EDITORIAL BOARD MEMBERS**

<https://www.wjgnet.com/2220-315x/editorialboard.htm>

PUBLICATION DATE

March 20, 2024

COPYRIGHT

© 2024 Baishideng Publishing Group Inc

PUBLISHING PARTNER

Department of Clinical Laboratory, The Affiliated Suzhou Hospital of Nanjing Medical University, Suzhou Municipal Hospital

INSTRUCTIONS TO AUTHORS

<https://www.wjgnet.com/bpg/gerinfo/204>

GUIDELINES FOR ETHICS DOCUMENTS

<https://www.wjgnet.com/bpg/GerInfo/287>

GUIDELINES FOR NON-NATIVE SPEAKERS OF ENGLISH

<https://www.wjgnet.com/bpg/gerinfo/240>

PUBLICATION ETHICS

<https://www.wjgnet.com/bpg/GerInfo/288>

PUBLICATION MISCONDUCT

<https://www.wjgnet.com/bpg/gerinfo/208>

Fang Gong, Ya-Jie Wang

ARTICLE PROCESSING CHARGE

<https://www.wjgnet.com/bpg/gerinfo/242>

STEPS FOR SUBMITTING MANUSCRIPTS

<https://www.wjgnet.com/bpg/GerInfo/239>

ONLINE SUBMISSION

<https://www.f6publishing.com>

PUBLISHING PARTNER'S OFFICIAL WEBSITE

<http://www.smh.cc/home2020/page/index/index.html>



Clinical Trials Study

Impact of primary percutaneous coronary intervention on ST-segment elevation myocardial infarction patients: A comprehensive analysis

Eza Nawzad Saeed, Abdulsatar Kamil Faeq

Specialty type: Health care sciences and services

Provenance and peer review: Unsolicited article; Externally peer reviewed.

Peer-review model: Single blind

Peer-review report's scientific quality classification

Grade A (Excellent): 0
Grade B (Very good): B
Grade C (Good): 0
Grade D (Fair): 0
Grade E (Poor): 0

P-Reviewer: He L, China

Received: September 27, 2023

Peer-review started: September 27, 2023

First decision: January 2, 2024

Revised: January 8, 2024

Accepted: February 2, 2024

Article in press: February 2, 2024

Published online: March 20, 2024



Eza Nawzad Saeed, Abdulsatar Kamil Faeq, Department of Medicine, Hawler Medical University, Erbil 44001, Kurdistan, Iraq

Corresponding author: Eza Nawzad Saeed, MBChB, Researcher, Department of Medicine, Hawler Medical University, Erbil - IRAQ 44001, Erbil 44001, Kurdistan, Iraq.
demolali542@gmail.com

Abstract

BACKGROUND

Myocardial infarction, particularly ST-segment elevation myocardial infarction (STEMI), is a key global mortality cause. Our study investigated predictors of mortality in 96 STEMI patients undergoing primary percutaneous coronary intervention at Erbil Cardiac Center. Multiple factors were identified influencing in-hospital mortality. Significantly, time from symptom onset to hospital arrival emerged as a decisive factor. Consequently, our study hypothesis is: "Reducing time from symptom onset to hospital arrival significantly improves STEMI prognosis."

AIM

To determine the key factors influencing mortality rates in STEMI patients.

METHODS

We studied 96 consecutive STEMI patients undergoing primary percutaneous coronary intervention (PPCI) at the Erbil Cardiac Center. Their clinical histories were compiled, and coronary evaluations were performed *via* angiography on admission. Data included comorbid conditions, onset of cardiogenic shock, complications during PPCI, and more. Post-discharge, one-month follow-up assessments were completed. Statistical significance was set at $P < 0.05$.

RESULTS

Our results unearthed several significant findings. The in-hospital and 30-d mortality rates among the 96 STEMI patients were 11.2% and 2.3% respectively. On the investigation of independent predictors of in-hospital mortality, we identified atypical presentation, onset of cardiogenic shock, presence of chronic kidney disease, Thrombolysis In Myocardial Infarction grades 0/1/2, triple vessel disease, ventricular tachycardia/ventricular fibrillation, coronary dissection, and

the no-reflow phenomenon. Specifically, the recorded average time from symptom onset to hospital arrival amongst patients who did not survive was significantly longer (6.92 ± 3.86 h) compared to those who survived (3.61 ± 1.67 h), $P < 0.001$. These findings underscore the critical role of timely intervention in improving the survival outcomes of STEMI patients.

CONCLUSION

Our results affirm that early hospital arrival after symptom onset significantly improves survival rates in STEMI patients, highlighting the critical need for prompt intervention.

Key Words: Percutaneous coronary intervention; Impact analysis, Segment elevation; Erbil

©The Author(s) 2024. Published by Baishideng Publishing Group Inc. All rights reserved.

Core Tip: Myocardial infarction, particularly the ST-segment elevation myocardial infarction (STEMI) subtype, is a leading global cause of mortality. Primary percutaneous coronary intervention is the preferred treatment, but its success depends on various factors. In a study of 96 consecutive STEMI patients at Erbil Cardiac Center, factors predicting in-hospital mortality included atypical presentation, cardiogenic shock, chronic kidney disease, TIMI grades 0/1/2, triple vessel disease, ventricular tachycardia/ventricular fibrillation, coronary dissection, and no-reflow phenomenon. Significantly, the time from symptom onset to hospital arrival emerged as a critical determinant in improving STEMI prognosis.

Citation: Saeed EN, Faeq AK. Impact of primary percutaneous coronary intervention on ST-segment elevation myocardial infarction patients: A comprehensive analysis. *World J Exp Med* 2024; 14(1): 88541

URL: <https://www.wjgnet.com/2220-315x/full/v14/i1/88541.htm>

DOI: <https://dx.doi.org/10.5493/wjem.v14.i1.88541>

INTRODUCTION

Myocardial infarction (MI), a type of coronary heart disease, is a leading cause of morbidity and mortality. This disease causes more than 15% of deaths in the world, most of them have non-ST-segment elevation MI than ST-segment MI (STEMI), men are more prone to develop MI than women, several modifiable risk factors are responsible for more than 90% of MI, these factors include hyperlipidemia, diabetes mellitus (DM), smoking, heavy alcohol consumption, physical inactivity, hypertension, psychosocial stress and a diet low in fruits and vegetables[1]. Factors that may lead to ST-segment elevation include infarction of the cardiac muscles due to occlusion of one vessel with a supply where there is obstruction, and this usually happens because of plaque rupture erosion, fissuring, or dissection, which leads to an obstructing thrombus. ST-elevation MI can be defined as a clinical syndrome in which the characteristic symptoms of MI associated with electrocardiogram (ECG) finding of ST-segment elevation in ECG associated later with elevation in biomarkers of myocardial necrosis, therefore a diagnostic ST-segment elevation is a new S.T. elevation at the J point in at least two contiguous leads > 2 mm (0.2 mV) in men or > 1.5 mm (0.15 mV) in women in leads V2-V3 and of > 1 mm (0.1mV) in other contiguous chest or limb lead[2]. It's found that timely primary percutaneous coronary intervention (PPCI) is the best treatment for ST-segment elevation MI[3]. The critical point is the time; most studies show that the preference of primary percutaneous coronary intervention (PCI) over fibrinolytic therapy is just approximately 2 h, and this depends on the duration of ischemia and the number of myocardial muscles involved with ischemia in some countries, which was named as door to balloon time has been reduced to less than 1 h[4]. At the same, some studies show that if PCI is delayed after the onset of the symptoms, the outcome will be poor; others show that delay in performing PPCI may be only significant within the first 2 to 3 h after the onset of the symptoms since this is the time where myocardial salvage is most fabulous, or in those who are risky group such as in patients with cardiogenic shock. In general, studies that didn't confirm this relationship had already depended on a small sample size[5]. This work aims to comprehensively evaluate the outcomes of PPCI in patients diagnosed with STEMI. To achieve this aim, we have set the following specific objectives. Firstly, assess the impact of PPCI on the improvement of cardiac function in patients diagnosed with STEMI, and determine and report the mortality rate among patients undergoing PPCI for STEMI. Investigate and establish associations between various risk factors and the overall outcomes of PPCI in patients diagnosed with STEMI, Analyze the association between the onset of STEMI symptoms and the timing of PPCI procedures, and their implications on patient prognosis and finally, explore correlations between the type of culprit vessel, the number of affected vessels, the occurrence of complications, and the ultimate clinical outcomes in patients with STEMI undergoing PPCI.

MATERIALS AND METHODS

The type of study in this research is an interventional study; after selecting the samples to be included according to specific criteria, the intervention will be the PCI procedure. Ninety-six consecutive cases were selected according to inclusion criteria. This study will be conducted in the Cardiac Center in Erbil city in Kurdistan Regional Government. The time frame for this study was more than four months.

Sampling

A consecutive sampling technique was used for this study because of time restriction and availability of cases with the specified criteria; in addition to that, every facility regarding investigation, treatment, and intervention is available in this center. For these reasons, this sampling technique was used.

Inclusion criteria

Cases present with myocardial infarction and apparent ST elevation on electrocardiography records. Case admitted to the hospital within the first 48 h of symptoms. The age of patients should be between 30 and 90 years. The patient agrees to participate in the study and sign the consent form.

Exclusion criteria

Age that is out of the range described. Cases received thrombolytic medications. Patients refused to participate in the study.

Procedure technique

Percutaneous coronary intervention is a surgical procedure used when there is a narrowing or stenosis in one of the coronary arteries that supply blood to the heart; this process includes coronary angioplasty and stenting, which is the process of inserting a permanent drug-eluting stent.

Tools used in the procedure: ECG; Echocardiography; Angiography and Angioplasty.

RESULTS

From the total number of patients enrolled in this study, 13 died, while eleven died during hospitalization before discharge and two died after discharge within one month of follow-up. Male to female ratio was 5:1, and no significant correlation was established between death and gender (Table 1) and age group (Table 2).

Table 1 Association of deaths during hospitalization and within one month after discharge with gender

Deaths		Gender			P value
		Female, %	Male, %	Total, %	
Death category	Deaths within one month	1	1	2	0.423 ¹
		50.0	50.0	100.0	
	Deaths during hospitalization	2	9	11	
		18.2	81.8	100.0	
Total		3	10	13	
		23.1	76.9	100.0	

¹Fisher's exact test.

More than one quarter (25%) of patients were hospitalized within the initial 2 h of symptom onset, up until balloon inflation, and the rest were admitted in more than 2 h, as shown in Table 3. There was a statistically significant association between total arrival time till balloon inflation and mortality. Therefore, the earlier the patient arrives, the better the outcome with a *P* value of < 0.0184. The time from symptom to hospital and door to balloon time alone was insignificant.

Most of the patients admitted with typical ischemic chest pain (89 cases), and 7 cases presented with an atypical presentation; there was a statistically significant association between syncope (8 cases), Cardiac arrest (1 case), and Ventricular arrhythmias (9 cases) with deaths inside the hospital as shown in Table 4.

Although smoking is one of the essential factors that are usually associated with deaths, in this study, there was no statistically significant association with this factor; on the other hand, dyslipidemia showed a strong association with deaths inside hospitals with a *P* value < 0.001. Chronic kidney disease was also significantly associated with in-hospital deaths, as shown in Table 5. On the other hand, outside hospital deaths, only chronic kidney disease showed a significant

Table 2 Association between age groups and deaths

Age		Death category			P value
		Deaths within one month, %	Deaths during hospitalization, %	Total, %	
Age groups	40-49	0	2	2	1.000 ¹
		0.0	100.0	100.0	
	50-59	1	3	4	
		25.0	75.0	100.0	
	60-69	1	2	3	
		33.3	66.7	100.0	
	70-79	0	2	2	
		0.0	100.0	100.0	
	80-90	0	2	2	
		0.0	100.0	100.0	
Total	2	11	13		
	15.4	84.6	100.0		

¹Fisher's exact test.**Table 3 Association of deaths inside and outside hospitals with time from symptom till balloon inflation**

Time interval		Death category			P value
		Deaths till one month, %	Survival till one month, %	Total, %	
Arrival in hours	< 2	0	25	25	0.0184 ¹
		0.00	30.1	26.4	
	> 2	13	58	71	
		100.0	69.87	73.95	
Total		13	83	96	
		100.0	100.0	100.0	

¹Fisher's exact test.

association with deaths after PCI with a *P* value of < 0.002 (Table 5).

Regarding the in-hospital deaths due to cardiogenic shock systolic blood pressure is less than 90, there was a statistically significant association with this variable with a *P* value of 0.004 (Table 6). Also, deaths within one month after discharge had a significant association with cardiogenic shock with a *P* value of 0.024 (Table 6).

More than half of patients had high levels of HbA1c, and nearly 78% of cases had an average level of creatinine. However, only creatinine level had a statistically significant association with deaths with a *P* value of 0.014 (Table 7).

Regarding angiographic results, most deaths inside the hospital happened due to 3 vessel disease (3VD) with a statistically significant association, a *P* value of < 0.001, and the minor disease association was a single vessel with a *P* value of < 0.05. Central stem disease was also associated with deaths inside the hospital with a *P* value of < 0.05 (Table 8). However for deaths outside the hospital, only 3VD was associated with deaths with a *P* value < 0.05 (Table 8).

The angiographic results regarding the culprit's vessels showed that the left circumflex, left anterior descending artery, and obtuse marginal were significantly associated with deaths inside the hospital (Table 9). On the other hand, only the Left anterior descending artery was significantly associated with deaths outside the hospital within one month of discharge (Table 9).

On looking at the complications associated with deaths inside the hospital, it was found that many complications were significantly associated with death except temporary pacemakers and contrast nephropathy. Most of these associations were highly significant, with a *P* value of < 0.001, as shown in Table 10. While for deaths outside the hospital, the insignificant complications were coronary dissection and temporary pacemakers, other complications were statistically significant with a *P* value < 0.05, as shown in Table 10.

Table 4 Atypical presentation of patients

Symptoms	Status	In-hospital deaths			
		Survivals, %	Deaths, %	Total, %	P value
Syncope	Outside hospital (1 month)	7	1	8	0.180 ¹
		8.4	50.0 ²	9.4	
	Inside hospital	8	5	13	0.006 ¹
		9.40	45.50	13.50	
Cardiac arrest	Outside hospital (1 month)	1	0	1	1.000 ¹
		1.2	0.0	1.2	
	Inside hospital	1	2	3	0.029 ¹
		1.20	20.00	3.20	
Ventricular Arrhythmia	Outside hospital (1 month)	8	1	9	0.204 ¹
		9.8	50.0	10.7	
	Inside hospital	9	4	13	0.030 ¹
		10.70	40.00	13.80	
Typical pain	Outside hospital (1 month)	78	2	80	1.000 ¹
		94.0	100.0	94.1	
	Inside hospital	80	9	89	0.182 ¹
		94.10	81.80	92.70	

¹Fisher's exact test.²Column percent.

DISCUSSION

In this study, the hospital mortality rate of STEMI patients who underwent PPCI was (11.4 %) and the mortality rate from discharge to one month was (2.35%). However, in comparison to another study done in 2021, the in-hospital mortality was slightly lower (9.2%), and 30-d mortality was (7.7%)[6], which is slightly higher than our study since only one-quarter of our patients were admitted to the hospital within first 2 h from symptoms till needle insertion and the rest over 2 h as shown in Table 3. The time to start treatment is the most important determinant of mortality, and it consists of the time from symptom to initiation of reperfusion therapy. This embraces the time from symptom to first medical contact and the time from hospital arrival to initiation of reperfusion[7]. Notably, there was a statistically significant association between the time from starting symptoms to balloon inflation and mortality. This is due to the lack of a standard emergency medical services system by telephone and public awareness. Nearly all patients were referred from other hospitals, especially emergency hospitals in Erbil, which are not PCI-capable hospitals, and no one received thrombolysis even those delayed more than six hours. This may be due to the delay in reaching the emergency hospital. The other explanation for higher in-hospital mortality is that primary PCI was done through a femoral rather than radial approach; the radial method, as compared to the femoral access approach, is associated with a lower mortality rate (2.7% vs 4.7%)[8].

This study aims to identify both risk factors and variables influencing mortality among patients who have undergone primary PCI for STEMI. Men have five-fold higher than females, and sex has shown no significant effect on mortality. However, death in STEMI patients occurs more in males, though some studies have found higher mortality rates in women than men[3]. The lack of elevated risk among our female patients underscores the advantages of primary PCI for women.

Based on our results, in terms of STEMI and mortality, it was mostly related to middle-aged patients; with increased age, the risk for death becomes higher in patients who experienced a myocardial infarction[9]. This difference is justifiable since very old patients with STEMI who did not undergo primary PCI may not reach PCI-capable hospitals and be prescribed pharmacological treatment instead.

In this study, we found that the presentation of patients to the hospital was critical; those patients who presented with typical ischemic chest pain were associated with a better survival rate, but patients who presented with syncope, ventricular arrhythmia, cardiogenic shock, and cardiac arrest were significantly associated with mortality[10].

In primary PCI patients, we observed diabetic state enhanced the probability of STEMI. In essence, diabetes did not augment mortality in hospitals and from hospital discharge to one month. Also, uncontrolled diabetes mellitus increases mortality in STEMI patients who underwent primary PCI after putting the stent; however, trials attempting to decrease macrovascular events have been unsuccessful[11]. However, better glycemic control has not led to reduction in the occurrence of cardiovascular events while ACCORD trial[11], It was linked to heightened risks of all-cause mortality and

Table 5 Risk factors associated with deaths inside and outside the hospital within one month of discharge

Symptoms	Status	Deaths in hospital				Deaths outside the hospital within one month			
		Survivals, %	Deaths, %	Total, %	P value	Survivals, %	Deaths, %	Total, %	P value
Smoking	No	40	5	45	0.92	38	2	40	0.218
		47.10	45.50	46.90		45.80	100.00	47.10	
	Yes	45	6	51		45	0	45	
		52.90	54.50	53.10		54.20	0.00	52.90	
H.T.	No	41	4	45	0.458	41	0	41	0.495
		48.20	36.40	46.90		49.40	0.00	48.20	
	Yes	44	7	51		42	2	44	
		51.80	63.60	53.10		50.60	100.00	51.80	
D.M.	No	49	3	52	0.057	48	1	49	0.671
		57.60	27.30	54.20		57.80	50.00	57.60	
	Yes	36	8	44		35	1	36	
		42.40	72.70	45.80		42.20	50.00	42.40	
Dyslipidemia	No	74	1	75	< 0.001	72	2	74	0.757
		87.10	9.10	78.10		86.70	100.00	87.10	
	Yes	11	10	21		11	0	11	
		12.90	90.90	21.90		13.30	0.00	12.90	
Family history of CAD	No	66	7	73	0.452	65	1	66	0.399
		77.60	63.60	76.00		78.30	50.00	77.60	
	Yes	19	4	23		18	1	19	
		22.40	36.40	24.00		21.70	50.00	22.40	
CKD	No	81	8	89	0.031	81	0	81	0.002
		95.30	72.70	92.70		97.60	0.00	95.30	
	Yes	4	3	7		2	2	4	
		4.70	27.30	7.30		2.40	100.00	4.70%	

CAD: Coronary artery disease; H.T.: Hypertension; D.M.: Diabetes mellitus; CKD: Chronic kidney disease.

Table 6 Association between cardiogenic shock (systolic blood pressure < 90) deaths inside and outside the hospital within one month of discharge

STEMI		Deaths in hospital				Deaths out-hospital one month			
		Survivals, %	Deaths, %	Total, %	P value	Survivals, %	Deaths, %	Total, %	P value
Cardiogenic Shock (SBP less than 90)	No	84	8	92	0.004	83	1	84	0.024
		98.80	72.70	95.80		100.00	50.00	98.80	
	Yes	1	3	4		0	1	1	
		1.20	27.30	4.20		0.00	50.00	1.20	
Total		85	11	96		83	2	85	
		100.00	100.00	100.00		100.00	100.00	100.00	

STEMI: ST-segment elevation myocardial infarction; SBP: Systolic blood pressure.

Table 7 Association between lab investigations and deaths inside and outside the hospital within one month of discharge

Lab results	Status	Deaths in-hospital				Deaths out hospital one month			
		Survivals, %	Deaths, %	Total, %	P value	Survivals, %	Deaths, %	Total, %	P value
Hb category	Low	24	3	27	0.757	22	2	24	0.208
		32.40	37.50	32.90		30.60	100.00	32.40	
	Normal	40	5	45		40	0	40	
		54.10	62.50	54.90		55.60	0.00	54.10	
	High	10	0	10		10	0	10	
		13.50	0.00	12.20		13.90	0.00	13.50	
WBC category	Low	2	1	3	0.44	2	0	2	0.533
		2.40	9.10	3.10		2.40	0.00	2.40	
	Normal	34	4	38		34	0	34	
		40.00	36.40	39.60		41.00	0.00	40.00	
	High	49	6	55		47	2	49	
		57.60	54.50	57.30		56.60	100.00	57.60	
HbA1c category	Low	32	4	36	0.539	32	0	32	0.624
		37.60	36.40	37.50		38.60	0.00	37.60	
	Normal	11	0	11		11	0	11	
		12.90	0.00	11.50		13.30	0.00	12.90	
	High	42	7	49		40	2	42	
		49.40	63.60	51.00		48.20	100.00	49.40	
S. Cr. category	Low	6	1	7	0.01	6	0	6	0.014
		7.10	9.10	7.30		7.20	0.00	7.10	
	Normal	70	5	75		70	0	70	
		82.40	45.50	78.10		84.30	0.00	82.40	
	High	9	5	14		7	2	9	
		10.60	45.50	14.60		8.40	100.00	10.60	

Hb: Hemoglobin; WBC: White blood counts.

cardiovascular-related mortality. Notably, on admission, HbA1c levels had no association with in-hospital mortality and short-term all-cause mortality outcomes in diabetic patients with STEMI undergoing primary PCI. Still, they affected long-term outcomes and major cardiovascular events, as demonstrated in another study[12].

Another major risk factor for coronary artery disease is smoking. The contribution of smoking to the prevalence of mortality rates after primary PCI is also a cause for attention. The case in this study is that smoking had no detrimental effects on mortality. Nevertheless, other studies have shown superior reperfusion following PCI in smokers. In contrast, high arterial blood pressure is associated with CAD and the incidence of complications after ACS[13,14]. However, we found that hypertension increases the risk of STEMI more than other risk factors but does not affect mortality. Furthermore, hyperlipidemia is a risk factor for coronary artery disease; it significantly affected the incidence of mortality in this study[15].

A strong association was demonstrated between mortality of STEMI in patients undergoing primary PCI and chronic kidney disease, and about half of them developed cardiogenic shock, were admitted to the intensive care unit (ICU) and associated with three-vessel disease, and had higher cardiovascular risk factors like hypertension, diabetes mellitus, and hyperlipidemia in contrast to those patients without chronic kidney diseases. The same results have appeared compared to a study of the outcome of STEMI patients with chronic kidney disease treated with primary PCI[15].

Low hemoglobin level before primary PCI was associated with a higher mortality rate, anemia was associated with cardiac arrest, congestive heart failure, cardiogenic shock and death, and anemia causing hypoxia during myocardial infarction. This hypoxia makes patients more vulnerable to spasms and arrhythmias[16]. However in this study, there was no association between anemia and mortality because the hemoglobin of all our patients was above 11 g/dL, so it was mild anemia.

Table 8 Number of vessels involved with deaths inside hospital and deaths outside hospital within one month of discharge

Number of vessels	Status	Deaths in-hospital				Deaths out hospital one month			
		Survivals, %	Deaths, %	Total, %	P value	Survivals, %	Deaths, %	Total, %	P value
SVD	No	37	10	47	0.003	35	2	37	0.187
		43.50	90.90	49.00		42.20	100.00	43.50	
	Yes	48	1	49		48	0	48	
		56.50	9.10	51.00		57.80	0.00	56.50	
2VD	No	62	9	71	0.723	60	2	62	1
		72.90	81.80	74.00		72.30	100.00	72.90	
	Yes	23	2	25		23	0	23	
		27.10	18.20	26.00		27.70	0.00	27.10	
3VD	No	71	3	74	< 0.001	71	0	71	0.025
		83.50	27.30	77.10		85.50	0.00	83.50	
	Yes	14	8	22		12	2	14	
		16.50	72.70	22.90		14.50	100.00	16.50	
Central stem disease (> 50%)	No	82	8	90	0.019	80	2	82	1
		96.50	72.70	93.80		96.40	100.00	96.50	
	Yes	3	3	6		3	0	3	
		3.50	27.30	6.30		3.60	0.00	3.50	

SVD: Singular-valued decomposition; VD: Vessel disease.

TIMI flow is one of the critical factors in determining the outcome of PCI in patients with STEMI. Good TIMI flows at the time of angiography, and PCI is a determinant of mortality in patients undergoing primary PCI. Patients with TIMI flow grade 3 are expected to have higher survival rates and fewer complications following primary PCI[17,18]. In the present study, TIMI flow grade less than three was associated with increased mortality in patients receiving primary PCI for STEMI. A significant relationship was shown between the number of involved vessels and outcome in patients who underwent primary PCI in STEMI[19]. However, the left circumflex and anterior descending arteries are affected in-hospital mortality following STEMI. This discovery validates the significance of the involvement of these arteries in myocardial infarction patients. Additionally, some studies have indicated that multi-vessel, especially 3VD and left central stem involvement in patients, increases the risk of primary PCI mortality. It is compatible with the results of this study[19].

Previous studies have proven that ventricular arrhythmia was significantly associated with in-hospital and thirty-day mortality rates[20]. Moreover, mortality from hospital discharge to one month was strongly affected by the three-vessel disease, chronic kidney disease, left anterior descending artery, cardiogenic shock, especially those are on positive inotropes and admitted to ICU on mechanical ventilation, intubated patients, patients who present to hospital with ventricular tachycardia/ventricular fibrillation or a ventricular arrhythmia that happened in Cath-lab and no-reflow less than class 2, respectively affect mortality.

CONCLUSION

This study thoroughly examines the effects of PPCI on patients diagnosed with STEMI. Through our analysis, we have uncovered numerous parameters that exert a substantial impact on patient outcomes.

The results of our study highlight the significance of crucial factors linked to the prognosis of patients undergoing percutaneous coronary intervention. Several characteristics that can be considered include delayed presentation, syncope as the initial symptom, ventricular arrhythmias, cardiogenic shock, cardiac arrest, hyperlipidemia, and chronic kidney disease. In addition, the identification of the particular coronary arteries affected, such as the left anterior descending artery, left circumflex artery or left main stem, as well as the assessment of the amount of disease (three-vessel disease), were observed to have significant impacts on the determination of outcomes.

The incidence of several complications during the PPCI operation, such as dissection, cardiogenic shock, the need for mechanical ventilation, ventricular arrhythmias, and the no-reflow phenomenon, have been found to have a significant impact on patient prognosis.

Table 9 Types of vessels involved and their association with deaths inside hospital and deaths outside hospital within one month of discharge

Vessels	Status	Deaths in-hospital				Deaths out hospital one month			
		Survivals, %	Deaths, %	Totals, %	P value	Survivals, %	Deaths, %	Total, %	P value
RCA	No	40	4	44	0.503	38	2	40	0.218
		47.10	36.40	45.80		45.80	100.00	47.10	
	Yes	45	7	52	0.005	45	0	45	0.264
		52.90	63.60	54.20		54.20	0.00	52.90	
LCx	No	73	5	78	0.005	72	1	73	0.264
		85.90	45.50	81.30		86.70	50.00	85.90	
	Yes	12	6	18	0.003	11	1	12	1
		14.10	54.50	18.80		13.30	50.00	14.10	
LAD	No	57	2	59	0.003	56	1	57	1
		67.10	18.20	61.50		67.50	50.00	67.10	
	Yes	28	9	37	0.099	27	1	28	1
		32.90	81.80	38.50		32.50	50.00	32.90	
OM	No	82	9	91	0.139	80	2	82	1
		96.50	81.80	94.80		96.40	100.00	96.50	
	Yes	3	2	5	0.034	3	0	3	1
		3.50	18.20	5.20		3.60	0.00	3.50	
Diagonal	No	81	9	90	0.139	79	2	81	1
		95.30	81.80	93.80		95.20	100.00	95.30	
	Yes	4	2	6	0.034	4	0	4	1
		4.70	18.20	6.30		4.80	0.00	4.70	
PDA	No	84	9	93	0.034	82	2	84	1
		98.80	81.80	96.90		98.80	100.00	98.80	
	Yes	1	2	3	0.034	1	0	1	1
		1.20	18.20	3.10		1.20	0.00	1.20	

RCA: Right coronary artery; LCx: Left circumflex artery; LAD: Left descending artery; OM: Obtuse Marginal; PDA: Patent ductus arteriosus.

Table 10 Complications and their association with deaths inside and outside hospitals within one month of discharge

Complications	Status	Deaths in-hospital				Deaths out hospital one month			
		Survivals, %	Deaths, %	Total, %	P value	Survivals, %	Deaths, %	Total, %	P value
Coronary dissection	No	79	7	86	0.009	78	1	79	1
		94.00	63.60	90.50		94.00	100.00	94.00	
	Yes	5	4	9	< 0.001	5	0	5	0.047
		6.00	36.40	9.50		6.00	0.00	6.00	
Cardiogenic shock	No	83	5	88	< 0.001	82	1	83	0.047
		97.60	45.50	91.70		98.80	50.00	97.60	
	Yes	2	6	8	< 0.001	1	1	2	0.047
		2.40	54.50	8.30		1.20	50.00	2.40	
Temporary PM	No	82	11	93	1	81	1	82	1

		97.60	100.00	97.90		97.60	100.00	97.60	
	Yes	2	0	2		2	0	2	
		2.40	0.00	2.10		2.40	0.00	2.40	
Mechanical ventilation	No	83	3	86	< 0.001	82	1	83	0.047
		97.60	27.30	89.60		98.80	50.00	97.60	
	Yes	2	8	10		1	1	2	
		2.40	72.70	10.40		1.20	50.00	2.40	
VT/VF	No	79	5	84	< 0.001	79	0	79	0.004
		92.90	45.50	87.50		95.20	0.00	92.90	
	Yes	6	6	12		4	2	6	
		7.10	54.50	12.50		4.80	100.00	7.10	
Contrast nephropathy	No	84	10	94	0.217	81	2	83	1
		98.80	90.90	97.90		97.60	100.00	97.60	
	Yes	1	1	2		2	0	2	
		1.20	9.10	2.10		2.40	0.00	2.40	
IV inotropes	No	84	6	90	< 0.001	83	1	84	0.024
		98.80	54.50	93.80		100.00	50.00	98.80	
	Yes	1	5	6		0	1	1	
		1.20	45.50	6.30		0.00	50.00	1.20	
No-reflow	No	77	4	81	< 0.001	77	0	77	0.006
		91.70	36.40	85.30		93.90	0.00	91.70	
	Yes	7	7	14		5	2	7	
		8.30	63.60	14.70		6.10	100.00	8.30	

PM: Pacemaker; VT: Ventricular tachycardia; VF: Ventricular fibrillation.

This study emphasizes the intricate nature of the parameters that influence the results of PPCI in patients with STEMI, hence emphasizing the crucial importance of prompt intervention and customized care methods that are specifically designed to address the unique risk profile of each patient. Efforts to optimize these parameters can potentially enhance the overall success of primary PPCI as a life-saving strategy for patients with STEMI.

ARTICLE HIGHLIGHTS

Research background

The Erbil Cardiac Center studied 96 patients with ST-segment elevation myocardial infarction (STEMI), treated by primary percutaneous coronary intervention (PPCI). Key factors influencing survival rates included clinical features, procedure details, and the time from symptom onset to hospital arrival. Prompt intervention significantly improved outcomes. Understanding these factors can enable better treatment strategies and public awareness campaigns, ultimately reducing mortality.

Research motivation

This study focuses on STEMI treatment, PPCI efficacy, and identifying mortality predictors. Key problems include identifying mortality predictors and determining onset-to-arrival time's role. Resolving these issues could enhance STEMI treatment, reduce time-to-treatment, and guide future STEMI and PPCI research endeavors, thereby improving patient outcomes and advancing cardiology and emergency medicine fields.

Research objectives

This STEMI study aspired to examine patient mortality rates, identify mortality predictors, and assess onset-to-door time impact. It successfully revealed specific mortality rates and predictors, and it confirmed the importance of prompt intervention. These findings provide a benchmark for treatment strategies, underscore the value of personalizing care,

and inspire research on reducing delays and further exploring mortality predictors.

Research methods

The study aimed to assess STEMI patient mortality rates, identify in-hospital mortality predictors, and uncover the impact of onset-to-hospital time using data analysis methods for a detailed evaluation. These objectives' fulfilment generates mortality benchmarks, guides new treatments, informs public health policies, and catalyzes future research, thereby contributing novel insights into STEMI patient care.

Research results

This study assessed STEMI patients, identifying mortality rates, mortality predictors, and onset-to-door time's significance on prognosis. The findings highlight early intervention importance, clarify mortality predictors, and stimulate personalized treatment plans to enhance PPCI effectiveness. Yet, underlying causes for hospital arrival delays, underlying processes of mortality predictors, and their generality across demographics need additional research.

Research conclusions

The study confirms the “time is muscle” theory, emphasizing swift intervention in STEMI cases, and broadens knowledge by identifying multiple mortality predictors. Though it proposes no new theories, methods, or phenomena, its insights improve our understanding of STEMI management. These findings don't imply confirmed hypotheses but provide a basis for future treatments and hypotheses in clinical practice.

Research perspectives

Future research should focus on reducing onset-to-door time by understanding delay causes, further exploring identified mortality predictors, verifying the study's findings in larger, diverse populations, and assessing novel STEMI treatments. Investigations may employ methods such as comprehensive data analysis, clinical trials, and patient education programs for these research directions.

FOOTNOTES

Author contributions: Faeq AK provided supervision for the project; Saeed EN was responsible for data collection and curation, reviewing and draft preparation.

Institutional review board statement: The study protocol received approval from the Institutional Review Board (IRB) at Hawler Medical University. All research procedures and data collection methodologies were conducted according to the principles of the Declaration of Helsinki and other relevant national and institutional ethical guidelines.

Clinical trial registration statement: This study is registered at college of medicine -Hawler medical university. The registration is required for complete M.Sc.

Informed consent statement: All study participants or their legal guardian provided informed written consent about personal and medical data collection prior to study enrolment.

Conflict-of-interest statement: The authors declare that they have no known competing financial interests or personal relationships that could have influenced the work reported in this paper. All authors have contributed significantly to the research and preparation of the manuscript and have approved the final version for submission. No external funding was received for this research.

Data sharing statement: Original contributions reflected in this work can be obtained from the article.

CONSORT 2010 statement: The authors have read the CONSORT 2010 statement, and the manuscript was prepared and revised according to the CONSORT 2010 statement.

Open-Access: This article is an open-access article that was selected by an in-house editor and fully peer-reviewed by external reviewers. It is distributed in accordance with the Creative Commons Attribution NonCommercial (CC BY-NC 4.0) license, which permits others to distribute, remix, adapt, build upon this work non-commercially, and license their derivative works on different terms, provided the original work is properly cited and the use is non-commercial. See: <https://creativecommons.org/licenses/by-nc/4.0/>

Country/Territory of origin: Iraq

ORCID number: Eza Nawzad Saeed [0009-0009-1099-4292](https://orcid.org/0009-0009-1099-4292).

S-Editor: Liu JH

L-Editor: A

P-Editor: Zhao YQ

REFERENCES

- 1 **Jayaraj RL**, Azimullah S, Beiram R, Jalal FY, Rosenberg GA. Neuroinflammation: friend and foe for ischemic stroke. *J Neuroinflammation* 2019; **16**: 142 [PMID: [31291966](#) DOI: [10.1186/s12974-019-1516-2](#)]
- 2 **Hwang C**, Lewis JT. ECG diagnosis: ST-elevation myocardial infarction. *Perm J* 2014; **18**: e133 [PMID: [24867559](#) DOI: [10.7812/TPP/13-127](#)]
- 3 **Keeley EC**, Hillis LD. Primary PCI for myocardial infarction with ST-segment elevation. *N Engl J Med* 2007; **356**: 47-54 [PMID: [17202455](#) DOI: [10.1056/NEJMc063503](#)]
- 4 **Pinto DS**, Kirtane AJ, Nallamothu BK, Murphy SA, Cohen DJ, Laham RJ, Cutlip DE, Bates ER, Frederick PD, Miller DP, Carrozza JP Jr, Antman EM, Cannon CP, Gibson CM. Hospital delays in reperfusion for ST-elevation myocardial infarction: implications when selecting a reperfusion strategy. *Circulation* 2006; **114**: 2019-2025 [PMID: [17075010](#) DOI: [10.1161/CIRCULATIONAHA.106.638353](#)]
- 5 **Nallamothu B**, Fox KA, Kennelly BM, Van de Werf F, Gore JM, Steg PG, Granger CB, Dabbous OH, Kline-Rogers E, Eagle KA; GRACE Investigators. Relationship of treatment delays and mortality in patients undergoing fibrinolysis and primary percutaneous coronary intervention. The Global Registry of Acute Coronary Events. *Heart* 2007; **93**: 1552-1555 [PMID: [17591643](#) DOI: [10.1136/hrt.2006.112847](#)]
- 6 **Motzer R**, Alekseev B, Rha SY, Porta C, Eto M, Powles T, Grünwald V, Hutson TE, Kopyltsov E, Méndez-Vidal MJ, Kozlov V, Alyasova A, Hong SH, Kapoor A, Alonso Gordo T, Merchan JR, Winquist E, Maroto P, Goh JC, Kim M, Gurney H, Patel V, Peer A, Procopio G, Takagi T, Melichar B, Rolland F, De Giorgi U, Wong S, Bedke J, Schmidinger M, Dutcus CE, Smith AD, Dutta L, Mody K, Perini RF, Xing D, Choueiri TK; CLEAR Trial Investigators. Lenvatinib plus Pembrolizumab or Everolimus for Advanced Renal Cell Carcinoma. *N Engl J Med* 2021; **384**: 1289-1300 [PMID: [33616314](#) DOI: [10.1056/NEJMoa2035716](#)]
- 7 **Kim HK**, Jeong MH, Ahn Y, Kim JH, Chae SC, Kim YJ, Hur SH, Seong IW, Hong TJ, Choi DH, Cho MC, Kim CJ, Seung KB, Chung WS, Jang YS, Rha SW, Bae JH, Cho JG, Park SJ; Other Korea Acute Myocardial Infarction Registry Investigators. Hospital discharge risk score system for the assessment of clinical outcomes in patients with acute myocardial infarction (Korea Acute Myocardial Infarction Registry [KAMIR] score). *Am J Cardiol* 2011; **107**: 965-971.e1 [PMID: [21256468](#) DOI: [10.1016/j.amjcard.2010.11.018](#)]
- 8 **Karrowni W**, Vyas A, Giacomino B, Schweizer M, Blevins A, Girotra S, Horwitz PA. Radial versus femoral access for primary percutaneous interventions in ST-segment elevation myocardial infarction patients: a meta-analysis of randomized controlled trials. *JACC Cardiovasc Interv* 2013; **6**: 814-823 [PMID: [23968700](#) DOI: [10.1016/j.jcin.2013.04.010](#)]
- 9 **Jackson EA**, Moscucci M, Smith DE, Share D, Dixon S, Greenbaum A, Grossman PM, Gurm HS. The association of sex with outcomes among patients undergoing primary percutaneous coronary intervention for ST elevation myocardial infarction in the contemporary era: Insights from the Blue Cross Blue Shield of Michigan Cardiovascular Consortium (BMC2). *Am Heart J* 2011; **161**: 106-112.e1 [PMID: [21167341](#) DOI: [10.1016/j.ahj.2010.09.030](#)]
- 10 **Puymirat E**, Simon T, Cayla G, Cottin Y, Elbaz M, Coste P, Lemesle G, Motreff P, Popovic B, Khalife K, Labèque JN, Perret T, Le Ray C, Orion L, Jouve B, Blanchard D, Peycher P, Silvain J, Steg PG, Goldstein P, Guéret P, Belle L, Aissaoui N, Ferrières J, Schiele F, Danchin N; USIK, USIC 2000, and FAST-MI investigators. Acute Myocardial Infarction: Changes in Patient Characteristics, Management, and 6-Month Outcomes Over a Period of 20 Years in the FAST-MI Program (French Registry of Acute ST-Elevation or Non-ST-Elevation Myocardial Infarction) 1995 to 2015. *Circulation* 2017; **136**: 1908-1919 [PMID: [28844989](#) DOI: [10.1161/CIRCULATIONAHA.117.030798](#)]
- 11 **Gerstein HC**, Swedberg K, Carlsson J, McMurray JJ, Michelson EL, Olofsson B, Pfeffer MA, Yusuf S; CHARM Program Investigators. The hemoglobin A1c level as a progressive risk factor for cardiovascular death, hospitalization for heart failure, or death in patients with chronic heart failure: an analysis of the Candesartan in Heart failure: Assessment of Reduction in Mortality and Morbidity (CHARM) program. *Arch Intern Med* 2008; **168**: 1699-1704 [PMID: [18695086](#) DOI: [10.1001/archinte.168.15.1699](#)]
- 12 **Sabatine MS**, Morrow DA, Giugliano RP, Burton PB, Murphy SA, McCabe CH, Gibson CM, Braunwald E. Association of hemoglobin levels with clinical outcomes in acute coronary syndromes. *Circulation* 2005; **111**: 2042-2049 [PMID: [15824203](#) DOI: [10.1161/01.CIR.0000162477.70955.5F](#)]
- 13 **Al Ali J**, Franck C, Filion KB, Eisenberg MJ. Coronary artery bypass graft surgery versus percutaneous coronary intervention with first-generation drug-eluting stents: a meta-analysis of randomized controlled trials. *JACC Cardiovasc Interv* 2014; **7**: 497-506 [PMID: [24746647](#) DOI: [10.1016/j.jcin.2013.12.202](#)]
- 14 **Ali WM**, Zubaid M, El-Menyar A, Al Mahmeed W, Al-Lawati J, Singh R, Ridha M, Al-Hamdan R, Alhabib K, Al Suwaidi J. The prevalence and outcome of hypertension in patients with acute coronary syndrome in six Middle-Eastern countries. *Blood Press* 2011; **20**: 20-26 [PMID: [20843191](#) DOI: [10.3109/08037051.2010.518673](#)]
- 15 **Ismail N**, Omar SV, Ismail NA, Peters RPH. Collated data of mutation frequencies and associated genetic variants of bedaquiline, clofazimine and linezolid resistance in Mycobacterium tuberculosis. *Data Brief* 2018; **20**: 1975-1983 [PMID: [30306102](#) DOI: [10.1016/j.dib.2018.09.057](#)]
- 16 **Mehta R**, Zhu RJ. Blue or red? Exploring the effect of color on cognitive task performances. *Science* 2009; **323**: 1226-1229 [PMID: [19197022](#) DOI: [10.1126/science.1169144](#)]
- 17 **Sadrnia S**, Pourmoghaddas M, Hadizadeh M, Maghamimehr A, Esmaeeli M, Amirpour A, Khosravi A. Factors affecting outcome of primary percutaneous coronary intervention for acute myocardial infarction. *ARYA Atheroscler* 2013; **9**: 241-246 [PMID: [23970919](#)]
- 18 **Brener SJ**, Moliterno DJ, Aylward PE, van't Hof AW, Ruzylo W, O'Neill WW, Hamm CW, Westerhout CM, Granger CB, Armstrong PW; APEX-AMI Investigators. Reperfusion after primary angioplasty for ST-elevation myocardial infarction: predictors of success and relationship to clinical outcomes in the APEX-AMI angiographic study. *Eur Heart J* 2008; **29**: 1127-1135 [PMID: [18375399](#) DOI: [10.1093/eurheartj/ehn125](#)]
- 19 **Jahic E**. Experience and Outcomes of Primary Percutaneous Coronary Intervention for Patients with ST-Segment Elevation Myocardial Infarction of Tertiary Care Center in Bosnia and Herzegovina. *Med Arch* 2017; **71**: 183-187 [PMID: [28974830](#) DOI: [10.5455/medarch.2017.71.183-187](#)]
- 20 **Entezarjou A**, Mohammad MA, Andell P, Koul S. Culprit vessel: impact on short-term and long-term prognosis in patients with ST-elevation myocardial infarction. *Open Heart* 2018; **5**: e000852 [PMID: [30228908](#) DOI: [10.1136/openhrt-2018-000852](#)]



Published by **Baishideng Publishing Group Inc**
7041 Koll Center Parkway, Suite 160, Pleasanton, CA 94566, USA

Telephone: +1-925-3991568

E-mail: office@baishideng.com

Help Desk: <https://www.f6publishing.com/helpdesk>

<https://www.wjgnet.com>

