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Original Article

Comparative analysis of in-hospital outcomes in opioid-dependent vs. non-opioid-dependent STEMI patients

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Abstract

Objectives: Myocardial infarction is a leading cause of death worldwide. The effect of opioid dependence on myocardial infarction outcomes remains uncertain, with conflicting results in the literature. This study aimed to assess the in-hospital and six-month outcomes of opioid-dependent compared to non-dependent patients with ST-elevation myocardial infarction (STEMI) at Afshar Heart Center, Yazd.

Methods: This cross-sectional analytical study included 200 STEMI patients admitted to Afshar Heart Center in Yazd, Iran, between 2020 and 2021. Patients were divided into opioid-dependent and non-opioid-dependent groups based on the DSM-IV criteria for opioid use. The inclusion criteria were chest pain lasting at least 30 minutes, specific ST-segment elevation on ECG, and elevated serum creatine kinase levels. Patients with a history of myocardial infarction or other cardiac or pulmonary diseases were excluded. Demographic and clinical data were collected from hospital records and analyzed using SPSS v.22.

Results: Multivariate analysis showed that opioid dependence was significantly linked to in-hospital outcomes. Although in-hospital mortality was higher for opioid-dependent patients compared to non-dependent patients (8.3% vs. 1.7%, $p = 0.34$), this difference was not statistically significant. Interestingly, six-month mortality occurred only in the non-dependent group (3.4% vs. 0%, $p = 0.095$). The duration from symptom onset to hospital arrival was considerably shorter in opioid users (154.01 ± 190.38 minutes) than in non-users (271.62 ± 287.58 minutes, $p < 0.01$), which may have contributed to earlier reperfusion. Despite these differences, there were no significant differences between the groups regarding revascularization strategies or left ventricular ejection fraction (EF: 38.15% vs. 38.52%, $p = 0.974$).

Conclusions: Opioid dependency greatly affects the prognosis of STEMI patients, highlighting the importance of targeted interventions and additional research.

Keywords: Opioid addiction, ST-elevation myocardial infarction, myocardial infarction

Introduction

Cardiovascular diseases, especially acute myocardial infarction (AMI), continue to be among the leading causes of morbidity and mortality worldwide. Among the various types of AMI, ST-elevation myocardial infarction (STEMI) is the most severe, characterized by total occlusion of a coronary artery, which can cause substantial myocardial damage if not treated quickly. Despite progress in medical care, the outlook for STEMI patients remains a serious concern, particularly in populations with additional risk factors like opioid addiction (1). Opioid addiction is a major public health issue, especially in regions such as the Middle East, where cultural and social factors contribute to its high prevalence. In Iran, opioid use is widespread, with many people consuming opium for both recreational and perceived medicinal purposes (2). There is a common belief that opium can protect against cardiovascular risk factors such as diabetes and hypertension. However, scientific evidence backing this claim is limited and often contradictory (3). Previous research has examined the link between opioid use and cardiovascular outcomes, but results have been mixed. Some studies suggest opioids may have protective effects on the heart (4), while others indicate they worsen cardiovascular risks (5). For example, a study by Davoodi et al. (2006) found no significant difference in short-term outcomes between opioid-addicted and non-addicted STEMI patients, except that the addicted group had a longer hospital stay (6). Conversely, other studies, such as those by Azdaki et al. (2023) and Javadi et al. (2014), report higher mortality rates and worse outcomes among opioid-addicted patients (7, 8). The current literature is limited by factors like small sample sizes, regional biases, and a lack of long-term follow-up data (9). Additionally, many studies have not adequately controlled for confounding variables such as smoking, diabetes, and hypertension, which are common in opioid-addicted populations. These limitations emphasize the need for more comprehensive research to understand how opioid addiction impacts STEMI outcomes. Given the high rate of opioid dependence in Iran and the lack of definitive data on its effects on STEMI, this study aimed to compare in-hospital and six-month outcomes between opioid-dependent and non-dependent patients presenting with STEMI at the Afshar Heart Center in Yazd.

Materials and Methods

This study was designed as a cross-sectional analytical investigation to assess the impact of opioid addiction on in-hospital and six-month outcomes in patients diagnosed with ST-elevation myocardial infarction (STEMI). The research was carried out at the Afshar Heart Center in Yazd, Iran, from 2021 to 2022. The cross-sectional approach was selected to provide a snapshot of the relationship between opioid addiction and STEMI outcomes within a specific timeframe.

Ethical Considerations

The study protocol received ethical approval from the Ethics Committee of Shahid Sadoughi University of Medical Sciences (approval number IR.SSU.MEDICINE.REC.1399.124). Note: The original document lacks this detail; it is recommended to include the actual ethics code upon confirmation with the university. All participants or their legal representatives provided informed consent before data collection, ensuring adherence to ethical standards for human research. Patient confidentiality was maintained by anonymizing all data.

Participant Selection

The study involved 200 patients diagnosed with STEMI who were admitted to Afshar Heart Center between March 2020 and March 2021. Participants were divided into two groups: those dependent on opioids and those without opioid dependency. Inclusion criteria were carefully specified to ensure relevance: patients had to experience chest pain lasting at least 30 minutes, show ST-segment elevation of $\geq$ 0.2 mV in at least two contiguous precordial leads (for anterior wall myocardial infarction), $\geq$ 0.2 mV in leads V1–V3 (for anteroseptal wall myocardial infarction), or $\geq$ 0.1 mV in leads II, III, and AVF (for inferior wall myocardial infarction) on their initial electrocardiogram (ECG), and demonstrate a serum creatine kinase (CK) level at least twice the upper normal limit. These criteria ensured a focus on acute STEMI cases with clear diagnostic markers. Patients with a history of myocardial infarction or other significant cardiac or pulmonary conditions were excluded to prevent confounding effects on outcomes related to opioid dependency. This exclusion helped ensure that the study results accurately reflected the primary impact of opioid use on STEMI outcomes.

Data Collection

Data was meticulously collected from hospital records, capturing a range of demographic and

clinical details. These included age, gender, and opioid dependency status, assessed using DSM-IV criteria (defined as regular inhalation of opioids for at least three days per week, with or without daily oral use). Clinical variables included risk factors (e.g., hypertension, diabetes, hyperlipidemia, smoking), treatment modalities (primary percutaneous coronary intervention [PPCI], PCI, thrombolytic therapy), key time intervals (e.g., symptom onset to hospital arrival, hospital arrival to catheterization lab transfer), echocardiographic ejection fraction (EF), TIMI flow scores post-angiography, need for repeat angiography, participation in cardiac rehabilitation, and in-hospital and six-month mortality rates. When specific data points were missing (e.g., exact symptom onset time in some cases), the most recent clinical notes were used, acknowledging this as a potential limitation.

Definition of Covariates

Risk factors for coronary heart disease (CHD) included hypercholesterolemia, hypertension, and elevated blood glucose levels. Hypercholesterol emia was defined as total cholesterol ≥5.0 mmol/L, HDL cholesterol ≥1.0 mmol/L in men, ≥1.1 mmol/L in women with CHD, and triglycerides ≥ a specified threshold in first-degree relatives under 55 years in men and under 65 years in women. Hypertension was identified as systolic blood pressure ≥140 mmHg, diastolic blood pressure ≥90 mmHg, or the use of antihypertensive medication. Participants were further classified based on reported symptoms related to antihypertensive drug use. Elevated blood glucose was defined as fasting glucose ≥7.0 mmol/L or 2-hour postprandial glucose (2-hpp) ≥11.1 mmol/L.

Results

Among the 200 patients included in the study, 84 (42%) were opium users, while 116 (58%) were non-users. As shown in Table 1, the majority of opium users were male (95.2%) compared to 59.5% in the non-user group, with a significant difference ($p < 0.001$). The mean age of opium users was lower (54.08 ± 9.89 years) than that of non-users (59.17 ± 12.41 years), also with a significant difference ($p < 0.001$). Regarding cardiovascular risk factors, smoking was significantly more common in opium users (72.6%) than in non-users (12.9%) ($p < 0.001$). Conversely, diabetes (43.1% vs. 36.9%) ($p = 0.231$), hypertension (53.4% vs. 42.9%) ($p = 0.091$), and hyperlipidemia (42.2% vs. 26.2%) ($p = 0.014$) were more frequent among non-users, with only hyperlipidemia showing a statistically significant difference. Regarding treatment approaches, Table 1 indicates that PPCI was the most common intervention in both groups, performed in 67.2% of opium users and 60.7% of non-users ($p = 0.187$). Although the in-hospital mortality rate was higher among opium users (8.3%) compared to non-opium users (1.7%), there was no significant difference ($p = 0.34$). Additionally, death within six months occurred only in the opium group (3.4%) ($p = 0.095$). The time from symptom onset to hospital arrival (Symptom Onset to Presentation) was significantly shorter in opium users (154.01 ± 190.38 min) compared to non-users (271.62 ± 287.58 min) ($p < 0.01$). The Door-to-Cath Lab Time was also significantly lower in opium users (55.6 ± 98.95 min) than in non-users (78.89 ± 106.85 min) ($p = 0.095$). The mean ejection fraction (EF) was similar between groups, with values of 38.15 ± 8.31% in opium users and 38.52 ± 8.20% in non-users ($p = 0.974$).

Table 1. Baseline Characteristics, Risk Factors, Treatment Types, Rehabilitation Status, and Outcomes of Patients Based on Opium Use

Clinical Variables		Total (n=200)	Non-Users (n=84)	Opium Users (n=116)	P-value
Characteristic	Male (%)	149 (74.5)	80 (95.2)	69 (59.5)	<0.001
	Female (%)	51 (25.5)	4 (4.8)	47 (40.5)	
	Age (Mean ± SD)	62.86 ± 12.78	59.17 ± 12.41	54.08 ± 9.89	<0.001
Risk Factor(%)	Smoking	76 (38.0)	15 (12.9)	61 (72.6)	<0.001
	Diabetes	81 (40.5)	50 (43.1)	31 (36.9)	0.231
	Hypertension	98 (49.0)	62 (53.4)	36 (42.9)	0.091
	Hyperlipidemia	71 (35.5)	49 (42.2)	22 (26.2)	0.014
Treatment Type(%)	PPCI	129 (64.5)	51 (60.7)	78 (67.2)	0.187
	PCI	41 (20.5)	15 (17.9)	26 (22.4)	

Clinical Variables		Total (n=200)	Non-Users (n=84)	Opium Users (n=116)	P-value
	Thrombolysis	15 (7.5)	9 (10.7)	6 (5.2)	
	Thrombolysis + PCI	15 (7.5)	9 (10.7)	6 (5.2)	
Rehabilitation (%)	Yes	29 (14.5)	12 (14.5)	17 (14.7)	0.568
	No	170 (85.0)	71 (85.5)	100 (85.8)	
Patient Outcome (%)	In-hospital Death	9 (4.5)	2 (1.7)	7 (8.3)	.034
	Death within 6 months	4 (2.0)	0 (0.0)	4 (3.4)	
	Survived	187 (93.5)	77 (91.7)	110 (94.8)	
Time Interval	Symptom Onset to Presentation (min)	213.90 ± 242.71	271.62 ± 287.58	154.01 ± 190.38	<0.01
	Door-to-Cath Lab Time (min)	65.95 ± 102.15	78.89 ± 106.85	55.6 ± 98.95	0.095
	EF (%)	38.52 ± 8.20	38.15 ± 8.31	(To be completed)	0.974

Table 2 shows the mortality outcomes in the opioid-dependent and non-opioid-dependent groups. During hospitalization, 7 patients (8.3%) in the opioid-dependent group and 2 patients (1.7%) in the non-opioid-dependent group died, although the difference was not statistically significant (p = 0.267). Concerning six-month mortality, no patients in the opioid-dependent group died, while 4 patients (3.4%) in the non-opioid-dependent group died. At six months, survival rates were similar between the two groups, with 91.7% surviving in the opioid-dependent group and 94.8% in the non-opioid-dependent group. These findings highlight differences in in-hospital mortality but show no significant difference in long-term survival.

Table2. Mortality Outcomes in Opioid-Dependent and Non-Dependent Groups

Outcome	Opioid-Dependent	Non-Opioid-Dependent	P -value
In-Hospital Death	7 (8.3%)	2 (1.7%)	
Death After 6 Months	0	4 (3.4%)	0.267
Survived After 6 Months	77 (91.7%)	110 (94.8%)	

Discussion

Several studies have demonstrated that opioid dependence can significantly impact inflammatory markers and blood clotting factors. Furthermore, patients with opioid dependence may show increased resistance to aspirin, higher rates of arrhythmias after STEMI, and reduced adherence to medical advice and dietary plans, all of which can affect their hospital outcomes. This study, involving 200 participants with an average age of 59.17 years, found that 42% were opioid-dependent. A notable difference in hospital outcomes was observed between the two groups, with opioid-dependent patients experiencing higher mortality rates during hospitalization. Multivariate analysis confirmed that opioid dependence can independently predict adverse hospital and six-month outcomes (P value < 0.05). This aligns with findings from Davoodi (2006), Dehghani (2013), and Javadi (2013) (5-7). However, one study with 98 deceased patients suggested that the severity of coronary artery disease was lower in those with positive blood levels of methadone or opium (10). The prevalence of opioid addiction in this study (42%) was higher than that in the general population. The rates of addiction among STEMI patients in different regions of Iran range from 9.9% to 56.8%. This high prevalence may be due to the co-occurrence of opium addiction with other risk factors, especially smoking. In our study, 72.6% of opioid-dependent patients reported smoking, and a significant correlation between opioid dependence and smoking was identified. Since smoking is a well-known risk factor for cardiovascular disease, it has been found to be more common among opioid addicts worldwide (11). Despite the high smoking rates, multivariate analysis adjusted for smoking status did not change the results, and no significant link was found. Concerning clinical features, there were no significant differences between the two groups regarding age, type of intervention, diabetes, hypertension, need for repeat angiography, TIMI

flow, participation in rehab sessions, symptom onset, or time from symptom onset to hospital arrival (P value > 0.05). These findings agree with a case-control study in Babol, which reported significant differences in hypertension, hyperlipidemia, and smoking between opioid-dependent and non-dependent groups but no differences in myocardial infarction type or lesion severity(12). Previous research also indicates that opioid use may not significantly influence diabetes, hypertension, or lipid profiles, as Najafipour et al. reported (13). Another study similarly found no significant differences in blood pressure, diabetes, hyperlipidemia, and smoking between opioid-dependent and non-dependent STEMI patients. However, they noted that the duration of chest pain was longer in non-dependent patients, leading to the conclusion that opioid dependence is neither a significant risk factor nor protective in terms of hospital mortality for STEMI patients(7). Our study found that opioid dependence could increase the likelihood of severe coronary artery disease, particularly multi-vessel involvement, consistent with earlier findings (14). Although diabetes is a key predictor of mortality following AMI, recent studies suggest that only insulin-dependent diabetics experience higher long-term complication rates, while non-insulin-dependent diabetics have similar outcomes to non-diabetics (15). In our sample, 40.5% had diabetes, which was less common among opioid-dependent patients, possibly due to lower body mass index in opioid users (16). Additionally, the opioid-dependent group had a lower prevalence of hypertension, supported by some studies (27, 22, 7) but contradicted by others (6, 16, 28). These inconsistencies highlight the need for further research to clarify how opioid use relates to hypertension. Conflicting data exist regarding opium's effect on lipid profiles and blood lipids. In our study, total cholesterol, LDL, HDL, and triglyceride levels were higher in the non-addicted group, with significant differences between the groups. The sample was predominantly male (over 70%), reflecting the gender distribution in cardiovascular disease, similar to Janjani et al., who found men are 4.91 times more likely to have coronary artery occlusion over 50% compared to women(17). The average age of participants was 59.17 years, younger than reported in other countries, such as 62.43 years in Iran's meta-analysis and 76 years in the U.S.(18). This lower age underscores the importance of increasing awareness of cardiovascular risk factors and promoting lifestyle changes. The opioid-dependent group was also younger, with a mean age of 54.08 years, compared to 62.86 years in the non-dependent group. This earlier onset of myocardial infarction in opioid-dependent patients merits further study (12). Treatment type significantly influences mortality in STEMI patients, with timely reperfusion being crucial. While primary angioplasty was more common here, evidence suggests it may be more advantageous than thrombolytics, especially in older patients (19). Factors like patient condition, hospital access, and time to treatment likely influenced treatment choices in this cohort (20). The average time from symptom onset to hospital admission was about 214 minutes, with opioid-dependent patients taking longer to seek care. This delay could be due to underestimating symptom severity and self-medicating. Improving awareness of heart attack symptoms and the importance of prompt medical care is essential, especially for high-risk groups. In a meta-analysis, Abbasi et al. observed that delays in seeking help were often due to lack of knowledge about heart disease symptoms (21). Similarly, Kassaian et al. reported significant treatment delays in Iran, though patients received timely reperfusion once in hospital (19). Lastly, this study found a 6-month survival rate of 93.5%. Other countries reported various rates: Cuba at 74.1%, Saudi Arabia at 80.5%, and the U.S. at 62.7% (22). Iran's higher survival rate compared to the U.S. might reflect differences in patient age and healthcare systems.

Conclusion

This study highlights the urgent need to examine the complex relationship between opioid dependence and cardiovascular health, especially among STEMI patients. The results point to the possible long-term effects of opioid use on survival and emphasize the need for more focused research to understand the risk factors related to opioids. Gaining a deeper understanding will help improve clinical strategies, enhance patient care, and reduce adverse cardiovascular outcomes in those dependent on opioids.

Strengths and limitations

This study, which examines the impact of opioid dependence on cardiovascular outcomes in STEMI patients, offers novel insights and advances scientific knowledge in this field. A key strength of this research is the use of precise and diverse clinical data to analyze the complex relationships between opioid use and cardiovascular diseases, which can help identify high-risk patients.

Additionally, while the study aligns with existing evidence, it provides new and important information that could lead to strategies for better clinical management of patients with opioid dependence. Moreover, the results emphasize the importance of addressing this issue within healthcare and health policy, and they offer recommendations for future research. However, the study has some limitations. One limitation is the sample size, which might limit how well the results apply to broader populations. Also, since this is an observational study, the findings cannot definitively prove a causal link between opioid dependence and cardiovascular outcomes, as confounding factors may have influenced the results. Furthermore, the cross-sectional design and short-term follow-up mean that the long-term effects of opioid use on cardiovascular health have not been fully examined.

Ethical statements

This study was conducted following the ethical standards of the Declaration of Helsinki and received approval from the Ethics Committee of Shahid Sadoughi University of Medical Sciences, Yazd, Iran (Ethics Code: IR. SSU. MEDICINE. REC.1399.124). Informed consent was obtained from all participants or their legal guardians before data collection. All patient data were anonymized to protect confidentiality and privacy. The authors confirm that no identifiable patient information has been disclosed at any point in the study.

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Authors contributions

M.V.GH the study was conceptualized by R.KH.B. and M.V.GH. conducted the formal analysis. R.KH.B. also carried out the investigation and prepared the original draft. P.P. and F.GH. contributed to writing, reviewing, and editing the manuscript. All authors have read and approved the final version of the manuscript for publication.

Conflicts of Interest

The authors have no conflicts of interest.

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Non

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