One-Year Outcomes of Patients with ST-Segment Elevation Myocardial Infarction

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A B S T R A C T

Objective(s): Cardiovascular diseases are becoming increasingly prevalent worldwide, resembling an epidemic. With industrialization and lifestyle shifts, more young individuals are experiencing acute myocardial infarctions. The objective of this study is to examine the one-year outcomes of acute myocardial infarction with ST-segment elevation among patients under 40 years old.

Methods: In this study, we included patients diagnosed with ST-Segment Elevation Myocardial Infarction (STEMI) who were referred to Imam Ali Heart Hospital in Kermanshah, as part of a prospective cohort study. Our objective was to determine the incidence of cardiovascular diseases, including heart attack, stroke, and mortality, among these patients.

Results: In this study, we examined 118 patients diagnosed with ST-Segment Elevation Myocardial Infarction (STEMI). Of these, 93.2% were male and 6.8% were female. The mean age of the participants was 34.81 years (standard deviation 4.79). During the one-year follow-up, no cases of stroke were observed among the patients. However, the prevalence of angina, heart failure (HF), and myocardial infarction (MI) among the patients was 15.3%, 7.6%, and 2.5%, respectively.

Conclusion: In the one-year outcomes of ST-segment elevation acute myocardial infarction in patients under 40 years of age, it was observed that the majority of individuals who died were smokers. This finding underscores the critical importance of addressing smoking as a significant risk factor, even when patients receive appropriate and timely medical care for ST-segment elevation myocardial infarction. Moreover, smoking can potentially render treatment measures ineffective. Therefore, the significance of screening for and addressing risk factors should not be underestimated.

Introduction

A major public health concern worldwide is the escalating burden of cardiovascular disease, which stands as the leading cause of death globally. Despite significant advancements in the diagnosis and treatment of cardiovascular diseases, it remains an ongoing epidemic. By 2030, the number of deaths attributable to heart disease and stroke is projected to reach 23.3 million (1-3). Among cardiovascular diseases, acute myocardial infarction (MI) holds the highest prevalence, affecting approximately 1.72% of the world's population. ST-Segment Elevation Myocardial Infarction (STEMI) primarily results from sudden coronary artery blockage or thrombosis.

According to recent global statistics and clinical

manifestations of MI, approximately 25-40% of acute myocardial infarction cases are associated with ST-segment elevation (4). Normally, an electrocardiogram (ECG) displays a smooth section, referred to as the ST segment. During a severe heart attack, the patient's ECG may exhibit two QRS complexes and a T wave connected, leading to an absence of smoothness and an elevated segment (5, 6).

In Iran, the incidence of cardiovascular diseases is on the rise (7). Evidence suggests a declining age of onset for this disease not only in Iran but also globally, attributed to industrialization, urbanization, and changes in dietary and behavioral patterns. Consequently, there's a notable prevalence of cardiovascular diseases among young individuals, particularly men, compared to the elderly and women, with hospital mortality rates ranging from 3% to 13.5% (8, 9). Cardiovascular diseases rank as the primary cause of death in Iranian patients over 35 (10, 11).

Given the limited research on young Iranian patients with STEMI, this study aimed to identify and examine the one-year outcomes of patients under 40 years old with acute STEMI at the Cardiovascular Disease Center of Kermanshah Heart Hospital. Additionally, we provided demographic information and clinical findings of the patients after one year.

Materials and Methods

In this study, patients who experienced ST-segment elevation myocardial infarction (STEMI) and were referred to Imam Ali Heart Hospital in Kermanshah, Iran, were enrolled in a prospective cohort study. The research protocol was registered at the Heart Research Center of Imam Ali Hospital in Kermanshah under the ethics code (KUMS. REC.1395.252).

After receiving appropriate treatment and being discharged from the hospital, the patients were followed up for one year. As per the study protocol, comprehensive patient information was recorded, including their condition after one year, age, gender, body mass index, smoking status, type of discharge, discharge history, presence of diabetes, hyperlipidemia, blood pressure, type of heart attack, and initial test results such as left ventricular ejection fraction (LVEF), fasting blood sugar (FBS), low-density lipoprotein (LDL), high-density lipoprotein (HDL), and creatinine.

Subsequently, the incidence of cardiovascular diseases (heart attack, stroke, and death) among these patients was investigated.

Data Analysis

The results were presented using descriptive statistics, indicating frequency (percentage) for qualitative variables and mean ± standard deviation or median (interquartile range) for quantitative variables. The independent t-test was employed to compare the means of quantitative variables between two groups, while the chi-square test was utilized to examine the relationship between qualitative variables. Data analysis was conducted using SPSS version 19 software. A significance level of less than 5% was considered statistically significant.

Results

In this study, 118 patients diagnosed with ST-segment elevation myocardial infarction (STEMI) and referred to Imam Ali Hospital in Kermanshah province were included. Among them, 93.2% (110 individuals) were male, while 6.8% (8 individuals) were female. The average age of the participants was 34.81 years (standard deviation 4.79), and the average body mass index (BMI) was 27.87 units (standard deviation 3.74). Table 1 presents the clinical records of the studied patients.

Additionally, 72 STEMI patients (61.02%) were identified as smokers, and 16 patients (13.56%) had hypercholesterolemia. Hypertension was present in 10.17% of the patients, while 6.78% had a history of myocardial infarction (MI). The prevalence of diabetes, history of percutaneous coronary intervention (PCI), history of stroke, and history of coronary artery bypass graft (CABG) was 5.93%, 3.39%, 0.85%, and 0.85%, respectively.

Initial Assessment of Qualifying ECG

Table 2 displays the results of the initial evaluation of Qualifying ECG in patients included in the study with STEMI. Among the patients, 55.93% (66 individuals) presented with Anterior STEMI, while 44.07% exhibited Other STEMI.

Examination of the Coronary Status of Patients

Table 3 presents the results of coronary examination in patients with STEMI. Among the patients, 0.85% exhibited left main stem (LMS) stenosis. Regarding the culprit vessel status, 35 patients (29.66%) did not present with a culprit vessel, while 52 patients (44.07%) had a culprit vessel of the left anterior descending artery (LAD) type, 16 patients (13.56%) had a culprit vessel of the right coronary artery (RCA) type, 8 patients (6.6%) had a culprit vessel of the left circumflex artery (LCX) type, and 5 patients (4.24%) had a culprit vessel of the obtuse marginal (OM) type. Additionally, stents were present in 75 patients (63.56%).

Table 1. Frequency of clinical characteristics of patients with STEMI

Patient Clinical History	N (%)
Systolic Blood Pressure	130.21 ± 22.56
Current Smoking	72(61.02)
Hypercholesterolemia	16(13.56)
Hypertension	12(10.17)
Previous MI	8(6.78)
Diabetes Mellitus	7(5.93)
Previous PCI	4(3.39)
Previous Stroke	1(0.85)
Previous CABG	1(0.85)

Table 2. Results of Qualifying ECG in STEMI patients

Presentation and Initial Assessment		N (%)
Qualifying ECG	Anterior STEMI	66(55.93)
	Other STEMI	52(44.07)

Table 3. Frequency of Patients According to Culprit Vessel

Details of Coronary		N (%)
LMS stenosis	Yes	1(0.85)
Type of Culprit Vessel	LAD	52(44.06)
	OM	5(4.24)
	LCX	8(6.78)
	RCA	16(13.56)
	Other	2(1.69)
	Total	83(70.34)
	No	35(29.66)
Stent	Yes	75(63.56)

Laboratory Findings of Patients during Hospitalization

Table 4 displays the descriptive statistics of laboratory factors for STEMI patients studied during hospitalization. The mean (standard deviation) blood pressure of patients with STEMI was 130.21 mmHg (22.56). Additionally, the initial hemoglobin level upon admission was 15.59 (1.8) units, while the hemoglobin level at discharge was 14.88 (2.28) units. Other laboratory factors are presented in Table 4.

Outcomes of STEMI Patients

After one year of follow-up, no strokes were observed among any of the patients. The prevalence of angina during the one-year follow-up period was 15.3%. Additionally, among patients with STEMI, the prevalence of heart failure (HF) and myocardial infarction (MI) was 7.6% and 2.5%, respectively. It is noteworthy that all patients who experienced MI survived.

During the one-year follow-up period, 6.8% of STEMI patients (8 individuals) died, all due to cardiovascular problems. Among them, 3 patients passed away outside the hospital, while 5 patients died within the hospital. The average age of deceased patients was 31.25 years, which was statistically significantly lower compared to the average age of surviving patients (35.06 years), with a p-value of 0.029. Notably, all deceased patients were male. No deaths were observed among female participants in the study after one year (p-value=0.99).

Based on Fisher's exact test, no statistically significant relationship was found between the smoking status of patients and the study outcomes. The death rates among smoking and non-smoking patients were 8.3% (6 individuals) and 4.3% (2 individuals), respectively, yielding a p-value of 0.48. Similarly, the rates of myocardial infarction (MI) among smoking and non-smoking patients were 1.4% (1 individual) and 4.3% (2 individuals), respectively, with a p-value of 0.56. Furthermore, the prevalence of angina was consistent between smokers (11 individuals) and non-smokers (7 individuals) at 15.3%. Notably, no deaths were observed among the 8 diabetic patients included in the study.

Table 4. Laboratory Data of Patients

	N	Minimum	Maximum	Mean±SD/Median (Q1-Q3)
Earliest Hemoglobin	116	8.5	20.4	15.59 ± 1.8
Last Hemoglobin	116	8.1	20.1	14.88 ± 2.28
First PLT	116	108	512	259.25 ± 72.53
LDL Cholesterol	109	32	295	113.62 ± 40.29
HDL Cholesterol	106	18	68	40.03 ± 9.71
Glocose Plasma Level(First value)	113	60	450	133.21 ± 72.64
Total Cholesterol(Highest value)	110	83	374	188.58 ± 53.35
Triglyceride	104	39	780	132.5(95.25-191)
Earliest Creatinine	116	0.80	11.80	1.035(1-1.1)
Highest Creatinine	112	0.80	11.80	1.1(1-1.2)
First CPK	102	84	10003	1200(441.5-2469.75)
Higest CPK	105	94	10003	1727(641-2850)
First CK-MB	112	13	270	19.5(16-26.75)
Higest CK-MB	116	15	405	89.5(35-180.25)
ESR	84	2	74	5(3-8.75)

Discussion

The present study aimed to investigate the one-year clinical outcomes of adults under 40 years old who were referred to Imam Ali Heart Hospital with ST-segment elevation myocardial infarction (STEMI).

In the presence of risk factors such as hypertension, hypercholesterolemia, glucose intolerance, diabetes, and smoking, the complications of cardiovascular disease (including death, heart attack, and cerebrovascular disease) can exacerbate. Notably, approximately 70% of patients with obstructive arteriosclerosis are smokers, and all patients with nearly obstructive thromboangiitis also have a smoking history.

From a statistical standpoint, being a smoker and having an unhealthy diet rich in fat may contribute to the increasing prevalence of ST-segment elevation myocardial infarction in young individuals. The most common risk factors observed in our study were smoking, hypercholesterolemia, hypertension, and diabetes. Studies have consistently shown that STEMI is more prevalent among smokers, and smoking often leads to STEMI at a younger age compared to non-smokers, with a higher mortality rate observed among smokers.

Interestingly, in our study, 61.2% of patients were smokers; however, no statistically significant relationship was found between the smoking status of patients and their one-year cardiovascular disease complications, a phenomenon known as the smoker paradox. This high percentage of smokers raises significant concerns for public health.

There are studies highlighting the association between dyslipidemia and the incidence of heart attacks in young individuals. In our study, 13.56% of participants had hypercholesterolemia. Additionally, diabetes is recognized as a significant factor leading to hospitalization among patients with acute myocardial infarction. Although 8 patients in our study had diabetes, no cases of cardiovascular complications, such as death, were observed in diabetic patients.

These findings are consistent with the study by Ding Q et al., which conducted a one-year follow-up on diabetic patients with myocardial infarction and found no increased risk of health deterioration. Ding Q and colleagues attributed this positive outcome to regular screening and modification of risk factors among diabetic patients with myocardial infarction.

A meta-analysis examining short-term follow-up periods suggested higher mortality rates among women with STEMI. However, a study by Helena Tizón-Marcos et al. reported significantly lower mortality rates in women during a one-year follow-up. Notably, our study did not report any cases of death among women [22].

It's important to note that direct comparisons with other studies may not be definitive due to differences in study populations. In our study, 93.2% (110 individuals) of patients were male, leaving only 6.8% (8 individuals) as women. Conversely, the study conducted by Helena Tizón-Marcos and colleagues included a predominantly female population with an average age of 60 years and above [22].

It's worth noting that in the present study, 63.56% of patients underwent stent implantation (Percutaneous Coronary Intervention - PCI). PCI is a recommended procedure for patients with STEMI as it activates reperfusion parameters, leading to improved long-term survival and patient recovery.

A pivotal observation during the one-year follow-up period in our study was the absence of any cases of stroke among the participants, despite the presence of other cardiovascular complications such as heart failure (HF) and myocardial infarction (MI) in 7.6% and 2.5% of patients with STEMI, respectively.

This significant finding underscores the effectiveness of strategies adopted by the hospital, including stenting, as well as the importance of follow-up and regular caregiving for patients. These measures likely contributed to the favorable outcomes observed during the one-year follow-up period.

Limitations

Firstly, it's crucial to acknowledge that this research was a single-center, prospective analytical study with a small sample size. This inherent limitation may have introduced selection bias and resulted in missing data, thereby potentially compromising the generalizability of the study findings.

Secondly, the study design did not account for the type of initial intervention received by patients following a heart attack, and patient follow-up was solely based on their one-year medical records. This limitation may have influenced the comprehensiveness of the data collected and the accuracy of the outcomes assessed.

Thirdly, while it's important to adjust for gender effects in the analysis, the disproportionately low number of female participants in this study poses a challenge. The limited representation of women may hinder the ability to draw meaningful conclusions regarding gender-related differences in outcomes.

Lastly, the effects of other comorbidities, such as diabetes, remain a subject of debate. The study may benefit from further exploration of these comorbidities and their potential impact on patient outcomes.

Conclusions

In this study focusing on patients under 40 years with ST-segment elevation myocardial infarction (STEMI), it is noteworthy that no cases of stroke were observed, which is a positive outcome. However, it's crucial to highlight that a significant proportion of deceased patients were smokers, underscoring the prime importance of addressing smoking as a major risk factor. Despite the provision of appropriate and timely medical care for patients with STEMI, certain risk factors such as smoking can undermine the effectiveness of treatment measures. Hence, it is imperative not to overlook the importance of screening for and correcting these risk factors. By addressing modifiable risk factors like smoking, healthcare professionals can enhance the efficacy of treatment strategies and improve patient outcomes.

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Conflicts of Interest

None

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