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Research Article

Mode of Referral and Time to Primary PCI in ST-Elevation Myocardial Infarction

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Abstract

Background: ST-elevation myocardial infarction (STEMI) is a critical emergency where timely reperfusion via primary percutaneous coronary intervention (PCI) is vital. Delays in treatment, particularly during referral or transfer, can severely worsen patient outcomes. ***Objective***: To evaluate transport modes and treatment delays among STEMI patients, focusing on critical intervals from pain onset to first medical contact (FMC) to electrocardiogram (ECG), ECG to PCI, FMC to PCI, and total ischemic time to evaluate factors influencing timely reperfusion and patient outcomes. ***Methods***: This retrospective study included 152 STEMI patients (25–97 years) at Shar Teaching Hospital, Sulaimani, from November 2024 to May 2025. Data on demographics, transport mode, and key time intervals (pain-FMC, FMC-ECG, ECG-PCI, FMC-PCI, and total ischemic time) were analyzed. ***Results***: Significant delays were observed in STEMI treatment processes and timelines. Pain to FMC averaged 11.08± 8.20 hours (13.8% < 30min). FMC to ECG was 9.68±2.99 min (71.7% <10min). ECG to PCI was 1.31±1.60hr (69.1% <1.0hr), and FMC to PCI was 1.46±1.59 hr (67.8% <1.5hr). Total ischemic time was 12.55±18.17 hr (4.6% <2.0 hr). Most patients (71.7%) arrived by private vehicles, while only 28.3% used Emergency Medical Services (EMS) transport, affecting outcomes. ***Conclusions***: The study identified major delays in pain-to-FMC and total ischemic times, mainly due to low EMS use. In-hospital times (FMC-ECG, ECG-PCI) met guidelines, indicating efficient hospital care. Enhancing EMS utilization and prehospital transport could further reduce delays and improve outcomes.

Keywords: Emergency department, Ischemic time, PCI, STEMI, Transport mode.

طريقة الإحالة والوقت إلى التدخل الاولي عن طريق الجلد في احتشاء عضلة القلب عند ارتفاع ST

الخلاصة

الخلفية: احتشاء عضلة القلب بارتفاع ST (STEMI) هو حالة طارئة حرجة حيث يكون إعادة التروية في الوقت المناسب عبر التدخل التاجي الأولي من طريق الجلد (PCI) أمرا حيويا. التأخيرات في العلاج، خاصة أثناء الإحالة أو النقل، يمكن أن تؤدي إلى تفاقم نتائج المرضى بشكل كبير. **الهدف**: تقييم أنماط النقل وتأخيرات العلاج بين مرضى STEMI، مع التركيز على الفترات الحرجة من بداية الألم إلى الاتصال الطبي الأول (FMC) إلى تخطيط القلب (ECG)، وتخطيط القلب إلى PCI، وFMC إلى PCI، والوقت الإقفاري الكلي لتقييم العوامل المؤثرة على إعادة التروية في الوقت المناسب ونتائج المرضى. **الطرائق**: شملت هذه الدراسة الاستعادية 152 مريضا ب STEMI (من 25 إلى 97 سنة) في مستشفى شار التعليمي في السليمانية، من نوفمبر 2024 إلى مايو 2025. تم تحليل بيانات عن التركيبة السكانية، ونمط النقل، والفترات الزمنية الرئيسية (الألم - FMC، FMC-ECG، ECG-PCI، FMC-PCI، والوقت الإقفاري الكلي). **النتائج**: لوحظ تأخير كبير في عمليات وجداول العلاج ب STEMI. متوسط الألم إلى FMC كان 11.08 ± 8.20 ساعة (13.8٪ < 30 دقيقة). كانت مدة FMC إلى 9.68±2.99 ECG دقيقة (71.7٪ <10 دقائق). كانت نسبة تخطيط القلب إلى 1.31±1.60 PCI ساعة (69.1٪ <1.0 ساعة)، وكانت نسبة FMC إلى 1.46±1.59 PCI ساعة (67.8٪ <1.5 ساعة). كان إجمالي وقت الإقفارية 12.55±18.17 ساعة (4.6٪ <2.0 ساعة). وصل معظم المرضى (71.7٪) بالمركبات الخاصة، بينما استخدم 28.3٪ فقط النقل عبر خدمات الطوارئ الطبية (EMS)، مما أثر على النتائج. **الاستنتاجات**: حددت الدراسة تأخير كبير في أوقات الألم إلى FMC وأوقات الإقفاري الكلي، ويرجع ذلك أساسا إلى انخفاض استخدام EMS. كانت أوقات المستشفى (FMC-ECG، ECG-PCI) تلبي الإرشادات، مما يشير إلى رعاية صحية فعالة. تعزيز استخدام خدمات الطوارئ الطبية والنقل قبل المستشفى يمكن أن يقلل من التأخير ويحسن النتائج.

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INTRODUCTION

ST-Elevation Myocardial Infarction (STEMI) is one of the most severe forms of acute coronary syndrome and requires immediate intervention to restore coronary blood flow and minimize myocardial damage. Rapid reperfusion, typically achieved through primary percutaneous coronary intervention [1], is associated with improved survival rates and reduced infarct size [2]. Current guidelines insist that the time from the onset of symptoms to reperfusion must be shortened. Primary PCI is recommended early in patients with STEMI who present within 12 h of symptom onset and with persistent ST-segment elevation or presumed new complete left bundle branch block on 12-lead ECG. It is a class-I recommendation and seriously backed up by a level of evidence. The guidelines also say that the delay from the first medical contact (FMC) to primary PCI must not exceed 2 hours for any STEMI patient and ought to be within 90 minutes in those who present within 2 hours of symptom onset or have extensive anterior STEMI with low risk of bleeding, an injunction that is supported by a class I recommendation and level of evidence [3]. Similarly, the American College of Cardiology and American Heart Association

guidelines suggest that STEMI patients presenting to hospitals capable of primary PCI stay in pairs from the start to the end, both within 90 minutes of FMC. Total ischemic time should be less than 120 minutes, according to the guidelines [4]. Delays in STEMI care occur due to factors such as pre-hospital care and method of transportation. One study found that patients brought to the hospital via Emergency Medical Service tend to have shorter reperfusion time compared with those brought in a private car, probably because the PCI team was activated and diagnostic ECGs were transmitted at a pre-hospital stage of their journey [5]. The key is to know that the recognition and treatment of patients with STEMI are done early: delays in first medical contact (FMC) and ECG acquisition bring inferior results [6]. Although international guidelines emphasize the critical importance of minimizing total ischemic time and optimizing each treatment interval in the management of ST-Elevation Myocardial Infarction (STEMI), much of the current evidence on transport modes, pre-hospital delays, and their impact on outcomes is drawn from settings with well-developed emergency medical services and established referral networks. In contrast, few studies have systematically analyzed these processes in the Kurdistan region of Iraq, where pre-hospital care infrastructure, patient awareness, and EMS usage patterns may differ substantially. The limited availability of local data creates a barrier to understanding and improving STEMI outcomes in this population. Therefore, the present study was conducted to fill this research gap by evaluating the patterns of transport, key time intervals, and factors influencing reperfusion delays among STEMI patients in Sulaimani. Findings from this analysis will provide critical insights to guide regional healthcare policy and practice and to identify targets for future quality improvement initiatives.

METHODS

Study design and setting

The present study is a retrospective cohort survey of 152 patients aged 25 to 97 (mean ± SD 56.96 ± 15.22 years) diagnosed with ST-elevation Myocardial Infarction (STEMI) who came to the Emergency Department (ED) and had percutaneous coronary intervention (Figure 1). The study took place at Shar Teaching Hospital, Sulaimani, Iraq, from November 2024 to May 2025. Upon hospital admission, patients were evaluated for key demographic and clinical characteristics, including age, gender, occupation, smoking and alcohol consumption habits, and relevant medical history. The mode of transport (private vehicle vs. emergency medical services) and presenting symptoms (e.g., chest pain, shortness of breath) were also documented. Additionally, past medical histories of hypertension (HTN), diabetes mellitus (DM), and ischemic heart disease (IHD) were collected, along with any family history of cardiovascular disease. The clinical status of patients at presentation was classified as either stable or unstable.

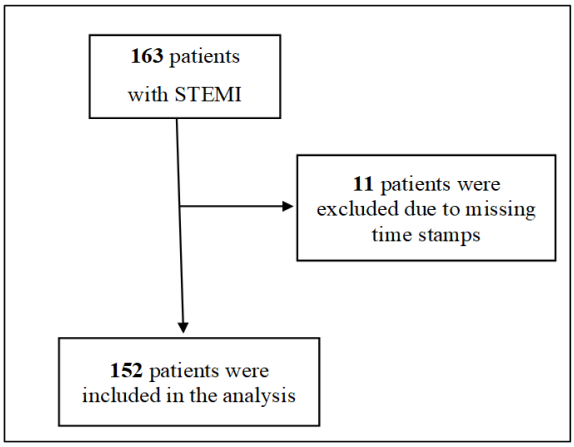

Figure 1. Flow chart of the study patients.

The study also focused on documenting key time intervals in accordance with Portuguese and international guidelines for STEMI management [4]. Pain to First Medical Contact (FMC): Time from the onset of chest pain to the arrival of emergency medical services or hospital admission. FMC to Electrocardiogram (ECG): Time from first medical contact to performance of the ECG. ECG to PCI: Time from completion of ECG to initiation of PCI. FMC to PCI: Time from first medical contact to PCI. Total Ischemic Time: Time from the onset of chest pain to PCI.

Data collection

Demographic and clinical data, including the aforementioned time intervals, were extracted from patient records and hospital databases. The study specifically aimed to analyze time delays in the treatment process and their potential impact on patient outcomes, particularly regarding timely reperfusion therapy in STEMI patients.

Calculation of Critical Time Intervals

Critical time intervals—including pain onset to first medical contact (FMC), FMC to electrocardiogram (ECG), ECG to percutaneous coronary intervention (PCI), FMC to PCI, and total ischemic time—were calculated by extracting standardized timestamps from patient charts and hospital records. Symptom onset was noted from patient or family reports at ED admission; FMC and ECG times were documented from EMS records or ED logs; PCI start time was taken from catheterization lab records. All intervals were computed as the difference between these time points, with checks for consistency and resolution of discrepancies by a senior investigator. This method provides reliable and comparable measurements with international STEMI studies.

Inclusion criteria

Patients aged 18 years or older, with a clinical and electrocardiographic diagnosis of STEMI, were included in the study.

Exclusion criteria

Patients with a history of prior myocardial infarctions, those diagnosed with non-ST elevation myocardial infarction (NSTEMI), patients who did not present within the clinically defined window for STEMI treatment, and individuals with insufficient recorded data were excluded from the study.

Ethical considerations

The study was conducted in accordance with the ethical guidelines and approved by the Ethics Committee of the College of Medicine, University of Sulaimani (Approval No.: 11340; Date: 8-7- 2025).

Statistical analysis

Data analysis was performed using the Statistical Package for the Social Sciences (SPSS, version 26). Descriptive statistics were utilized to summarize demographic and clinical characteristics. Continuous variables were expressed as means ± standard deviation (SD), and categorical variables were presented as frequencies and percentages. Chi-square tests were employed to compare categorical variables, and t-tests were used to analyze continuous variables. A *p*-value of < 0.05 was considered statistically significant.

RESULTS

The study encompassed 152 patients diagnosed with ST-Elevation Myocardial Infarction (STEMI), with ages ranging from 25 to 97 years (56.96 ± 15.22 years). Notably, 106 patients (69.7%) were over 50 years old, while 46 patients (30.3%) were aged 50 years or younger. In terms of gender distribution, male patients were overwhelmingly predominant, accounting for 135 patients (88.8%), while female patients comprised only 17 patients (11.2%) (Table 1).

Table 1: Sociodemographic profile of patients with ST-elevation myocardial infarction

Sociodemographic characteristics		Values
Age (year)	Mean±SD	56.96±15.22
	<50	46(30.3)
	>50	106(69.7)
Gender	Male	135(88.8)
	Female	17(11.2)
Occupation	Employed	32(21.1)
	Free worker	85(55.9)
	Housewife	13(8.6)
	Non-employed	22(14.5)
Residency	Rural	60(39.5)
	Urban	92(60.5)
Smoking status	No smoker	38(25)
	Smoker	114(75)
Alcoholic status	Alcoholic	18(11.8)
	Not Alcoholic	134(88.2)

Values are expressed as frequency, percentage, and mean±SD.

With respect to occupational status, the majority were categorized as free workers (85 patients, 55.9%), followed by employed patients (32 patients, 21.1%), non-employed patients (22 patients, 14.5%), and housewives (13 patients, 8.6%). Regarding place of residence, a relatively balanced distribution was observed, with 79 patients (52.0%) residing inside the city and 73 patients (48.0%) living in areas outside the city. A particularly noteworthy finding appeared concerning smoking habits: 114 patients (75.0%) were smokers, whereas only 38 patients (25.0%) reported being non-smokers. In contrast, the prevalence of alcohol consumption was low; 18 patients (11.8%) reported alcohol use, while the vast majority, 134 patients (88.2%), denied any alcohol consumption. In terms of past medical history (Table 2), 73 patients (48.0%) had a history of hypertension (HTN) alone.

Table 2: Clinical characteristics and prehospital information of patients presenting with ST-elevation myocardial infarction

Clinical characteristics		Values
Past medical history	HTN alone	73(48)
	HTN and DM	43(28.3)
	HTN and IHD	12(7.9)
	HTN, DM and IHD	9(5.9)
	Other	15(9.9)
Significant family history of heart disease	No	60(39.5)
	Yes	92(60.5)
Chief complain	Chest pain	134(88.2)
	SOB	12(7.9)
	Other	6(3.9)
Stability state	Stable	112(73.7)
	Unstable	40(26.3)
Doing troponin test	No	122(80.3)
	Yes	30(19.7)
Transport	EMS (Ambulance)	43(28.3)
	Private car	109(71.7)
Outcome	Alive	150(98)
	Died	3 (2.0)

Values are expressed as frequency and percentage. DM: Diabetes Mellitus; EMS: Emergency Medical Services; HTN: Hypertension; IHD: ischemic heart disease; n: Number of Patients; SOB: Shortness of Breath.

Additionally, 43 patients (28.3%) had both hypertension and diabetes mellitus (DM), 12 patients (7.9%) had a combination of hypertension and ischemic heart disease (IHD), and 9 patients (5.9%) presented with all three conditions: HTN, DM, and IHD. The remaining 15 patients (9.9%) reported other comorbid conditions. A significant family history of cardiovascular disease was documented in 92 patients (60.5%), while 60 patients (39.5%) had no such history, suggesting a substantial hereditary component within the cohort. Chest pain was the primary chief complaint among 134 patients (88.2%) who reported presence of symptoms. Among those, 115 patients (86.2%) experienced typical chest pain, while 19 patients (13.8%) presented with atypical symptoms. Additionally, 12 patients (7.9%) complained shortness of breath, and 6 patients (3.9%) reported other symptoms. In terms of clinical status at presentation, 112 patients (73.7%) were classified as stable, while 40 patients (26.3%) were considered unstable. Troponin testing was performed in only 30 patients (19.7%) before hospital admission, while the majority of 122 patients (80.3%) did not undergo the test. Although an electrocardiogram (ECG) was not explicitly recorded in the dataset, it remains a standard diagnostic tool in STEMI evaluation. Concerning mode of transport, 109 patients (71.7%) arrived at the hospital via private vehicles, while only 43 patients

(28.3%) utilized emergency medical service, highlighting the underuse of specialized pre-hospital care (Table 2). Finally, the in-hospital outcome was favorable for most patients, with 150 (98.0%) surviving the event, and only 3 patients (2.0%) succumbed to hospitalization. First, the Pain to First Medical Contact (FMC) time revealed a substantial delay, with an observed mean of 11.08 ± 18.20 hours, far surpassing the recommended 30 minutes. Remarkably, only 13.8% of patients were treated within the optimal time, highlighting a significant gap in early intervention. In contrast, the FMC-to-electrocardiogram (ECG) time showed more promising results, with an observed mean of 9.68 ± 2.99 minutes, well within the recommended 10 minutes. Encouragingly, 71.7% of patients received their ECG within the optimal window, reflecting an efficient diagnostic process once the patient made initial contact with medical services. However, when examining the ECG-to-PCI time, the observed mean of 1.31 ± 1.60 hours exceeded the recommended 1 hour and 20 minutes. Although 69.1% of patients underwent PCI within the target time, the delay suggests room for improvement in streamlining this critical phase of treatment. Similarly, the FMC-to-PCI time showed an observed mean of 1.46 ± 1.59 hours, surpassing the recommended 1 hour and 30 minutes. While 67.8% of patients received PCI within the target window, the delays in this crucial time period emphasize the need for more efficient systems and protocols to ensure timely reperfusion. Lastly, the total ischemic time was alarmingly high, with an observed mean of 12.55 ± 18.17 hours, far exceeding the recommended 2 hours. Only 4.6% of patients received treatment within the optimal ischemic window, underscoring the significant challenges in reducing ischemic time and achieving timely reperfusion in STEMI patients. As shown in Table 3 and Figure 2.

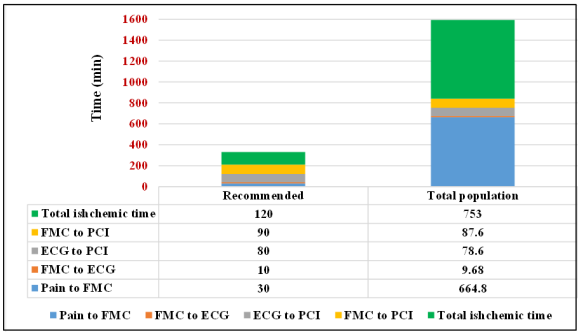

Figure 2: The mean times observed in the overall population were compared to the maximum recommended times. ECG: Electrocardiogram; FMC: First Medical Contact; min: Minute; PCI: Percutaneous Coronary Intervention; RT: Recommended Time.

DISCUSSION

Timely reperfusion is crucial in STEMI management, as delays in treatment are linked to higher morbidity and mortality. Early primary percutaneous coronary intervention [1]. Delays, often occurring in the pre-hospital phase, lead to longer ischemic times and compromised outcomes. Factors such as delayed symptom recognition and transport delays with private vehicle use are responsible for much of these periods [7].

Table 3: Mean times observed in the overall population were compared to the maximum recommended times

Time	Max RT	Observed	< Max RT (%)
Pain to FMC	0 hr. 30 min	11 hr. 5 min (11.08±18.2 hr)	13.8
FMC to ECG	0 hr.10 min	0. hr. 9.68 min (9.68±2.99 min)	71.7
ECG to PCI	1 hr. 20 min	1 hr. 18.6 min (1.31±1.60 hr)	69.1
FMC to PCI	1 hr. 30 min	1 hr. 27.6 min (1.46±1.59 hr)	67.8
Total ischemic time	2 hr. 00 min	12 hr. 33 min (12.55±18.17 hr)	4.6

ECG: Electrocardiogram; FMC: First Medical Contact; hr.: Hour; min – Minute; PCI: Percutaneous Coronary Intervention; RT: Recommended Time.

The intervals between symptom onset and first medical contact (FMC), and from FMC to reperfusion, are critical in determining patient prognosis. Studies consistently show that EMS transport leads to faster reperfusion times compared to private vehicle transport. Optimizing prehospital care and streamlining hospital workflows are essential for reducing delays and improving outcomes [8]. The present study assessed the impact of transport mode and time intervals on STEMI management at Shar Teaching Hospital, focusing on treatment delays and their effects on patient outcomes. In the present cohort, 71.7% of patients (n=109) arrived at the hospital by private vehicle, while 28.3% (n=43) used Emergency Medical Services (EMS). This finding is consistent with other studies, which have shown that, in general, private car transportation ranks highest for out-of-hospital transport needs. For example, a study from Türkiye and Iran found that 58.4% of patients were taken by EMS, while 41.6% used non-emergency medical services to get to the hospital [9,10]. Similarly, research conducted in Saudi Arabia revealed that just less than half (40.1%) of the patients were transported by ambulance, and the remaining 59.9% arrived by private vehicle [11]. Likewise, a study from Portugal found that 63.0% of the STEMI patients can get home by personal vehicle [12]. Prompt medical attention in the presence of arterial blockage is critical; underutilization of Emergency Medical Services (EMS) is still a significant challenge. However, the establishment of new reperfusion centers and efficient EMS protocols can shorten time to therapy compared with private transport. Only with a good EMS system can prepared cardiologists be at the other end ready to perform PCI in response to suspected MI; it helps get diagnostic information to hospitals more quickly, thus facilitating treatment for patients as soon as they get there. Self-transported patients may experience added delays due to traffic congestion and sequential triage procedures. These factors highlight the ongoing need for public education about early symptom recognition and the

advantages of EMS activation. Accessibility to emergency medical treatment is essential to prevent unnecessary delays and unfavorable outcomes. Emergency medical treatment must be available anywhere and without delay. This policy of isolating STEMI patients in order to obstruct their outcomes therefore delays their prognosis even further [13]. This is from the point of symptom presentation to the first diagnosis, or FMC. The literature shows that this delay is a great pity, so it is imperative in our interventional cardiology unit to be around the clock to take care of STE lactic patients [14]. Nevertheless, only 13.8% of patients throughout the country received early intervention on time, which is a large gap in early treatment. In one study looking at the proportion of STEMI patients that have PCI referred to them between 2003 and 2007, it was found that the standard time window for admission to hospital was observed for only 6% [12]. In a multicenter study across 30 countries, the time from symptom onset to first medical contact (FMC), defined more specifically as performing an ECG to determine if the patient has MI, varied from 60 to 210 minutes, while the time from first medical evaluation (FMC) to balloon ranged from 60 to 177 minutes. The delays in our study were approximately halfway between the extremes identified by this study, which took in data from diverse locations [15]. So that these delays were generally short stemmed from several causes, one of which is that all Emergency Medical Services (EMS) remain underused; more than 71.7% of driving patients, and therefore the initial record showed up, came by private vehicle. This finding is consistent with research that shows EMS transport shortens reperfusion times as opposed to private vehicle transport [16]. Another important factor is that approximately 39% of patients live in rural areas, perhaps requiring much extra time before reaching the hospital. Patients from rural areas might (on account of the much greater distances between hospitals and their homes and less use made by local residents of EMS) spend longer travel times. Geographic barriers should be considered in efforts to reduce response times and improve access to essential medical care for individuals residing in remote or outlying regions. In addition, the average time from FMC to ECG was 9.68 minutes, generally within recommended levels; 71.7% of patients got EKGs done within that optimal period. The diagnostic process appeared efficient following hospital arrival or upon the initiation of Emergency Medical Services (EMS) protocols, as shown by timely acquisition of electrocardiograms (ECGs) and activation of reperfusion strategies. Nevertheless, the average time taken from ECG to PCI admission remained high: 1.31 hours above the recommended limit of 80 minutes, with only 69.1 in every 100 patients able to meet this deadline. Delays here suggest more work needs to be done in the hospital/EMS system and among emergency action teams. FMC to PCI (Percutaneous Coronary Intervention) was approximately 1.46 hours, significantly longer than the recommended 90 minutes for patients arriving at the hospital within 2 hours of their symptoms starting. Although 67.8% of patients were treated within this staging time, another factor motivating a major review of hospital logistical and operational procedures is the length of time it takes for treatment to begin. On top of this, the total ischemic time was very long too. Averaging 12.55 hours, it was far beyond the optimal period of 2 hours. Just 4.6% of patients fell within ischemic time guidelines as well. This indicated that both prehospital and hospital treatment settings were markedly delaying the start of ischemia. Similar results have been reported by other studies where a longer ischemic period resulted in poorer patient outcome and higher mortality [4]. A study by Sousa *et al*. found that STEMI treatment in 16-time cities was significantly delayed from recommended times. When this study was conducted, the time from onset of pain to first medical contact (FMC) had a median of 1 hour and 45 minutes, with only 6% of such patients being treated in under 30 min. The time from ECG to PCI center was 1 hour and 34 minutes, with only 7% of such patients treated in the under 30-minute window. The total ischemic time was 4 hr. and 30 minutes, with only 3.7% of such patients undergoing PCI within the recommended 2 hr [12]. Yet other studies have emphasized that pre-hospital delays need to be curtailed when managing STEMI if outcomes are to improve. A study by Scholz *et al*. (2018) found that EMS transportation dramatically lowered the time to PCI, especially in regions that had well-developed EMS systems [17]. A study by Mehta *et al*. (2009) stressed that early recognition and treatment of STEMI, especially via EMS, significantly shortened ischemic times and improved survival rates [18]. These findings are consistent with the current study, where delays in the pre-hospital phase were a major contributor to prolonged ischemic times. In summary, this study reinforces the critical role of timely treatment in STEMI management. The underuse of EMS, combined with delays in both pre-hospital and hospital phases, resulted in prolonged ischemic times and suboptimal treatment. To improve outcomes, efforts should focus on increasing EMS utilization, optimizing hospital workflows, and enhancing public awareness of STEMI symptoms to encourage faster medical attention. Reducing pre-hospital delays, particularly through increased use of EMS, could significantly shorten ischemic times and improve the overall prognosis for STEMI patients.

Study limitations

This research has several shortcomings. First, by limiting subjects to one medical care center, the findings may not be applicable to other hospitals or regions. Reasons for delays in the pre-hospital phase were not fully investigated, such as patient factors or transportation problems, leaving questions about prolonged ischemic times unanswered. Where will the information come from? Moreover, the sample size may not be big enough to draw a complete picture of all STEMI cases, hindering the ability to identify any consistent factors contributing. Finally, because this was a retrospective study, it is possible that there could exist sources of bias in data collection,

especially from such areas as incomplete or missing patient records, which would in turn affect the accuracy of findings.

Conclusion

This study revealed that there were significant delays in the treatment of patients with STEMI, especially in the prehospital phase. Although treatment times once patients were admitted to the hospital met optimal standards and did not show time lags or delays when in transit, particularly because ambulances were underutilized. Therefore, it prolonged ischemic time. Improving the use of Emergency Medical Services (EMS), shortening transportation times, and increasing public awareness are all essential to greatly reduce ischemic times and improve patient prognosis.

Recommendation

Future research on the treatment of STEMI should have a regional collection of data from diverse centers. To reduce pre-hospital delays and ensure timely perfusion re-establishment order, enhance ambulance services by raising the use of Emergency Medical Service at all levels. Public relations work should emphasize early recognition of symptoms in order to encourage more prompt medical attention. Time from 'first medical contact' (FMC) to percutaneous coronary intervention (PCI) hospitals should improve their process for shortening. In particular, further study is needed to identify and eliminate specific barriers that are in the way that prevent treatment in the pre-hospital phase from being carried out on time.

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Conflict of interests

The author declares no conflict of interest.

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Data sharing statement

Supplementary data can be shared with the corresponding author upon reasonable request.

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