

Republic of Iraq

Ministry of Higher Education and Scientific Research

University of Thi-Qar

College of Medicine



Door to balloon duration for patients with acute chest pain to Al-Nasiriyah Heart Center, from Sep 2021 to April 2022.

Authors:

- Dehak Ali Ghalib Aziz
- Oula Khaldoun
6th year students 2021-2022 - Thi-Qar University / College of medicine

Supervisors:

- Prof. Dr Tahsin Ali Al-Kinani
Consultant cardiologist - Thi-Qar University / College of Medicine

Abstract

Background

Acute Myocardial infarction is a leading cause of death worldwide. Reperfusion therapy ,if accomplished within the time window, can save the patients. The ambulance response time in out-of-hospital ischemic chest pain has major impact on the prognosis of patient, even after having successful cardiac intervention.

Methods and Results

A cross sectional study enrolled on patients with STEMI admitted to Al-Nasiriyah Heart Center (NHC) from (Sep 2021) to (April 2022), assessing their initial ECG changes in addition to the time from symptoms onset to first medical contact, ambulance departure, and NHC arrival and the patient prognosis thereafter.

Most patients were from Nasiriyah district (22.2%) & Al-Shatra district (22.2%), and least from Al-Chibaysih & Al-Qalaa (5.6%). Longest durations for ambulance arrival were from Suq Al-Shuyukh (150 minutes) and Al-Chibaysih (120 minutes). Also, highest durations of ambulance arrival were in the morning and afternoon periods (6AM – 8PM)

Conclusions

Early referring of patients with acute myocardial infarction can greatly improve the prognosis after reperfusion therapy.

Keywords: Acute myocardial infarction, Primary PCI, Reperfusion therapy

Abbreviations

ACS	Acute coronary syndrome
CABG	Coronary artery bypass grafting
CCU	Coronary care unit
cTn	Cardiac Troponin
EMS	Emergency Medical System
LVEF	Left ventricle ejection fraction
MI	Myocardial Infarction
NHC	Nasiriyah heart center
PCI	Percutaneous coronary intervention
STEMI	ST elevation Myocardial Infarction

Dictation

To the ones who sacrifice their time & power for our success, our parents.

Index

Abstract	1
Abbreviations.....	2
Dictation	3
Index.....	4
List of tables.....	5
Introduction.....	6
Definition	6
Diagnosis	7
Reperfusion therapy	8
Aim of the study	9
Methodology	10
Results	11
Discussion	14
Strength.....	14
Limitation	14
Explanations	14
Conclusion	16
Recommendations.....	17
References.....	18

List of tables

Table 1 Patients according to gender	11
Table 2 Patients according to their age group	11
Table 3 Patients according to living district.....	11
Table 4 Patients according to their symptom's onset	12
Table 5 Patients according to ECG findings	12
Table 6 Durations (in minutes) for diagnosis after symptoms onset, ambulance departure after diagnosis and NHC arrival after ambulance departure according to district.....	12
Table 7 Durations (in minutes) for diagnosis after symptoms onset, ambulance departure after diagnosis and NHC arrival after ambulance departure according to time of day	13
Table 8 Patients according to their acute prognosis following primary PCI	13

Introduction

Definition

The term acute myocardial infarction should be used when there is acute myocardial injury with clinical evidence of acute myocardial ischemia and with detection of a rise and/or fall of serum troponin values with at least one value above the 99th percentile and at least one of the following:

- Symptoms of myocardial ischemia;
- New ischemic ECG changes;
- Development of pathological Q waves;
- Imaging evidence of new loss of viable myocardium or new regional wall motion abnormality in a pattern consistent with an ischemic etiology;
- Identification of a coronary thrombus by angiography or autopsy (not for types 2 or 3 MIs).

Post-mortem demonstration of acute athero-thrombosis in the artery supplying the infarcted myocardium meets criteria for type 1 MI¹.

Evidence of an imbalance between myocardial oxygen supply and demand unrelated to acute athero-thrombosis meets criteria for type 2 MI.

Cardiac death in patients with symptoms suggestive of myocardial ischemia and presumed new ischemic ECG changes before cTn values become available or abnormal meets criteria for type 3 MI.

Percutaneous coronary intervention (PCI) related MI is termed type 4 MI.

Coronary artery bypass grafting (CABG) related MI is termed type 5 MI

Worldwide, ischemic heart disease is the single most common cause of death and its frequency is increasing. However, in Europe, there has been an overall trend for a reduction in ischemic heart disease mortality over the past three decades². Ischaemic heart disease now accounts for almost 1.8 million annual deaths, or 20% of all deaths in Europe, although with large variations between countries³.

The mortality in STEMI patients is influenced by many factors, among them advanced age, Killip class, time delay to treatment, presence of emergency medical system (EMS)-based STEMI networks, treatment strategy, history of MI, diabetes mellitus, renal failure, number of diseased coronary arteries, and left ventricular ejection fraction (LVEF)⁴. Several recent studies have highlighted a fall in acute and long-term mortality following STEMI in parallel with greater use of reperfusion therapy, primary percutaneous coronary intervention (PCI), modern antithrombotic therapy, and secondary prevention. Nevertheless, mortality remains high⁵.

Although ischemic heart disease develops on average 7–10 years later in women compared with men, MI remains a leading cause of death in women.

Acute coronary syndrome (ACS) occurs three to four times more often in men than in women below the age of 60 years, but after the age of 75, women represent the majority of patients. Women tend to present more often with atypical symptoms, up to 30% in some registries, and tend to present later than men do. It is therefore important to maintain a high degree of awareness for MI in women with potential symptoms of ischemia.

Diagnosis

Initial diagnosis requires:

ECG monitoring

- 12-lead ECG recording and interpretation is indicated as soon as possible at the point of FMC, with a maximum target delay of 10 min ⁶.
- ECG monitoring with defibrillator capacity is indicated as soon as possible in all patients with suspected STEMI.
- The use of additional posterior chest wall leads (V7–V9) in patients with high suspicion of posterior MI (circumflex occlusion) should be considered.
- The use of additional right precordial leads (V3R and V4R) in patients with inferior MI should be considered to identify concomitant RV infarction.

Blood sampling

Routine blood sampling for serum markers is indicated as soon as possible in the acute phase but should not delay reperfusion treatment ⁷.

Treatment delays are the most easily audited index of quality of care in STEMI; they should be recorded in every system providing care to STEMI patients and be reviewed regularly, to ensure that simple quality of care indicators are met and maintained over time. If projected target times are not met, then interventions are needed to improve performance of the system.

The Components of the ischemic time, delays of initial management, and selection of reperfusion strategy are shown in next figure.

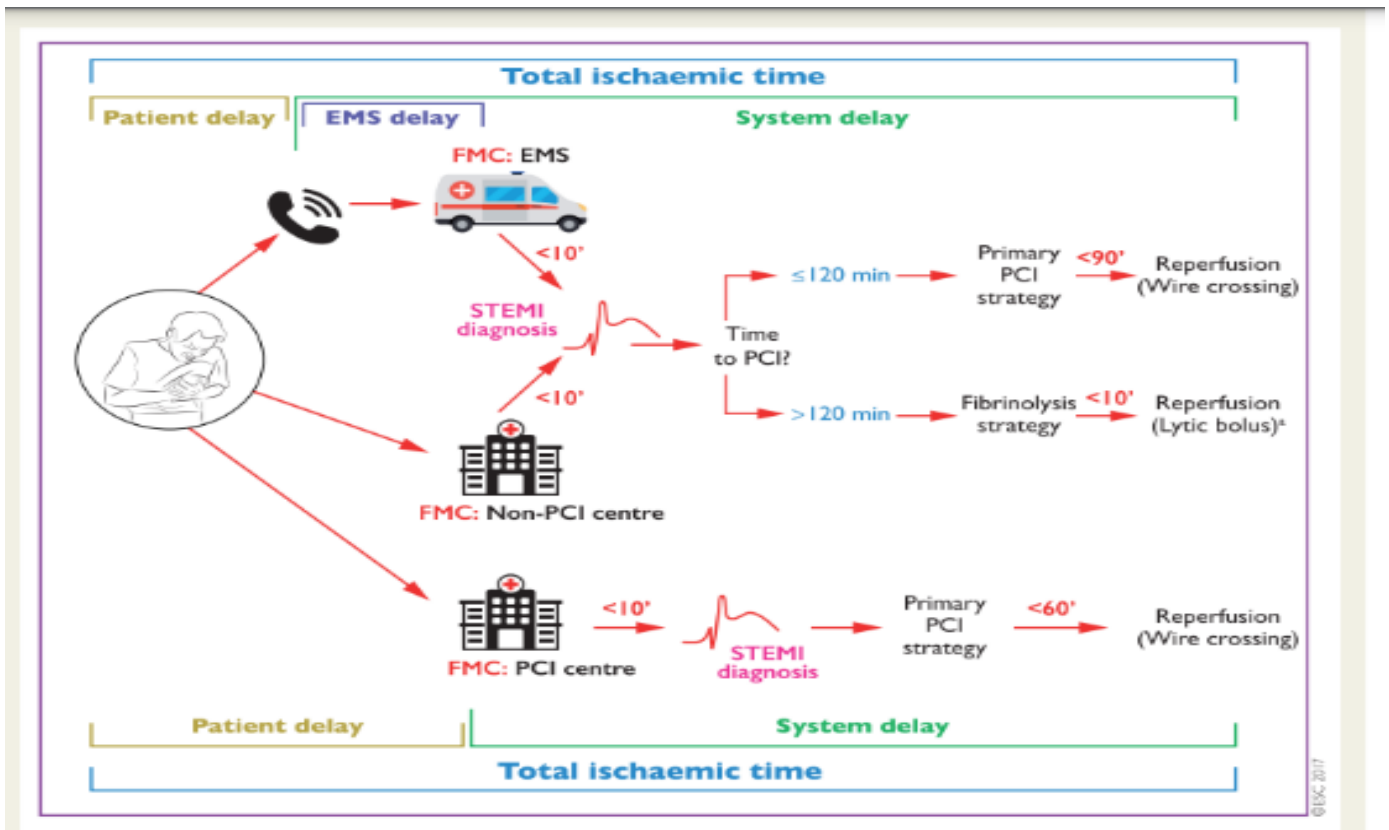


Figure 1 Components of the ischemic time, delays of initial management, and selection of reperfusion strategy

Reperfusion therapy

Primary PCI is the preferred reperfusion strategy in patients with STEMI within 12 h of symptom onset, provided it can be performed expeditiously (i.e. 120 min from STEMI diagnosis, (Figure 1) by an experienced team ⁸. An experienced team includes not only interventional cardiologists but also skilled support staff. Lower mortality rates among patients undergoing primary PCI are observed in centers with a high volume of PCI procedures ⁹. Real-life data confirm that primary PCI is performed faster and results in lower mortality if performed in high-volume centres. Randomized clinical trials in high volume, experienced centers have repeatedly shown that, if delay to treatment is similar, primary PCI is superior to fibrinolysis in reducing mortality, reinfarction, or stroke ^{10 11}.

The extent to which the PCI-related time delay diminishes the advantages of PCI over fibrinolysis has been widely debated. Because no specifically designed study has addressed this issue, caution is needed when interpreting available data from post hoc analyses. Registry data estimated this time limit as 114 min for in-hospital patients and 120 min in patients presenting in a non-PCI centre. All these data are old and patients undergoing fibrinolysis did not undergo routine early angiography, which improves outcomes in patients receiving fibrinolysis ¹².

Aim of the study

- This study is aiming for evaluating time of delivering patients with STEMI to primary PCI capable center.
- Assessing the possible causes for any delay in the patient diagnosis & referring.

Methodology

Type of study: cross-sectional

Duration of study: 8 months (Sep 2021 – April 2022)

Area of study: Al-Nasiriyah Heart Center

Sample of study: Patients undergoing primary PCI

Inclusion criteria:

- Acute symptoms of ischemic chest pain.
- ECG findings of STEMI.
-

Exclusion criteria:

- Patients without STEMI.

Study plan:

Patients that are admitted to the CCU of NHA were reviewed in the study duration, any who met the inclusion criteria were evaluated and history was taken regarding symptoms, residency & arrival time, prognosis was assessed by symptom relieve, ECG & Echo improvements after they primary PCI.

Statistical analysis:

Data obtained from patients were recorded in a spreadsheet using Excel 2021, then the records were converted to SPSS edition 26 and statistical measures were applied.

Results

Table 1 Patients according to gender

	Frequency	Percent
Female	25	27.8%
Male	65	72.2%
Total	90	100.0%

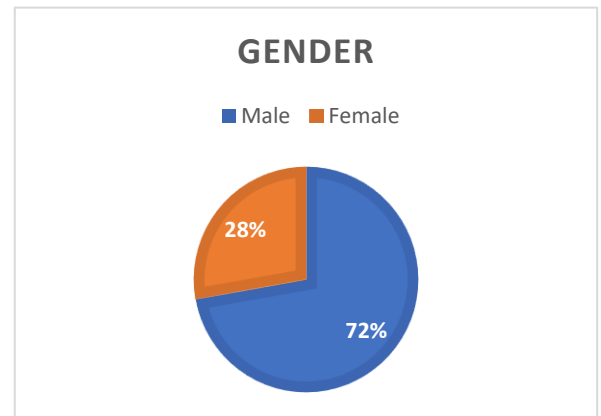


Figure 2 Patients according to gender

Table 2 Patients according to their age group

	Frequency	Percent
40-50 years	25	27.8%
51-60 years	25	27.8%
61-70 years	20	22.2%
71-80 years	15	16.7%
> 81 years	5	5.6%
Total	90	100.0%

Table 3 Patients according to living district

	Frequency	Percent
Basrah	5	5.6%
Al-Gharraf	10	11.1%
Al-Chibaysih,	5	5.6%
Nasiriyah	20	22.2%
Al-Qalaa	5	5.6%
Al-Rifa'i	15	16.7%
Al-Shatra	20	22.2%
Suq Al-Shuyukh	10	11.1%
Total	90	100.0%

Table 4 Patients according to their symptom's onset

	Frequency	Percent
Morning (6AM-12PM)	40	44.4%
Afternoon (12 PM – 8 PM)	35	38.9%
Evening (8PM – 12AM)	5	5.6%
Night (12AM-6AM)	10	11.1%
Total	90	100.0

Table 5 Patients according to ECG findings

	Frequency	Percent
Anterior STEMI	55	61.1%
Inferior STEMI	35	38.9%
Total	90	100.0%

Table 6 Durations (in minutes) for diagnosis after symptoms onset, ambulance departure after diagnosis and NHC arrival after ambulance departure according to district

	Symptoms to diagnosis			Diagnosis to ambulance			Ambulance to NHC		
	Mean	Maximum	Minimum	Mean	Maximum	Minimum	Mean	Maximum	Minimum
Basrah	300	310	290	20	20	20	85	90	80
Al-Gharraf	225	420	30	30	30	30	75	120	30
Al-Chibaysih,	180	185	175	120	125	115	75	75	75
Nasiriyah	105	300	30	57.50	120	5	40	75	25
Al-Qalaa	180	180	180	30	30	30	30	30	30
Al-Rifa'i	60	120	30	210	240	180	56.67	60	50
Al-Shatra	85	180	30	50	90	20	40	50	30
Suq Al-Shuyukh	45	60	30	100	150	50	95	120	70

Table 7 Durations (in minutes) for diagnosis after symptoms onset, ambulance departure after diagnosis and NHC arrival after ambulance departure according to time of day

	Symptoms to diagnosis			Diagnosis to ambulance			Ambulance to NHC		
	Mean	Maximum	Minimum	Mean	Maximum	Minimum	Mean	Maximum	Minimum
Morning	57.50	180	30	106.25	240	5	60.63	120	25
Afternoon	201.43	420	30	67.14	180	20	51.43	120	30
Evening	180	180	180	30	30	30	30	30	30
Night	45	60	30	70	90	50	50	70	30

Table 8 Patients according to their acute prognosis following primary PCI

	Frequency	Percent
Good	85	94.4%
Poor	5	5.6%
Total	90	100.0%

Discussion

Strength

This study focused the light on a very important aspect of a leading cause of mortality, acute myocardial infarction. As much as this disease is fatal, reperfusion therapy showed to lower the mortality to less than 5% when performed in time window ¹³.

NHC is a tertiary center capable for primary PCI, and is the only one in Thi-Qar state, therefore estimating delivery time is crucial for all patients in the state & neighboring areas.

Limitation

Of course, there were limitations in our study, one limitation is multiple translations to different health centers/hospitals before arrival to NHC. So it was complex to get the proper duration in ambulance transferring the patient, thus we took the last ambulance transfer where diagnosis confirmed and decision for primary PCI was made.

Another difficulty was in missed cases due to the fact our sampling was performed mainly in the CCU of NHC at daytime, so a minority of cases that admit and discharged/died at night are missed.

Another limitation was in a major factor of delay, which is slow traffic, that differs in holidays and work days.

Explanations

Most of patients were males (72.2%), while only (27.8%) were females, this is expected to the fact that males until the age of 55 years are more likely to develop atherosclerosis¹⁴.

Yet most patients in our study were in the 40-60 years age group (55.6%), this can be due to the fact that older patients may die to other illnesses (CVA) or die due to acute MI before arrival to NHC ¹⁵.

Most patients were from Nasiriyah district (22.2%) & Al-Shatra district (22.2%), and least from Al-Chibaysih & Al-Qalaa (5.6%). This expected due to the population size of those areas.

Regarding time of the days, most patients started their symptoms at the early morning (44.4%), this is due the increased adrenergic activity in the morning and going out to work ¹⁶.

Regarding duration of arrival to NHC based on location, nearly all Thi-Qar districts got an ambulance time of 40-95 minutes, which is under the time window of 120 minutes¹⁷, yet Suq-Al-Shuyukh got the longest trips. This can be explained due to the unpaved & crowded road between Suq & NHC.

A noticeable delay was in preparing & ambulance departure after confirming the diagnosis, as it took (20 minutes) in best occasions, and may reach even to 150 minutes (in Suq Al-Shuyukh) and 120 minutes (in Al-Chibaysih), this needs to be looked for as it might be due to low number of ambulances & increased need for referral, or due to the long administrative routine for arranging an ambulance and referring.

Also, to be noted, that highest durations of ambulance arrival were in the morning and afternoon periods (6AM – 8PM) where reaching up to 120 minutes, while the mean of ambulance arrival was low in the evening and night periods (8PM – 6AM) (30 minutes, 50 minutes respectively).

Regarding acute prognosis of patients underwent primary PCI, nearly all patients were in good prognosis (94.4%) while only (5.6%) had bad prognosis (regarding improvement in ventricular wall motion), and the latter were those with symptoms-to-diagnosis duration of more than 300 minutes.

Conclusion

We saw the effect early diagnosis and referring to a center capable of primary PCI in the prognosis of patients with acute myocardial infarction.

Delay in arranging referring ambulance was high, mostly in Suq-Al- Shuyukh & Al-Chibaysih.

High door-balloon durations were in the morning and afternoon periods, due to poorly paved roads & increased traffic.

Recommendations

- Patient awareness about symptoms & risk factors of myocardial infarction should be increased.
- ECG should be performed for patients with chest pain, especially if having risk factors & co-morbidities.
- Early arrangement of ambulance & facilitate referring routine can greatly reduce duration of arrival to NHC.
- Providing special access for ambulances during traffic times & improve the quality of roads, especially that are leading to all hospitals and NHC in special.

References

- ¹ Temporal trends in coronary heart disease mortality and sudden cardiac death from 1950 to 1999: the Framingham Heart Study. *Circulation*. 2004
- ² Acute ST-elevation myocardial infarction in patients hospitalized for noncardiac conditions. *J Am Heart Assoc*. 2013
- ³ Case definitions for acute myocardial infarction in administrative databases and their impact on in-hospital mortality rates. *Health Serv Res*. 2013; 48: 290-318
- ⁴ Algorithms for enhancing public health utility of national causes-of-death data. *Popul Health Metr*. 2010; 8: 9
- ⁵ Gersh, B.J., Kronmal, R.A., Frye, R.L., et al. Coronary Arteriography and Coronary Bypass Surgery: Morbidity and Mortality in Patients Age 65 Years or Older: A Report from the Coronary Artery Surgery Study. *Circulation* 67:483–491, 1983.
- ⁶ Riley RF, Miller CD, Russell GB, Soliman EZ, Hiestand BC, Herrington DM, Mahler SA. Usefulness of Serial 12-Lead Electrocardiograms in Predicting 30-Day Outcomes in Patients With Undifferentiated Chest Pain (the ASAP CATH Study). *Am J Cardiol*. 2018 Aug 01;122(3):374-380.
- ⁷ Alquézar-Arbé A, Sanchís J, Guillén E, Bardají A, Miró Ò, Ordóñez-Llanos J. Cardiac troponin measurement and interpretation in the diagnosis of acute myocardial infarction in the emergency department: a consensus statement. *Emergencias*. 2018 Oct;30(5):336-349.
- ⁸ Hlatky, M.A. Trends in Physician Management of Uncomplicated Acute Myocardial Infarction, 1970–1987 . *American Journal of Cardiology* 61:515–518, 1988.
- ⁹ Kent, K.H. Coronary Angioplasty. A Decade of Experience. *New England Journal of Medicine* 316:1148–1149, 1989
- ¹⁰ Skarkey, S.W., Burnette, D.D., Ruiz, E., et al. An Analysis of Time Delays Preceding Thrombolysis for Acute Myocardial Infarction. *Journal of the American Medical Association* 263:3171–3174, 1989.
- ¹¹ Weaver, W.D., Eisenberg, M.S., Martin, J. S., et al. Myocardial Infarction Triage and Intervention Project - Phase I: Patient Characteristics and Feasibility of Prehospital Initiation of Thrombolytic Therapy. *Journal of the American College of Cardiology* 15:925–931, 1990.
- ¹² White, H.D. Effects of Intravenous Streptokinase as Compared With That of Tissue Plasminogen Activator of Left Ventricular Function After First Myocardial Infarction. *New England Journal of Medicine* 320:817–821, 1989
- ¹³ Reperfusion Therapies for Acute ST Elevation Myocardial Infarction. Author links open overlay panel Harold L.Dauerman Prospero B.GogoJr Burton E. Sobel
- ¹⁴ Naghavi M, Abajobir AA, Abbafati C, et al., GBD 2016 Causes of Death Collaborators. Global, regional, and national age-sex specific mortality for 264 causes of death, 1980-2016

¹⁵ Gurwitz JH, Col NF, Avorn J. The exclusion of the elderly and women from clinical trials in acute myocardial infarction

¹⁶ Increased Morning Incidence of Myocardial Infarction in the ISAM Study: Absence With Prior f-Adrenergic Blockade. Stefan N. Willich, MD, Thomas Linderer, MD

¹⁷ Cannon CP, Gibson CM, Lambrew CT, et al. Relationship of symptom-onset-to-balloon time and door-to-balloon time with mortality in patients undergoing angioplasty for acute myocardial infarction

المقدمة

احتشاء عضلة القلب الحاد هو سبب رئيسي للوفاة في جميع أنحاء العالم. إعادة التروية للشرابين التاجية علاج فعال إذا تم إجراؤه ضمن الفترة الزمنية المحددة. الوقت السريع لتجهيز ووصول سيارة الإسعاف له تأثير كبير على حالة المريض الصحية حتى بعد التداخل القسطاري الناجح.

الوسائل والنتائج

اجريت الدراسة على مرضى احتشاء عضلة القلب الحاد مع ارتفاع مقطع (ST) في تخطيط القلب والذين ادخلوا في مركز الناصرية للقلب في الفترة من (أيلول ٢٠٢١) الى (نيسان ٢٠٢٢)، حيث تم تسجيل أعراض المرضى ووقت وصولهم للمستشفى أول مرة ووقت انتقالهم في سيارة الاسعاف الى مركز الناصرية للقلب.

أغلب المرضى كانوا من قضاء الناصرية (٢, ٢٢٪) والشطرة (٢, ٢٢٪)، فيما كانت الحصة الأقل لقضاء الجبايش والقلعة (٦, ٥٪ لكل منهما). أطول فترة تنقل لسيارة الاسعاف كانت من قضاء سوق الشيوخ (١٥٠ دقيقة) والجبايش (١٢٠ دقيقة). أيضاً أعلى معدل للفترة الزمنية لوصول سيارة الاسعاف كان في فترة الصباح وما بعد الظهر (٦ ص - ٨ م).

الاستنتاج

التحويل السريع لمرضى احتشاء عضلة القلب الحاد له تأثير كبير على استجابة المرضى بعد العلاج الاروائي والتدخل القسطاري.