



Assessment of time intervals from the moment of arrival in the emergency department until performing primary angioplasty in patients with acute myocardial infarction in Northwestern Iran

Yasin Hosseini¹, Amin Soheili², Kamal Khadem Vatani³, Azad Rahmani⁴✉

Background & Aim: Door-to-balloon time is an important variable on the extent of the necrotic area, the severity of cardiac damage and the consequences of primary angioplasty in patients with acute myocardial infarction. This study aimed to determine the time intervals from the moment of arrival in the emergency department until performing primary angioplasty in patients with acute myocardial infarction was performed. **Methods & Materials:** This descriptive cross-sectional study was performed on 191 patients with acute myocardial infarction treated by primary angioplasty in the Madani hospital of Tabriz and Seyed-al-Shohada hospital of Urmia. In this study the sampling method was convenient and the data gathering tools were included a researcher-made checklist containing 15 items related to demographic characteristics, history of disease and risk factors, type of transmission, type of pain and myocardial infarction, general condition and time actions and causes of delayed. After determining the validity and reliability of the tools, the data were collected and analyzed by statistical software Spss/16. **Results:** The mean age of participants was 57.41 ± 13.67 . The mean time interval from the moment of arrival in the emergency department until requesting of the primary angiography 66.62 ± 66.67 minutes, and from the moment of arrival in the emergency department until the transfer to the catheterization laboratory or Cath lab unit (Door-to-balloon) 76.15 ± 48.48 minutes were obtained. There was a significant difference between the type of acute myocardial infarction and the mean door-to-balloon time ($P = 0.008$). Also, there was no significant difference between the mean door-to-balloon time in the work shifts of the morning, evening and night ($P = 0.66$). **Conclusion:** The mean door-to-balloon time in patients with acute myocardial infarction referred to the cardiac centers in northwestern Iran was within the standard range.

INTRODUCTION

Coronary artery disease (CAD) is one of the most important health challenges in human societies (1). It is predicted that this disease will increase in rate of 120 percent in women and 137 percent in men in developing countries by 2020 (1, 2). Among coronary heart diseases, acute myocardial infarction (MI) is the most serious and fatal form of the disease, which is increasing significantly in developing countries (1, 3). The disease is characterized by stable changes in the ECG as ST segment elevation and release of myocardial necrosis biomarkers (4, 5). The most common symptom of acute myocardial infarction is an acute chest pain that can be felt constrictively in the middle of the chest or

epigastric region and in some cases it spreads to the arms, abdomen, back, mandible (lower jaw), and neck (6). In these patients, the most valuable goal of treatment in the early hours is to restore coronary blood flow as soon as possible (7-9). The therapies which are currently available in Iran, including Thrombolytic therapy (streptokinase, replace, alteplase) and primary angioplasty. Primary angioplasty has more advantages over thrombolytic therapy like better restoration of blood flow, locating the lesion and reducing hemodynamic complications (10). Results of a study showed that, after acute myocardial infarction the access rate of coronary artery flow restoration followed by streptokinase administration is almost 40% and followed by emergency angioplasty is almost 95% if it would be done before or maximum 90 minutes after getting the patient to hospital (11) and considering to this reason, currently, the primary and effective treatment in most of the advanced countries is emergency angioplasty (12, 13). Evidences show that the duration of ischemia and the delay in the onset of primary angioplasty are the determinant factors in the success of this therapeutic approach to the restoration of perfusion and its clinical consequences in patients with acute myocardial infarction (14, 15). In

¹MSc Student in Emergency Nursing, Dept. of Medical Surgical Nursing, School of Nursing & Midwifery, Tabriz University of Medical Sciences, Tabriz, Iran, Email: yasin2012h@gmail.com; ²PhD Candidate in Nursing, Student Research Committee, Dept. of Medical Surgical Nursing, School of Nursing & Midwifery, Tabriz University of Medical Sciences, Tabriz, Iran, Email: soheili.a1991@gmail.com; ³Associate Professor of Cardiology, Department of cardiology faculty of Medicine, Urmia University of Medical Sciences, Urmia, Iran, Email: Khademvatan2002@yahoo.com; ⁴Associate Professor, Center, Dept. of Medical Surgical Nursing, School of Nursing and Midwifery, Tabriz University of Medical Sciences, Tabriz, Iran; (Corresponding Author) Email: azad.rahmani@yahoo.com

these patients, the duration of the onset of symptoms until the start of treatment is checked in two separated periods, from the onset of symptoms to the arrival of the patient to the hospital, "the onset of the symptoms-arrival to emergency department" and from the time the patient enters until the insertion of the stent "door- to- balloon" (16). Therapeutic measures that have been done to reduce the time of coronary artery blood flow restoration were in the second period (after arrival the patient to the emergency department). Because reducing the duration of the first period (the onset of symptoms till the arrival of the patient to the emergency department or the ED) is affected by many factors and it is very difficult in reality, and the focus on reducing this period is not efficient (17). Therefore, considering the importance of time in treatment of acute myocardial infarction with primary angioplasty, and because the period of "door- to- balloon" was the most important criterion in primary coronary intervention in the last decade and is included as a key criterion of the national guidelines of many countries (18, 19); this study was done to measure the time intervals from the arrival of patients to the medical centers until primary angioplasty and some of the clinical factors affecting it.

METHOD

This descriptive cross-sectional study was performed on 191 patients with acute myocardial infarction treated by primary angioplasty in the Madani hospital of Tabriz and Seyed-al-Shohada hospital of Urmia in 2017. In this study, all of the subjects were selected through the convenient sampling method. Sample size by using of Gharakhani and et al study (20), with a power of test 0.8 and the level of significance 0.05 and finally with considered the possibility of 10% attrition in the follow-up period was estimated 191 patients. Inclusion criteria included were confirmation of acute myocardial infarction with ST-segment elevation by the physician with the record in the clinical document, physical and psychological (cognitive) abilities of the patient to participate in this studying and answering questions, residency in the city of Urmia or Tabriz and give informed consent to participate in the study.

In this study, data gathering tools were included a researcher-made checklist containing 15 items related to demographic characteristics, history of disease and risk factors, type of transmission, type of pain and myocardial infarction, general condition and time actions and causes of delayed.

To determine the validity of the data collection tool, face content validity was utilized, so that the tool was provided to 10 qualified nursing and medical professors in the heart area and after receiving comments, the necessary amendments were made, and again, by five of the aforementioned professors were reached final confirmation. After confirming of validity, the reliability of the data collection tool through the internal consistency and by using Cronbach's alpha with a sample of 15 patients who were not the main research component, 89% was obtained.

In this study, the researcher completed the data collection tool through the question from the patient or his / her family, the study of medical records, and emergency registration forms. Also, how to calculate the time interval from referring to the medical center until intervention was measured by the time of computer admission until the record intervention request time.

After getting permission from the research-technology deputy and the Regional Ethics Committee of Tabriz University of Medical Sciences (code No. 22.35), the researcher with coordination the nursing offices and the authorities of emergency departments and cardiac care units acted to sampling and data collection. The researcher, after

introducing himself to the research subjects and explaining the objectives, received informed consent from them and assured that the information obtained would remain confidential.

Data analysis was performed using descriptive statistics (mean and standard deviation). After examining the normal distribution of variables by Kolmogorov test, nonparametric tests (Mann-Whitney, Kruskal-Wallis and Spearman correlation) were used. SPSS software version 16 was used for data analysis. Also, the significance of the data was set at the p-value of 0/05.

RESULTS

In total, 191 patients with acute myocardial infarction treated with primary angioplasty with an average age of 57.41 ± 13.66 participated in this study, which 79.1% were male. Also the most commonly diagnosed acute myocardial infarction was anterior (Table 1). Table (2) shows the intervals from the moment of patient arrival until performing the primary angioplasty by the separate steps taken. In total, the mean time interval from the moment of arrival in the emergency department until requesting of the primary angiography (66.62 ± 66.67) minutes, and from the moment of arrival in the emergency department until the transfer to the catheterization laboratory or cath lab unit (76.15 ± 48.48) minutes were obtained.

The mean time interval from the moment of arrival of patients to the cardiac centers until the determination of treatment in the emergency department, (21.24 ± 14.94) was obtained, that based on the average percentage share of time intervals, the greatest proportion were related to the time interval between visit of the emergency physician until the relevant service visit (22%) and the time interval between the relevant service visit until the determination of treatment in the emergency department (41%), Figure (1).

In the present study, the mean door-to-balloon time in male and female patients was 71.45 ± 68.59 and 93.89 ± 93.93 minutes respectively. According to Mann-Whitney test, there was no significant difference in mean door-to-balloon time between male and female patients ($P = 0.52$). Also, based on the Spearman correlation test, there was no significant correlation between age of patients and the mean door-to-balloon time ($p = 0.23$, $r = 0.08$).

The Kruskal Wallis statistical test showed a significant difference between the type of myocardial infarction and the mean door-to-balloon time ($P = 0.008$). This mean time in patients with acute anterior MI (63.73 ± 49.49), acute inferior MI (102.54 ± 111), acute lateral MI (146.83 ± 13.13), extensive MI (54.56 ± 26.83), acute anterolateral MI (67.9 ± 36.36), acute inferior-posterior MI (45 ± 22.17), right ventricular posterior- inferior MI ($35/15 \pm 35/44$), right Inferior ventricle MI ($14/66 \pm 75/74$) and), anteroseptal acute MI ($95/95 \pm 70/102$) were obtained.

Among the mean of the three time intervals: from the moment of arrival of patients to the cardiac centers until the determination of treatment in the emergency department ($P = 0.95$); from the moment of arrival in the emergency department until requesting of the primary angiography ($P = 0.60$); and door-to-balloon time ($P = 0.06$), in the work shifts of the morning, evening and night, no significant difference was found Table (3).

DISCUSSION

Based on the results of this study, the mean time interval from the moment of arrival of patients to the cardiac centers until the determination of treatment in the emergency department was 21.24 ± 14.94 . Despite the fact that the longest part of this period is devoted to the time interval between a physician visit to determine the patient's

Table 1 Comparison of qualitative demographic characteristics of research units		
	Variables	Frequency (percent)
Gender	Female	(79/1)151
	Male	40 (20/9)
Marital status	Single	2 (1)
	Married	170 (89)
	Widow	19 (9/9)
Place of living	Urban	150 (78/5)
	Village	41 (21/5)
Level of Education	Illiterate	22 (11/5)
	Reading Writing	49 (25/7)
	Under the diploma	42 (22)
	diploma	46 (24/1)
	Academic degree	32 (16/8)
Type of myocardial infarction	Anterior	71 (37/2)
	Inferior	33 (17/3)
	Lateral	12 (6/8)
	Extensive	11 (5/8)
	Anterolateral	10 (5/2)
	Inferior-Posterior	6 (3/1)
	Right Ventricular Posterior- Inferior	14 (7/3)
	Right Inferior Ventricle	29 (15/2)
	Anteroseptal	4 (2/1)

Table 2 The mean time intervals from the moment of patient arrival until performing the primary angioplasty

Time intervals	Minimum	Maximum	Mean $\pm$ SD (min)
Entrance to the triage	1	3	1/19 $\pm$ 0/42
Duration of hospital triage	1	4	1/36 $\pm$ 0/56
Triage until emergency physician visit	1	25	2/20 $\pm$ 2/08
Visit of the emergency physician until performing the treatment	1	10	3/15 $\pm$ 1/77
Visit of the emergency physician until the relevant service visit	1	15	4/58 $\pm$ 2/48
Relevant service visit until the determination of treatment	1	50	8/32 $\pm$ 7/09
From the moment of arrival of patients to the cardiac centers until the determination of treatment in the emergency department	7	174	21/24 $\pm$ 14/96
From the moment of arrival in the emergency department until requesting of the primary angiography	3	532	37/66 $\pm$ 62/66
From the moment of arrival in the emergency department until the transfer to the catheterization laboratory or cath lab unit (Door-to-balloon)	18	592	76/15 $\pm$ 71/48

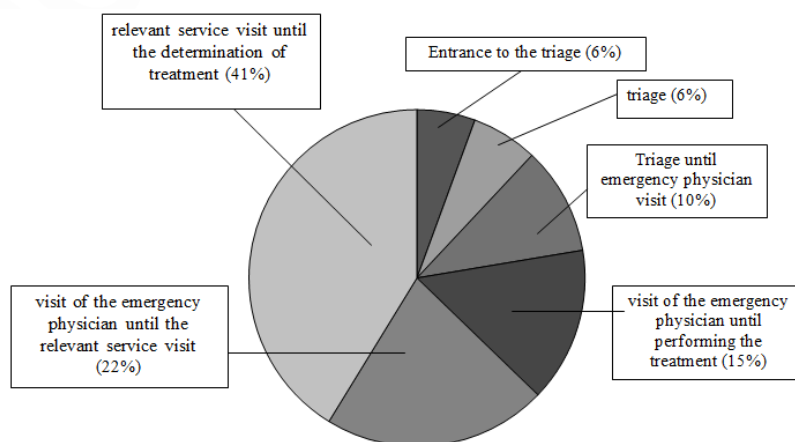


Figure 1 Share of time intervals from the moment of arrival of patients to the cardiac centers until the determination of treatment in the emergency department

Table 3 Comparison of the mean time intervals (min) in the different work shifts

Intervals (min)	Work shifts	Mean $\pm$ SD (min)			Kruskal Wallis
		Morning	Evening	Night	
From the moment of arrival of patients to the cardiac centers until the determination of treatment in the emergency department		21/64 $\pm$ 17/84	20/69 $\pm$ 9/37	20/78 $\pm$ 11/24	P = 0.95
From the moment of arrival in the emergency department until requesting of the primary angiography		38/73 $\pm$ 68/76	40/62 $\pm$ 69/93	31/98 $\pm$ 33/24	P = 0.60
From the moment of arrival in the emergency department until the transfer to the catheterization laboratory or cath lab unit (Door-to-balloon)		74/95 $\pm$ 79/25	78/97 $\pm$ 73/96	76/38 $\pm$ 43/77	P = 0.06

treatment and the final decision for primary angioplasty, In sum, this mean time seems appropriate for attending a physician, checking the clinical manifestations and diagnostic and para-clinical tests. For performing primary (emergency) angioplasty, facilities such as equipping catheterization laboratory and expert personnel and hospital operator is required, which all in all can return the blood flow to the blocked artery in less than 90 minutes after the arrival of the patient to the hospital and this time interval is called a door to balloon time(21). In this study, the mean time interval from the arrival of patients to ED till be transferred to the catheterization unit for primary angioplasty was 76.15 ± 71.48 which was standard and acceptable. The "door- to-balloon" time interval is an important variable on the extent of the necrotic area, the severity of cardiac tissue damage, and the consequences of primary angioplasty in patients with acute myocardial infarction(22). In a study by Fallah (1394) which was done in three educational hospitals in Tehran, the mean of this time interval was 10.46 ± 62.37 which was 14.16 minutes more than the standard time(21); while the mean of this interval in this study was estimated 13.85 minutes less than the standard time. In explanation of this finding, several factors can affect, which one of the most important of them is the time(14). This study was carried out two years after the study of Fallah, which the facilities and equipment, personnel skills and people awareness of timely referring to the medical centers may be improved over the time. The results of Mentias study (2015), also showed that over the time, the time period of "door- to- balloon" dropped from 135 minutes in 2009 to 38 minutes in 2014(23). In this study, the mean time of "door- to-balloon" in patients with lateral and inferior acute myocardial infarction was higher than other types and was much higher than standard time. This finding may be due to limitations of the ECG and its correct interpretation by the physician and the medical personnel. In order to reduce this time interval and reach the accepted standard, ECG should not be used as the only diagnostic tool for heart diseases, because many heart diseases cannot be diagnosed by the ECG (24). Measures that can reduce the rate of failures in these patients included patient history and accurate patient examination, along with request for specific tests and serial ECG (24, 25). In this study, there was no significant statistical difference between the mean time of "door- to- balloon" in morning, evening and night shifts. But the results showed that this time period was two to three minutes lesser in the morning shift in comparison with the evening and night shifts. In explanation of the finding reason, some cases such as the presence of a physician, the presence of experienced staff, adequate facilities, and a suitable and comfortable coordination for giving the medical treatments and cares for the patient in the morning shift in comparison with other shifts can be pointed out.

One of the most important limitations of this study was the gender composition of the samples. Because most of the samples in this study

were women, It is suggested that a study with a wider time period and the same gender composition would be done so that it is possible to compare the time of "door-to-balloon" between male and female patients and the factors affecting it in each of them.

CONCLUSION

Despite the fact that the mean time of "door- to- balloon" in patients with acute myocardial infarction referred to cardiac centers was within the standard range; but this time interval was longer than the standard time in patients with lateral and inferior acute myocardial infarction. It seems that carrying out similar studies on a large scale for checking the time interval between "door- to- balloon" and effective factors on it in these patients is particularly necessary, which with identifying the affective factors that leading to reducing the complications of the disease led to the improved of the quality of life and increased the longevity of these patients.

REFERENCES

- Ahmadi A, Sajjadi H, Etemad K, Khaledifar A, Mobasherii M. Epidemiological characteristics and determinants of mortality in acute coronary syndrome in Iran. *J Mazandaran Univ Med Sci*. 2015;25(124):1-9.
- Panahi M, Yavari P, Khalili D, Mehrabi Y, Hadaegh F, Azizi F. The Risk of Chronic Kidney Disease and Metabolic Syndrome in the Incidence of Coronary Heart Disease: Tehran Lipid and Glucose Study. *IJE*. 2014;9(4):10-20.
- Bashar FR, Vahedian-Azimi A, Mahmood Salesi SM, Zijoud H. The Effect of Progressive Muscle Relaxation on the Outcomes of Myocardial Infarction: Review Study. *Journal of military medicine*. 2017;19(4):326-35.
- Rahmani A, Mohammadi A, Moradi Y. Effectiveness of Scenario-based Education on the Performance of the Nurses in the Critical Cardiac Care Unit for Patients with Acute Coronary Syndrome. *Int J Med Res Health Sci*. 2016;5(8):218-24.
- Thygesen K, Alpert JS, Jaffe AS, Simoons ML, Chaitman BR, White HD. Third universal definition of myocardial infarction. *Glob Heart*. 2012;7(4):275-95. DOI:10.1016/j.ghheart.2012.08.001.
- Kurich T, Lasiuk GC, Norris CM. Acute Coronary Syndromes Symptom Presentation Among Persons of South Asian Descent: A Comprehensive literature Review. *Can J Cardiovasc Nurs*. 2017;27(1).
- Dracup K, McKinley SM, Moser DK. Australian patients' delay in response to heart attack symptoms. *Med J Aust*. 1997;166(5):233-6.
- Nallamotheu BK, Normand S-LT, Wang Y, Hofer TP, Brush JE, Messenger JC, et al. Relation between door-to-balloon times and mortality after primary percutaneous coronary intervention over time: a retrospective study. *Lancet*. 2015;385(9973):1114-22. DOI:10.1016/S0140-6736(14)61932-2.

9. Shahin M, Obeid S, Hamed L, Templin C, Gamperli O, Nietlispach F, et al. Occurrence and Impact of Time Delay to Primary Percutaneous Coronary Intervention in Patients With ST-Segment Elevation Myocardial Infarction. *Cardiol Res.* 2017;8(5):190-8. DOI:10.14740/cr612w.
10. Motlagh B, O'Donnell M, Yusuf S. Prevalence of cardiovascular risk factors in the Middle East: a systematic review. *Eur J Cardiovasc Prev Rehabil.* 2009;16(3):268-80. DOI: 10.1097/HJR.0b013e328322ca1b.
11. Moser DK, Kimble LP, Alberts MJ, Alonzo A, Croft JB, Dracup K, et al. Reducing delay in seeking treatment by patients with acute coronary syndrome and stroke a scientific statement from the American heart association council on cardiovascular nursing and stroke council. *Circulation.* 2006;114(2):168-82. DOI: 10.1097/01.JCN.0000278963.28619.4a.
12. Melberg T, Jørgensen M, Ørn S, Solli T, Edland U, Dickstein K. Safety and health status following early discharge in patients with acute myocardial infarction treated with primary PCI: a randomized trial. *Eur J Prev Cardiol.* 2015;22(11):1427-34. DOI:10.1177/2047487314559276.
13. Nallamothu BK, Bates ER. Percutaneous coronary intervention versus fibrinolytic therapy in acute myocardial infarction: is timing (almost) everything? *Am J Cardiol.* 2003;92(7):824-6.
14. Dudek D, Rakowski T, Dziewierz A, Mielecki W. Time delay in primary angioplasty: how relevant is it? *Heart.* 2007;93(10):1164-6. DOI:10.1136/hrt.2006.112805.
15. Tarkin J, Malhotra A, Apps A, Smith R, Di Mario C, Rogers P, et al. Inter-hospital transfer for primary angioplasty: delays are often due to diagnostic uncertainty rather than systems failure and universal time metrics may not be appropriate. *EuroIntervention.* 2015;11(5):511-7. DOI:10.4244/EIJV11I5A103.
16. Fox KA, Steg PG, Eagle KA, Goodman SG, Anderson FA, Jr., Granger CB, et al. Decline in rates of death and heart failure in acute coronary syndromes, 1999-2006. *Jama.* 2007;297(17):1892-900. DOI:10.1001/jama.297.17.1892.
17. Siepmann DB, Mann NC, Hedges JR, Daya MR, Treatment REAfC. Association between prepayment systems and emergency medical services use among patients with acute chest discomfort syndrome. *Ann Emerg Med.* 2000;35(6):573-8.
18. Ahmar W, Quarin T, Ajani A, Kennedy M, Grigg L. Improvement in door-to-balloon times in management of acute ST-segment elevation myocardial infarction STEMI through the initiation of 'Code AMI'. *IMJ.* 2008;38(9):714-8. DOI:10.1111/j.1445-5994.2007.01476.x.
19. Chandrasekhar J, Marley P, Allada C, McGill D, O'Connor S, Rahman M, et al. Symptom-to-balloon time is a strong predictor of adverse events following primary percutaneous coronary intervention: results from the Australian Capital Territory PCI Registry. *Heart Lung Circ.* 2017;26(1):41-8. DOI:10.1016/j.hlc.2016.05.114.
20. Gharakhani M, Naghsh Tabrizi B, Emami F, Seif Rabiee MA. Evaluation of the Time Interval between the Beginning of Acute Chest Pain in the Patients with Acute Myocardial Infarction and Admission of them at Coronary Care unit and the Related Factors. *Sci J Hamadan Univ Med Sci.* 2007;14(2):51-5.
21. Fallah LY, Ghadi MP, Sari HN, Alipour M. Evaluating the Time Interval between Calling Emergency Medical Services and Undergoing Primary Percutaneous Coronary Intervention in Patients with Acute Myocardial Infarction. *iranjem.* 2016;4(3):118-24.
22. Prasad A, Gersh BJ, Mehran R, Brodie BR, Brener SJ, Dizon JM, et al. Effect of ischemia duration and door-to-balloon time on myocardial perfusion in ST-segment elevation myocardial infarction: an analysis from HORIZONS-AMI Trial (Harmonizing Outcomes with Revascularization and Stents in Acute Myocardial Infarction). *JACC Cardiovasc Interv.* 2015;8(15):1966-74. DOI:10.1016/j.jcin.2015.08.031.
23. Mentias A, Raza MQ, Barakat AF, Youssef D, Raymond R, Menon V, et al. Effect of shorter door-to-balloon times over 20 years on outcomes of patients with anterior ST-elevation myocardial infarction undergoing primary percutaneous coronary intervention. *Am J Cardiol.* 2017;120(8):1254-9. DOI:10.1016/j.amjcard.2017.07.006.
24. Shahmirzaee R, Sadrnia S, Solhi H, Ghasemi A. The evaluation of electrocardiogram in patients with unstable angina and non-ST elevation myocardial infarction. *AMUJ.* 2010;13(2).
25. Swap CJ, Nagurney JT. Value and limitations of chest pain history in the evaluation of patients with suspected acute coronary syndromes. *Jama.* 2005; 294(20):2623-9. DOI:10.1001/jama.294.20.2623.

Article Keywords

Myocardial infarction, percutaneous coronary intervention, door-to-balloon time, emergency

Article History

Received: 12 May 2018

Accepted: 08 August 2018

Published: September-October 2018

Citation

Yasin Hosseini, Amin Soheili, Kamal Khadem Vatani, Azad Rahmani. Assessment of time intervals from the moment of arrival in the emergency department until performing primary angioplasty in patients with acute myocardial infarction in Northwestern Iran. *Medical Science*, 2018, 22(93), 498-502

Publication License



This work is licensed under a Creative Commons Attribution 4.0 International License.

General Note



Article is recommended to print as color digital version in recycled paper. *Save trees, save nature*