DETERMINANTS OF PREHOSPITAL DELAY IN PATIENTS WITH ACUTE MYOCARDIAL INFARCTION

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Abstract- Determination of pre-hospital delay time of patients with acute myocardial infarction and seeking ways of speeding up the time for reperfusion is an important factor to lower mortality in these patients. This is a cross-sectional study to determine pre-hospital delay time, its components, and related causes and conditions, obtained in 375 patients with prolonged chest pain referred to four hospitals of Tehran University of Medical Sciences. Means of transport to hospital, reasons of ambulance disuse, decision time by the patient and finally the entire time of pre-hospital delay were specified. Suspected factors related to delays of more than 2 and 6 h were scrutinized with chi-square test. Rate of ambulance utility (18.9%) directly correlated with age of patients ($P<0.05$). Principal motives to disuse ambulance insuccession were unrememberance (33.7%), access to private vehicle (32.8%) and supposition of sufficient speed of personal reference (18.9%). Pre-hospital delay time was 8.1 ± 9.1 h (mean ± SD) in whole patients and 7.6 ± 9.1 h in those with acute myocardial infarction. Delays of more than 2 and 6 h occurred in 67.5% and 33.6% of patients, respectively. Decision time constitute three fourth of whole pre-hospital delay and was correlated with female gender, older age, history of diabetes, lower level of literacy and nocturnal onset of symptoms. In conclusion, a significant number of patients with acute myocardial infarction have pre-hospital delay of more than 2 and even 6 h, when golden time for thrombolytic therapy has already been elapsed.

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Key word: Myocardial infarction , myocardial reperfusion, hospital referral, ambulance

INTRODUCTION

Delay in hospital arrival (pre-hospital delay) is an important cause of increasing early and also late mortality in acute myocardial infarction (AMI) (1,2). About half of the mortality of this disease occurs in the first hour (2). Thus recognition and removal of impediments in speedy hospital arrival significantly diminish mortality in AMI (3,4). American national registry of myocardial infarction found that average duration of the pre-hospital phase was 5.1 h. First and the most prolonged part of pre-hospital delay is the time for the patient to take notice of gravity of symptoms and seek medical attention (decision time). Additional components of the delay between the onset of symptoms and initiation of definitive therapy involve pre-hospital evaluation, treatment and transport time, and the time involved with the diagnosis and initiation of treatment in the hospital.

In foreign studies mean of prehospital delay varies between 1.6 to 42.4 h (5).Regarding lack of precise information about pre-hospital delays in patients with AMI in our country (Iran), we designed a cross sectional study to scrutinize duration of pre-hospital delay and its components and causes in the endurers of prolonged chest pain suspected of AMI. According to the importance of reperfusion before six and preferably two hours from onset of symptoms (2,6), frequency and factors related to delays of more than two and six hours were also investigated (7). Owing to the essential role of ambulance in safe and swift transfer to hospital (8,9), rate of ambulance employment and reasons of its misuse were also inquired.

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MATERIALS AND METHODS

This observational, analytic, cross sectional study was accomplished in order to inspect duration of pre-hospital delay and its components and causes in

patients afflicted with AMI. Pre-hospital delay indicates time between onset of symptoms and hospital presentation. It constitutes of two major components, decision and transport periods. Decision time denotes interval form onset of symptom till patient would notice the seriousness of the problem and seek medical attention. The inquired population were sufferers of prolonged (>30 min) chest pain referring to four hospitals of Tehran University of Medical Sciences in the year 2000. Exclusion criteria were non-cardiac chest pain, transfer from other hospital, in-hospital onset of symptom and lastly uncooperative patients. Tested variables were age, gender, history of diabetes, systemic hypertension, cardiac disease, level of literacy, time of onset of symptoms, final diagnosis, means of transport, reasons of ambulance disuse, decision and entire pre-hospital delays longer than two and six hours.

Stratified sampling among the hospitals and systematic random sampling in each hospital were performed. Main scope of the study was pre-hospital delays of more than two and six hours which were considered respectively 0.65 and 0.40 according to previous studies, so sampling size was estimated about 370.

Data about 375 patients was collected by information sheets via interview and observation and analyzed by computer (SPSS 9.1). The level of significance was established at $P \leq 0.05$. Factors associated with decision time of more than two and six hours were investigated by Chi-square test.

RESULTS

A total of 375 patients with prolonged chest pain (68.3% male) were studied with mean age of 58.5 ± 12.2 years (Table 1). Acute myocardial infarction was diagnosed according to WHO criteria in 38.1% (n=143) of patients. Only 18.9% (n=71) of patients were transferred to hospital by ambulance and private vehicle (49.1%) was the commonest means of transport (Table 2). There was no gender difference concerning means of transport, yet patients 60 years old and over had more frequent use of ambulance (P= 0.01, OR=2.96). Reasons of ambulance disuse in decreasing order of frequency were unrememberance of ambulance use (35.7%), availability of private vehicle (32.8%), presumption of enough speed of personal reference (18.9%) and ultimately assumption that symptoms were not severe enough to call on ambulance (10.9%). There was no important variation regarding age and sex of patients about reasons of ambulance disuse. Prehospital delays of more than two and six hours occurred respectively in 67.5% (n=242) and 33.6% (n=92) of patients (Fig. 1). Half of our patients reached the hospital in 3.8 hours or less (median). Prehospital period in all the patients was 8.1±9.1 h (mean ± SD) and 7.6±9.1 h in patients afflicted with AMI. This wide standard deviation is due to weighty influence of delays of more than 24 h (8%). By ignoring delays of more than 24 h, prehospital delays of patients diminished to 5.8±4.9 h (Table 3).

Table 1. Sample characteristics and comparison of short and long delayers*

Variable	Samples (n=375)	<6 h delay (n=283)	≥ 6h (n=92)	*P* value†	Odds ratio
Sex (%Women)	31.7 (119)	29 (82)	40.2(37)	< .05	1.65
Age					
<45 y	12.3 (46)	14.5 (41)	5.4 (5)	0.01	1
45-59 y	42.9 (161)	44.9 (127)	37 (34)	0.01	2.2
60-74 y	36.5 (137)	34.6 (98)	42.4 (39)	0.01	3.2
≥ 75y	8.3 (31)	6 (17)	15.2 (14)	0.01	6.7
Diabetes	19.5 (73)	16.6 (47)	28.3 (26)	0.02	1.98
Hypertension	36.8 (138)	34.3 (97)	44.6 (41)	> 0.05	-
Cardiac disease	38.1 (143)	35.7 (101)	45.5 (42)	> 0.05	-
Literate	88.3 (331)	91.2 (258)	79.4 (73)	0.01	2.69
Onset of symptoms (24:00-5:55AM) ‡	21.1 (79)	14.3 (19)	24.8 (60)	< 0.05	2
Admission diagnosis (AMI)	38.1 (143)	34 (97)	50 (46)	0.1	-

Abbrivations:AMI, Acute myocardial infarction;SD,Standard deviation.
*Data are given as percentage (n)
† Chi-square test
‡ Short and long delays dichotomized based on 2 hr. instead of 6h.

Table 2. Means of Transport (n=375)

	No	%
Ambulance	71	18.9
Private vehicle	184	49.1
Public vehicle	114	30.4
Others	6	1.6

Table 3. Prehospital delays characteristics*

	Median	Mean	SD	Range
Delay time	3.8 (3.4)†	8.1 (5.8)	9.1 (4.9)	0.5-48
Decision time	3.1 (2.9)	6 (4.9)	7.2 (4.8)	20 (min)-45
Transport time (min)	25	31.1	20.9	10-100
Others	1.2	1.6	1.1	10 (min) -4

Abbreviation: SD, Standard deviation

*Values are in hour unless mentioned otherwise.

†Amounts in parentheses calculated after ignoring delays of more than 24 hr.

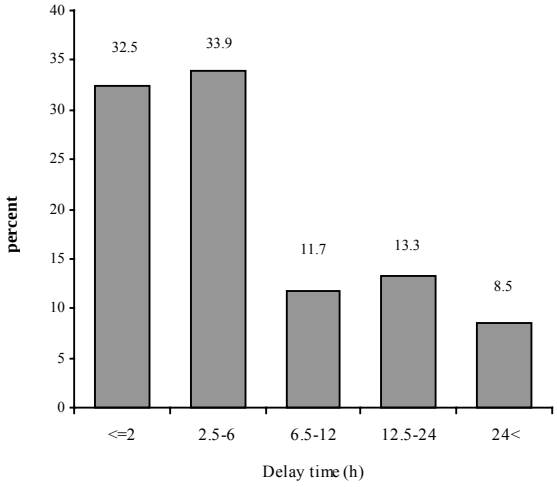

Fig. 1. Distribution of samples according to prehospital delay time (n= 375)

Sixty three (16.8%) of patients had visited a general physician before hospital arrival. Mean delay to this visit was 2.9 ±1.7 h .Main temporal components of pre-hospital delay in patients with AMI were decision time (77%) and transport period (7%).The remainder (16%) consumed by human factors including the time a patient take to modify existing social obligations and to prepare for going to the hospital, delays to visit a general physician and so on (Fig. 2). Among factors that were investigated by Chi-square test, the following correlated with decision delays more than 2 and 6 h (*P* value, odds ratio): female gender (< 0.05, 1.65), older age (Table 1), history of diabetes (0.02, 1.98), onset of symptom at night (<0.05, 2) and illiteracy (0.01, 2.69).

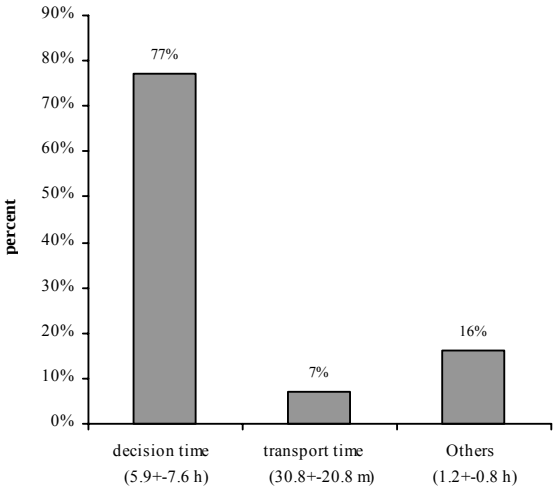

Fig. 2. Components of pre-hospital delay time in patients with acute myocardial infarction (n=143)

DISCUSSION

Mean pre-hospital delay time in patients with AMI in our study was 7.6 ± 9.1 h and more importantly approximately two thirds of them arrived at hospital with delays of more than 2 h when maximal effect of reperfusion had passed and one third were even delayed by more than six h when golden time of thrombolytic therapy had already expired. Similar domestic studies were out of reach and it's therefore impossible to criticize any change in pre-hospital delay in this country. In foreign studies mean of pre-hospital delay varies from 1.6 to 42.4 h (5).Although causes of this variety are not clear, factors such as definition of components of delay and onset of symptom, inclusion and exclusion criteria, number of patients and dissimilarities in demographic and clinical characteristics of patients studied, make comparison difficult. As mentioned earlier the American national registry of myocardial infarction has found that average duration of the pre-hospital phase is 5.1 h.

Percentage of ambulance utility (18.9%) was very low regarding the importance of swift hospital referral and watchful pre-hospital care. With respect to the most common reason of ambulance disemployment (unrememberance), it is important to advertise secure ambulance use, confronting manifestations suspected of AMI. A study in Sweden showed that media campaign on patients with prolonged chest pain resulted in a significant decrease in delays of hospital presentation but without any consequence in ambulance usage (10).

In patients with AMI temporal components of delay in beginning of reperfusion therapy are important as well. Decision delay by patients was more prolonged than two other elements of retarding reperfusion therapy (transfer and intra-hospital delays). In our investigation 77% of entire pre-hospital delay was related to decision time which is compatible with other studies (Fig 2). We found an association of prolonged (>2 and 6 h) pre-hospital delays with female gender, age 60 y or more, history of diabetes, onset of symptoms at night and also level of literacy ($P<0.05$). Furthermore in various studies, factors such as loneliness, history of AMI and visit of a general practitioner were also more common in long delayers. Elderly persons, probably due to personal nonefficacy, would delay in attaining medical care (11, 12). Concerning diabetic persons, autonomic neuropathy and silent ischemia would explain delays in notifying symptoms of AMI and referring to hospital (13). Onset of symptoms at night yields more prolonged delay in hospital arrival because transport means and medical helps are beyond reach at that times (13,14) and finally literate persons are more acquainted with cardiac manifestations and refer to hospital sooner.

In conclusion, it is important to inform the general population and specially high risk persons about manifestations of myocardial ischemia and a need to prompt hospital referral by means of ambulance in case confronting these symptoms. Public campaign and medical care providers have substantial role in this regard. Precise data registration and monitoring of duration of pre-hospital delays and means of transfer to medical records is crucial for planning strategies and protocols to abolish referral delays of patients with AMI and establish early reperfusion which subsequently decrease their mortality.

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