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Original Research Article

Assessment of pre-hospital and in-hospital factors leading to delays in initiation of treatment in patient with ST segment elevation myocardial infarction

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ABSTRACT

Background: India has the highest burden of acute coronary syndrome (ACS) patients in the world. While managing patients with ACS, especially those with acute ST elevation myocardial infarction (STEMI), time plays an important role in determining the morbidity and mortality.
Methods: An observational prospective study was conducted among patients admitted with symptomatic STEMI. Questionnaire based information was obtained regarding demographic profile, risk factors, treatment seeking behaviour including duration and reasons for delay and treatment in the hospital. Outcome was assessed at discharge and at 30 days.
Results: A total of 100 patients were given a definite diagnosis of STEMI. The mean age was 55.38 (SD 10.28) years. Majority 80 (80%) were males and females constituted 20%. Sedentary lifestyle was the major risk factor present in sixty (60%) patients. The median time from symptoms to hospital was 420 min (range 30-2880 minutes). Only 17% patients reached hospital within 2 hours of symptoms and 37% between 2 to 6 hours and 46% after 6 hours. Thirty five patients (35%) thought it to be a heart attack. Hospital delay was recorded in 50% patients with ECG done in more than 10 minutes. Outcome at 30 day depicted as mortality in three patients with loss to follow in 18 (18%) and angina in 6 out of 81 (7.4%) patients.
Conclusions: Both pre hospital and in hospital delays have adverse effect on the outcome and thus efforts should be made to minimize these delays.

Keywords: Chest pain, Delay, Risk factors, STEMI

INTRODUCTION

India has the highest burden of acute coronary syndrome (ACS) patients in the world.[1] While managing patients with ACS, especially those with acute ST elevation myocardial infarction (STEMI), time plays an important role in determining the morbidity and mortality. Several studies have assessed the door to needle and door to balloon time as a measure of in-hospital delays in patients with (STEMI).[2] However, pre-hospital delays are equally important in determining the total ischemia time.[3-8] Certain patient related factors like misinterpretation of symptoms, denial, feeling of embarrassment and social stigma as well as system related factors such as non-availability of thrombolysis/PCI capable hospitals, transport facilities, educational facilities can greatly affect the treatment seeking behaviour and outcome in these patients. These factors may vary from place to place

depending upon the social, cultural and local beliefs particularly in India where there is wide variation in these practices.[5-12] Our hospital caters to a quiet varied population coming from hilly and far flung rural areas where the educational, socioeconomic and health awareness level of people is quiet variable and transportation is sometimes a big issue. Therefore, this study was planned to assess the factors leading to delays in presentation and treatment and to evaluate its impact on the short term outcome.

METHODS

Study design

This observational prospective study was carried out in the Department of Cardiology, Government Medical College and Hospital, Sector-32, Chandigarh, India during the period from August, 2018 to July, 2019.

Inclusion criteria

Patients with ST segment elevation myocardial infarction (STEMI) willing to participate in the study. Hundered (100) such patients were interviewed within 48 to 72 hours of hospitalization, preferably when pain-free and hemodynamicaly stable after obtaining an written informed consent. The study design was approved by the institutional ethics committee of our hospital.

Exclusion criteria

The patients with non-ST-elevation myocardial infarction (NSTEMI), myocardial infarction without chest pain (SILENT MI), patients unable to recall the time of the onset of chest pain and or hospital admission, critically ill patients, patients with language barrier and not consenting for the interview were excluded from the study.

Methodology of assessment

A semi-structured questionnaire was designed to collect information pertaining to the time of onset of chest pain, initial reaction to chest discomfort, time taken to recognize it to be a cardiac pain, time to first medical contact, time taken to reach hospital with facility for thrombolysis and or PCI, time taken to perform an electrocardiogram (ECG), door to needle and door to balloon time. Apart from this the socio demographic profile and risk factors assessment like history of hypertension, diabetes mellitus, smoking, sedentary lifestyle, obesity and family history of premature coronary artery disease (CAD) was also recorded. The medical and transport facility in the vicinity of patients were assessed. The mode of transport used by the patient and time taken to reach the hospital was recorded. Hospital outcome was assessed from the discharge register of hospital and a 30 day follow up was done telephonically or by hospital visit.

Statistical analysis

Statistical analysis was done by using statistical package for social sciences (SPSS) version 23. The results were summarized as mean±SD, range, percentage and a p value of <0.05 was considered as statistically significant. Chi-square test was used for comparison of various parameters and determination of association between various risk factors and delay in seeking treatment.

RESULTS

A total of 100 (80 male and 20 females) patients were interviewed. The mean age was 55.38±10.28 (range 33-83) years. Sixty three (63%) patients were from the urban area and 37% were from rural region. Forty six (46%) patients had hypertension, thirty (30%) patients were diabetic and sixty (60%) patients had a sedentary lifestyle. The average total cholesterol was 162.6±38.8, low density lipoprotein (LDL) 140.85±41.8, triglycerides (TG's) 105.45±45.5 and high density lipoproteins (HDL) was 42.2±9.7 mg/dl.

Table 1: Demographic profile, risk factors and treatment seeking by patients (n=100).

Parameter	Characteristics	Number
Gender	Male	80
	Female	20
Area of Residence	Urban	63
	Rural	37
Mode of transport	Ambulance	41
	Own vehicle	46
	Bike	4
	Auto rickshaw	4
	Others	5
Age distribution (in years)	≤40	9
	41-50	24
	51-60	37
	61-70	26
	>70	4
Risk factors	Hypertension	46
	Diabetes	30
	Smoking	46
	Obesity	13
	Family history of CAD	25
	Sedentary lifestyle	60
Timings during treatment seeking		
Median time to reach hospital, minutes (range)		420 (30-2880)
Door to needle time, minutes (mean±SD)		42.75±14.18
Door to balloon time, minutes (mean±SD)		125.5±36.68
Time of onset of chest pain		
Before 6.00 am		33 (33%)
After 6.00 am		77 (67%)

The most affected age group was between 51-60 years (37%) followed by 61-70 years (26%) and 41-50 years (24%). Only thirteen patients (13%) were seen in the extremes of age group i.e. 9 in <40 years and 4 in >70 years. Thirty three (33%) patients had onset of chest discomfort before 6.00 am and rest 67 after 6 am to 12.00 midnight (Table 1).

The initial reaction to chest discomfort was gas in 50 (50%) patients, muscular pain in 8 (8%), anxiety in 7 (7%) and thirty five (35%) could correctly identify it as the pain of cardiac origin. The median time from onset of symptoms to arrival in hospital was 420 minutes (range 30-2880 minutes). Only seventeen (17%) patients managed to reach the hospital within first 2 hours of symptoms, thirty seven (37%) reached between 2 to 6 hours and forty six (46%) reached after 6 hours. On comparing gender, only 2 of 20 (10%) females reached the hospital within first 2 hours of symptoms as compared to 15 of 80 (18.8%) males (Table 2).

Table 2: Influence of various factors on time to reach hospital.

Factors	Time to reach specialized hospital			
	<2 hours N (%)	2-6 hours N (%)	>6 hours N (%)	Total (n=100)
Gender				
Females	2 (10)	8 (40)	10 (50)	20
Males	15 (18.8)	29 (36.3)	36 (45.0)	80
Area of residence				
Urban	15 (23.8)	23 (36.5)	25 (39.7)	63
Rural	2 (5.4)	14 (37.8)	21 (56.8)	37
Initial reaction to symptoms				
Gas	6 (12.0)	15 (30)	29 (58)	50
Anxiety	0 (0)	3 (42.9)	4 (57.1)	07
Muscular pain	1 (12.5)	5 (62.5)	2 (25.0)	08
Cardiac pain	10 (28.6)	15 (42.8)	10 (28.6)	35
Mode of transport				
Ambulance	3 (7.3)	17 (41.5)	21 (51.2)	41
Car	13 (28.3)	14 (30.4)	19 (41.3)	46
Bike	0 (0.0)	1 (25)	3 (75)	4
Rickshaw	1 (25)	3 (75)	0 (0.0)	4
Bus	0 (0)	2 (40)	3 (60)	5

Out of the 50 patients who confused the symptoms with that of gastrointestinal origin, the 4 patients could recognize in 1 hour that it may be a heart attack while 23 patients took 1-2 hours to appreciate this and majority 25 (50%) patients took more than 2 hours (Table 3). Out of these 50 patients only 6 (12%) managed to reach the hospital within 2 hours, 15 (30%) within 2-6 hours and 29 (58%) took more than 6 hours to reach the hospital.

Among the thirty five patients who correctly thought it to be a heart attack at the onset of pain, only 10 (28.6%) reached the hospital within 2 hours of onset, 15 (42.9%) between 2-6 hours and the rest 10 (28.6%) patients took more than 6 hours to reach the hospital which appears better as compared to those who misinterpreted the symptoms. Forty one (41%) patients travelled by ambulance out of which only 3 (7.3 %) reached hospital within 2 hours. Forty six patients (46%) travelled by own car out of which thirteen patients (28.3%) reached within 2 hours. Four patients (4%) travelled by bike and none could reach within 2 hours, 1 reached in 2-6 hours and 3 of these reached hospital after 6 hours. Four patients (4%) travelled by a rickshaw out of which only 1 reached within 2 hours and rest 3 reached within 2-6 hours. Five patients (5%) travelled by bus out of which none reached within 2 hours and 2 patients reached in 2-6 hours and 3 after 6 hours (Tables 2 and 3). After reaching the hospital the electrocardiogram (ECG) was done within 10 minutes in forty patients (40%) and rest 60% patients took 10-30 min to get their ECG done. Forty patients (40%) were thrombolysed and 39 patients underwent primary angioplasty. The average door to needle time for thrombolysis was 42.75±14.18 (range 25-70) minutes. Out of these only eighteen (45%) patients were thrombolysed within the recommended door to needle time of <30 minutes. Thrombolysis was successful in 34/40 (85%) patients. Percutaneous coronary intervention (PCI) was done in 25 of these 40 patients within 24 hours as part of pharmacoinvasive strategy in 22 patients and as rescue PCI in 3 of the 6 patients with failed thrombolysis. Apart from this, the primary PCI was done in 39 patients with an average door to balloon time of 125.5±36.68 (range 75-200) minutes which was slightly higher than the recommended door to balloon time of <90 minutes.

The mean LVEF was 46.0±7.2 percent. Eight patients had an LVEF of 30-35%, 29 patients had >35-45%, forty three had an LVEF of 45-55% and 20 patients had LVEF of >55 percent. There were 3 (3%) deaths, and all among

those who reached the hospital beyond 6 hours. The reason for delay in these patients were misinterpretation of chest pain in 2 and non-availability of medical facility in the vicinity of patient in 1 patient. On 30 day follow up, 18 patients were lost to follow up and 6 patients had class-III angina who were managed with deferred angioplasty. The mis-interpretation of chest pain as gas was the most significant factor associated with delay of more than 6 hours (p=0.02). The mode of transport did not have any effect on the pre-hospital delay.

Table 3: Time taken to recognize heart attack in various groups.

Group		Time to recognize heart attack			
		<1 hour N (%)	1-2 hours N (%)	>2 hours N (%)	Total
Gender	Male	25 (31.3)	29 (36.3)	26 (32.5)	80
	Female	2 (10)	9 (45)	9 (45)	20
Area of residence	Urban	21 (33.3)	28 (44.4)	14 (22.2)	63
	Rural	6 (16.2)	10 (27)	21 (56.8)	37
Medical facility in area	Available	18 (32.7)	26 (47.3)	11 (20)	55
	Not available	9 (20)	12 (26.7)	24 (53.3)	45
Initial reaction to symptoms	Gas	2 (4)	23 (46)	25 (50)	50
	Anxiety	0 (0)	4 (57.1)	3 (42.9)	07
	Muscular pain	0 (0)	5 (62.5)	3 (37.5)	08
	Heart attack	25 (71.4)	7 (20)	3 (7.6)	35
Age group (in years)	≤40	2 (22.2)	3 (33.3)	4 (44.4)	9
	41-50	12 (50)	6 (25)	6 (25)	24
	51-60	5 (13.5)	16 (43.2)	16 (43.2)	37
	61-70	8 (30.8)	9 (34.6)	9 (34.6)	26
	>70	0 (0)	4 (100)	0 (0)	4

DISCUSSION

Patients with acute STEMI require reperfusion therapy at the earliest so as to salvage the myocardium and reduce subsequent morbidity and mortality. The present study investigated various factors responsible for delays in treatment and the mis-interpretation of symptoms was the most significant factor responsible. The median time from the onset of symptoms to arrival at hospital was 420 minutes (range 30-2880 minutes), which is longer as compared to the study conducted by Peng et al in which the median pre-hospital delay time (PDT) was 130 minutes in STEMI participants.[5] In present study the forty six (46%) patients took more than 6 hours to reach the hospital which is similar to others, Mohan et al in their study in district Ludhiana of Punjab which is geographically quiet similar to us also reported that 42% of the patients reached the hospital after 6 hours.[6] Similarly Prashantha et al and others also showed that about 40% of the patients presented after 6 hours of onset of pain.[11] In this study the most common reason for this delay was the misinterpretation of symptom as gas, anxiety and musculoskeletal pain by 65% of the patients. This has been reported in other studies also where misinterpretation of symptoms was found to be a major factor responsible for pre hospital delays.[7-12] The other reason for delay in presentation could be the fact that many of our patients comes from hilly areas where traffic movement is slower. This was seen more so among females, where only 2 out of 20 females (10%) received treatment in first 2 hours compared to 15 of 80 (18.8%) men. The reason for this could be due to more atypical symptoms in women and a longer decision time in women as was observed by Sofia et al.[13] Others also reported that female gender may have a significant impact on delay in presentation and treatment initiation.[13-16] The other reason could also be attributed to gender bias prevalent in our country.

After reaching the hospital certain in-hospital delays were also noticed as 60% of patients could get their ECG done in more than 10-30 minutes. This could be attributed to the high patient load in our medical emergency. The average door to needle time was longer than the recommended time of <30 minutes. The likely reason for this could be the delay in getting the ECG in majority (60%) patients and second reason could be delay in procuring the thrombolytic agent from chemist as the thrombolytic agents are not available in the hospital supply and patient has to procure by themselves from a chemist shop. Similarly, the average door to balloon time was higher than the recommended time of <90 minutes The reason for this could be the fact that we have only one catheterization laboratory and sometimes, patient has to wait for the procedure due to occupancy of the laboratory and secondly it could be because of long transfer distance from one building to another as our catheterization laboratory is situated in a different block from emergency block.

We didn't find any difference in delay related to mode of transport. The reason for this could be the fact that whatever delay occur is in the decision by the patient. Once the patient recognises and decides to seek medical

care the time taken to reach hospital is similar irrespective of mode of transport. Secondly the mode of transport used by the patient were dependent upon their area of residence.

Limitations

We studied a relatively small number of patients with STEMI. Moreover, we excluded hemodynamically unstable and critically ill patients which might have greatly affected the relationship of delays to outcome. Eighteen patients were lost to follow up, of which we do not know how many of them had angina or might have died. Therefore, larger studies are required to know the actual relationship between treatment delays and its impact on outcome.

CONCLUSION

Misinterpretation of the symptoms is the most important factor leading to pre-hospital delay and adverse outcome. Larger studies and inclusion of all hemodynamically unstable and critically ill patients will correctly answer the effect of delays on morbidity and mortality.

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