



A Study on Pre-Hospital and in Hospital Factors Affecting Thrombolysis in ST Segment Elevation Myocardial Infarction (STEMI) from Tertiary Care Centre in South India

Authors

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Introduction

Worldwide, cardiovascular disease (CVD) accounts for 17.5 million deaths and 46.2% of all deaths due to Non Communicable Diseases. The majority of deaths occur in low income countries such as India.¹ Around 29.8 million coronary artery disease patients are in India. South Indians are at higher risk of mortality from CVD.² The Global Burden of Diseases study highlighted that in India, mortality from Acute Coronary Syndrome [ACS] is projected to increase from 1.6 million in 2000 to approximately 64 million by 2015.³

Delay in presentation are attributed mostly to the patient's own decisions, and other factors contributing to delay are age, gender, education, marital status, living conditions, lack of transport facility, lack of perception of symptoms. These factors are influenced by socio-economic factors and vary from region to region. However, patient delay time, which accounts for 75% of the total pre-hospital delay has not changed in the past decade. Thus, reducing patient delay time and taking care of factors responsible for delay, is very crucial for better outcome.⁴⁻⁷

Methods

A prospective observational study was conducted at department of emergency medicine, in a tertiary care teaching hospital, from South India. The objective of the study was to identify the pre-hospital and in-hospital factors associated with the thrombolytic therapy in STEMI. All patients attending emergency department with symptoms suggestive of AMI and ECG showing STEMI were included in the study. The study was conducted from July 2014 to June 2016. A total of 413 patients were enrolled. Data was collected in structured format with reference to demographic features, initial symptoms, prehospital measures received, mode of transport and risk factors. Symptoms-to-door, door-to-diagnosis and door to needle time were estimated. The cases were divided into two groups based on thrombolytic therapy received or not. Various factors affecting thrombolysis were analyzed. The prehospital factors analyzed were- lack of identification symptoms, neglected and atypical symptoms, consultation at local hospital, missed diagnosis, transport related factors. In hospital factors analyzed were door to ECG time, interpretation of ECG, consultation with cardiologist for initiation of thrombolysis. All the data was entered in

Epidata version 3.1 and analyzed by Epidata Analysis version 2.2.2.183.

Results

Total 413 patients were included in the study. The mean age was 56.98 [12.52] years. Among them 74% [n = 306] were male and 26% [n= 107] were female. The male to female ratio was 2.8:1. Majority of patients were in age group of 41 to 60 years [n=208, 50.36%]. 76.5% patients were from rural area [n=316] with rural to urban ratio was 3.25:1. Among all patients approximately 42% did not have formal primary schooling [n= 173]. Ambulance services were used by only 54.2% [n=

224]. In 85.7% patients [n=354] chest pain was the first symptom. 54% [n=222] developed first symptoms during day time. While 22%patients [n=90] developed first symptom early in the morning

The mean symptom to door time was 723.89 [SD 688.] minutes (12 hours 3 minutes). A delay of > 12 hours were seen in 36% [n= 149] patients. Only 3% patients [n=13] arrived within one hour of onset of symptoms while 9.7% patients [n=40] arrived within 1 to 3hours, 24.5% patients [n=101] arrived within 3 to 6 hours and 26.6% patients [n=110] arrived within 6 to 12 hours of onset of symptoms.

Figure 1

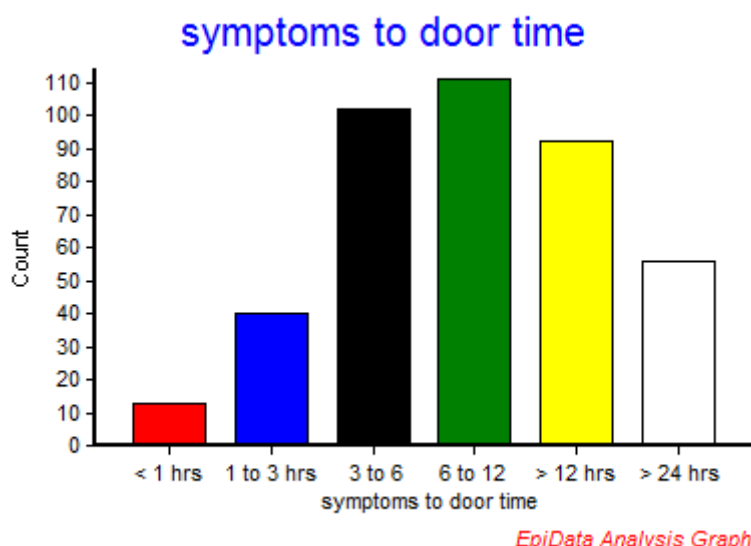


Table 1

Observations	Numbers	Thrombolysis group n= 215	Non thrombolysis group n= 198	P value
Male	306	170 [55.6%]	136 [44.4%]	0.016
Urban residence	97 [23.5%]	61 [62.9%]	36 [37.1%]	0.014
Ambulance services used	224 [54.2%]	159 [71%]	65 [29%]	0.000
Symptoms to door time in minutes [mean, SD]	413	402 [263.6]	1073.4 [825]	0.000
Door to ECG time in minutes	413	10.25 [5.67]	10.75 [5.62]	0.20
door to decision time in minutes	413	20.21 [11.46]	20.83 [10]	0.55

64.57% patients (n= 257) neglected their initial symptoms. It was the most common cause of pre-hospital delay followed by unavailability of transportation [n=71; (17.83%)]. Late first

consultation was taken by 58 [14.7%] patients. 3% of patients [n=12] had pre-hospital delay either due to lack of ECG in outside hospital or due to missed diagnosis in outside hospital.

Table 2 Prehospital factors

Pre hospital delay factors	Total n=398	Thrombolysis group n=204	Non Thrombolysis group n=194
Neglected symptoms	257 [64.57%]	92 [45.09%]	165 [85.05%]
Late consultation	58 [14.7%]	44 [21.56%]	14 [7.21%]
Lack of transport	71 [17.83%]	60 [29.41%]	11 [5.67%]
No ECG availability in outside hospital	3 [0.75%]	2 [0.98%]	1 [0.51%]
Missed diagnosis in outside hospital	9 [2.26%]	6 [2.94%]	3 [1.54%]

Among in-hospital delay factors 78% patients had delay due to delay in first ECG. The delay is said to occur if first ECG is taken after 10 minutes of arrival. Atypical symptoms in 15% and atypical ECG in 7% contributed in in-hospital delay. Mean door to ECG time is 10.49 min [SD 5.64] with minimum time noted is 2 minutes and maximum time is 45 minutes.

Table 3 In hospital factors

In hospital delay factors	Total (n= 100)	Thrombolysis group	Non Thrombolysis group
Atypical symptoms	15	4 [26.7%]	11 [73.3%]
Delay in ECG	78	46 [59%]	32 [41%]
Atypical ECG	7	4 [57.1%]	3 [42.9%]

Mean door to needle time is 35.84 minutes. The minimum and maximum time noted is 10 minutes and 120 minutes. 56% patients [n=120] received thrombolysis within 30 minutes

The mean symptom to needle time is 7 hours 18 minutes. There is absolute difference of 31 minutes between males and females.

Typical symptoms like chest pain, sweating radiation of pain and palpitation are present in 96.9%, 76.5%, 62.2%, and 40.4% respectively. While atypical symptoms like dyspnea, vomiting, epigastric pain, dizziness and nausea are present in 43.6%, 13.1%, 10.9%, 8.7% and 7.3% respectively.

Risk factors: Smoking was present in 54.2% patients followed by BMI > 25 [42.43%]. Diabetes is noted in 37.3% while hypertension is present in 29.3% patients.

Among 413 patients 52.1% patients [n=215] received thrombolysis for STEMI. Among 198 patients [47.9%] who did not receive thrombolysis and received only medical treatment, the main

contraindications were late presentation > 12 hours in 61% patients [n=121]. 24 elderly patients [age > 75 years] did not receive thrombolysis. And 4 patients had recent stroke. 60 patients (30.30%) came within 12 hours but did not get thrombolysis. Among them in 25 patients chest pain was stopped or decreased significantly; 16 patients had cardiac arrest or prolonged CPR; 13 patients were thrombolysed for AMI within past 1 year. One patient had bleeding diabetic foot ulcer. 5 patients refused thrombolysis.

Door to decision time include ECG interpretation and starting of thrombolytic therapy after cardiology consultation. Mean door to decision was 20.51 [SD 10.79] minutes.

In Bivariate analysis of patients characteristics and thrombolysis treatment received; male gender, urban residence, use of ambulance services are statistically significant factors ($p < 0.05$). Whereas door to decision time which includes first ECG interpretation by ED resident doctor and consultation time with cardiologist for possible primary PCI was found to be statistically non significant. ($p = 0.55$)

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Discussion

In this current study majority of the subjects were males [n=306 (74%)] with male to female ratio of 2.8:1 and predominantly from rural areas (76.5%). The mean age was 57 years [SD 12.52] and approximately 40% are having no formal education. This distribution of the background variables were comparable in an Indian study done by Mohanan et al. in Kerala in which around 57% of the participants were in age group of 50-70 years, majority were males (77.3%) and 22.5% had no education in STEMI group.⁸

Age is an independent determinant found out in our study, older the age less likely to receive thrombolysis which is consistent finding in a study conducted by Brass et al.⁹

There is significant association between male gender, urban area and use of ambulance services with thrombolysis as a treatment modality received. Kendall et al reported that female gender is a determinant of prolonged pre-hospital delay.¹⁰ Prasantha et al. in Lucknow found, rural residence, literacy status, socio economic class, having BPL card and medical insurance are significantly ($p < 0.05$) associated with delay.¹¹ Berger et al reported factors causing delay were old age, female gender, patients with diabetes, patients in shock and less marked ST elevation.¹² while a study by Farshidi et al. showed age and gender were not found to be related with the pre-hospital delay time.¹³

Patients residing in urban areas ($p=0.01$) and who used ambulance services ($p=0.000$) for transport, arrived significantly earlier. Previous studies done

by Matthews et al. in Boston and Hong et al. in tertiary hospital in Asia also reported that the use of ambulance reduced the delay.¹⁴⁻¹⁵ while Venkatachalam et al found out that Gender, age, literacy, mode of transport and past history of MI were not significant factors for pre-hospital delay.¹⁶ 46% of our patients came by private or public transports other than ambulance similar fact was seen in study by Lee et al in Korea where corresponding figure is 34%.¹⁷

Typical first symptom like chest pain was associated with early arrival as compared atypical symptoms. Jehangir et al found out that lack of knowledge of symptoms was associated with significant delay.¹⁸

The median door to first ECG time was 10 minutes [inter quartile range 8 – 10 minutes] which is as proposed by AHA/ACC guidelines.¹⁹ Comparable results were found in study by Huynh et al in Canada AMI-QUEBEC study where median door to ECG time was 12 min for patients who came during regular working hours and 13 minutes who came outside regular hours.²⁰

The mean door to needle time was 35.8 [SD18.6] minutes in this study. Thrombolytic therapy was started within the recommended 30 minutes for 56% of the patients. Similarly an ACS registry from Kerala reported that about 68% of the patients received thrombolysis within 30 minutes.²¹ While study conducted by Masurkar et al. in Mumbai in 2005 and Zed et al. in Riyadh in 2004 reported door to needle time of less than 30 minutes in 54.28% and 24.2% patients respectively.²²⁻²³

Table 4

Door to needle time	No of patients [%]		
	Present study n= 215	Masurkar et al n= 35	Zed et al n=140
Mean door to needle time [SD]	35.8 [18.6]	45.25	58
< 30 minutes	120 [56%]	19 [54.28%]	34 [24.2%]
30-60 minutes	83 [39%]	10 [28.57%]	65 [46.3%]
>60 minutes	12 [6%]	6 [17.14%]	41 [29.3%]

Pre hospital delay factors in current study were neglected symptoms, female gender, rural residence. These were comparable with studies done in India¹¹, Iran¹³, Kashan²⁴ and Salvador²⁵.

The delay of > 12 hours were seen in approx 36% [n= 149] patients while 63% [n=259] patients came after 6 hours of symptom onset. The pre-hospital delay of > 6 hours were reported in 41%

patients in a study done by Mohanan et al in 2013 in Kerala.²¹ But much lesser median delay times were reported from Iran (2.6 hours) by Alishahi Tabriz et al²⁵ and Beijing (2.3 hours) by Song li et al.²⁶

In current study risk factors such as hypertension [29.3%], diabetes [37.3%], smoking [54.2%], CAD [9.2%] and BMI > 25 [42.43%] were noted and were comparable with studies done by Mohanan et al. [2013 in Kerala India]²¹ and Song et al. [2010 in Beijing China]²⁷

Table 5

Risk factor	current study in India 2016 n=413	Mohanan et al. ²¹ in India 2013 n=9569	Song et al. ²⁷ in Beijing, China 2010n=799
Hypertension	121 [29.3%]	5315 (55.5%)	252 [54.2%]
Diabetes	154 [37.3%]	3314 (34.6%)	98 [21.1%]
Smoking	224 [54.2%]	3376 (35.3%)	243 [52.3%]
Known CAD	38 [9.2%]	1257 (13.1%)	164 [35.3%]
BMI > 25	171 [42.43%]		211 [45.4%]

Limitations

The study population does not exactly represent STEMI population as patients who were taken for PCI or who is already thrombolysed in outside hospital are excluded. Being a single center study, the results cannot be generalized to the whole population and needs replications by large multicenter studies.

Conclusion

ACS/STEMI is a major problem in south India. Symptom to door time is unacceptably high in the study population. Only 52.1% patients received thrombolytic treatment in current study and among them only 56% received it within 30 minutes which below the standards given by AHA/ACC.

36% patients have reached hospital after 12 hours of symptoms indicated significant pre-hospital delay. The mean door to ECG time [10.49 minutes] and mean door to needle time [35.84minutes] are closer to recommended time given by AHA/ ACC.

The significant delay was due to pre-hospital factors which can be minimised by public education, awareness about CAD, use of ambulance services and good pre hospital care system. In-hospital delay factors can be minimised by good triage system and efficient teamwork.

Early recognition of symptoms, early contact with Emergency Department and early thrombolysis will have better outcome in STEMI patients.

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