Acute coronary syndrome-related mortality audit in a teaching hospital at Port Blair, India

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Abstract

Background: India has a growing trend of acute myocardial infarction (AMI) due to shifting lifestyle. Objective: To study the profile of patients died due to AMI and to find its risk correlates. Methods: A study was conducted on consecutive AMI cases admitted in the teaching hospital at Port Blair from April 2011 to March 2016. During inpatients management, outcomes were followed up from admission till discharge or expiry. Results: Of the total 491 cases, majority (75.99%) had ST-elevated myocardial infarction (STEMI); mean age of 73 deaths was 58.01 ± 13.60, mortality probability among females was less; in the age group 41-50 years the case fatality rate was the lowest (7.58%). Mean age of survival was 56.75 ± 10.47; great majorities were males across all age groups in cases and deaths; highest number of cases were in the age group 51-60 (34.21%); reportedly 83.10% had some physical activities; 6.52% were vegetarian; 34.22% were smokers; 10.39% had family history of AMI, majority (59.06%) were from white collar profession (teacher, clerical, etc.); 52.95% were diabetics; and 47.45% were hypertensives. Lifestyle-related risk factors, physical activity, and vegetarian diet were not protective; family history and addiction to smoking were significantly associated with AMI deaths. Thrombolytic intervention helped the survival of 73.68%, and the odds ratio of survival showed benefit. Conclusions: Acute STEMI had male and middle-age predominance with a common risk factor of family history, smoking, diabetes, and hypertension.

Keywords: Acute myocardial infarction, coronary artery disease, ST-elevated myocardial infarction

Introduction

Acute coronary syndrome (ACS) is important global causes of death and also the major cause of morbidity and mortality in India. In Urban India, coronary heart disease (CHD) prevalence in adult has increased considerably and occurred at a much younger age as compared to North America and Western Europe.³⁴ CHD global fatality was estimated to be 17.5 million/year, 31% of deaths - 75% in low- and middle-income countries;⁵ the prevalence of CHD in rural India was estimated to be 3%–4% and 8%–10% in urban areas.⁶⁷ Thrombolytic therapy is a proven therapy for acute myocardial infarction (AMI) cases with ST elevation in electrocardiogram (ECG) that can be administered by any properly trained health-care provider, even in the prehospital setting.⁸ Among the health conditions in Andaman and Nicobar Islands, the cardiovascular diseases in general and AMI has been a perennial problem in Andaman and Nicobar Islands.

With this background, this study was performed by systematically recording the clinical profile of patients with ACS treated between April 2010 and March 2016 at GB Pant Hospital, Port Blair, in an attempt to identify various outcomes. To the horizon of our knowledge, we are the first to report on clinical spectrum, risk factors, and deaths in ACS cases in these islands.

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Methods

This study was conducted on 491 patients with ACS admitted at the Intensive Care Unit of GB Pant Hospital, Port Blair, the only teaching institute of Andaman and Nicobar Islands from April 2010 to March 2016. During inpatient management, the cases were followed up from admission till discharge or death. The World Health Organization definition was followed for the diagnosis of AMI in this study. Initial 12 lead ECG was recorded on BPL Cardiart 408, immediately on admission and subsequently at 8 hourly intervals on the 1st day, thereafter as per need; also before and after the thrombolytic therapy.

During admission, high-risk consent was obtained from the patients after explaining the details of the clinical findings, reasons for admission, and probable management plan.

Other investigations were done as follows:
- Urine routine analysis (sugar, albumin, and microscopy)
- Blood routine (hemoglobin percent, total and differential leukocyte count, erythrocyte sedimentation rate)
- Random blood sugar (or fasting/postprandial blood sugar), blood urea, serum creatinine
- Lipid profile
- Echocardiography (two-dimensional) was done to confirm myocardial infarction
- Chest X-ray (if required)
- Serum electrolytes (if required).

Inclusion criteria

All consecutive cases presented with symptoms suggestive of ACS.

Exclusion criteria

Those cases with proven noncardiac chest pain and those discharged before completion of the treatment for any reason.

Operational definitions

ST-elevated myocardial infarction (STEMI) was defined by characteristic symptoms of myocardial ischemia in association with persistent ECG ST elevation and consequent release of biomarkers of myocardial necrosis.[7]

Non-ST-elevated myocardial infarction/unstable angina

Persons reported with symptoms suggestive of suspected myocardial infarction without persistent ST elevation in ECG.[7]

Thrombolytic intervention

AMI cases, which presented within 12 h of the appearance of symptoms with persistent ST elevation, were administered streptokinase/tenecteplase.

Absolute contraindications for thrombolysis in STEMI (a) prior intracranial hemorrhage, (b) known structural cerebral vascular lesion, (c) known malignant intracranial neoplasm, (d) ischemic stroke within 3 months, (e) suspected aortic dissection, (f) active bleeding or bleeding diathesis, (g) significant closed head trauma or facial trauma within 3 months, (h) severe uncontrolled hypertension (HTN), and (i) intracranial or intraspinal surgery within 2 months.

Relative contraindications (a) history of chronic, severe, poorly controlled HTN; (b) significant HTN on presentation >180/110 mmHg; (c) traumatic or prolonged (more than 10 min) cardiopulmonary resuscitation or major surgery <3 weeks previously; (d) history of prior ischemic stroke not within the last 3 months; (e) dementia; (f) recent (within 2–4 weeks) internal bleeding; (g) pregnancy; (h) noncompressible vascular punctures; (i) active peptic ulcer; and (j) current use of an anticoagulant that has produced an international normalized ratio >1.7 or a prothrombin time longer than 15 s.[8,9]

Ethical considerations

The study was approved by the Medical Superintendent, GB Pant Hospital, Port Blair. Ethical principles were adhered to while gathering the information with strict confidentiality.

Statistical methods

Statistical analysis was performed using the software SPSS version 20 (SPSS IBM (PC + version 20.0)). Multivariate binary logistic regression was carried out to find a relation between the risk factors with the outcomes, considering the alpha level of error as 5%.

Results

Of the 491 cases, great majority 373 (75.99%) were STEMI, unstable angina 108 (21.99%), and non-STEMI 10 (1.98%). The mean age of 418 survived cases was 56.75 ± 10.47 while in 73 deaths, it was 58.01 ± 13.60. Majority (76.58%) of cases was males across all age groups; the male: female ratio was 3.3:1. An overall highest number were in the age group 51–60 (34.21%) followed by 41–50 (26.88%); notably only 27 (5.50%) were 73 years and above. Hindus were 72.51% tallying with the demography of Andaman and Nicobar Islands; 83.10% reported only one in three (33.40%) of their religions and majority of the cases (59.06%) were from white collar profession (teacher, clerical, etc.) [Table 1].

Out of all admitted cases, deaths was in 73 (14.87%); mortality probability among females was less (12.17%) compared to males (15.69%). Case fatality rates were the lowest in the age group 41–50 years (7.58%) followed by 51–60 years (9.52%), similar among both genders. Of the fatal cases, 59 (80.82%) were
males across all age groups. The highest proportional death rate was in 31–40 age group (30.43%) followed 61–70 (26.47%) and more than 70 years (19.35%) [Table 2].

Association between demographic, comorbidity, and lifestyle-related variables was tested using Chi-square test. ACS deaths were significantly associated with diabetes, HTN, smoking and family history, and not so with gender, religion, dietary habits, and physical activity [Table 3].

Backward multivariate binary logistic regression was applied, and it was noted that physical activities and vegetarian diet were not protective; addiction to smoking was significantly ($P = 0.023$) associated with death. Among comorbidities, diabetes was most significantly ($P = 0.002$) associated with death followed by HTN ($P = 0.009$). A family history of myocardial infarction was also a significant ($P = 0.030$) risk factor [Table 4].

Thrombolytic was administered to 114 (23.65%) STEMI cases, out of which 84 (73.68%) survived, while 88.32% of nonrecipient also survived; odds ratio of survival with thrombolysis was 2.699 (95% confidence interval = 1.598–4.560, $P < 0.0002$) showing benefit to recipients.

**Discussion**

Of the 491 cases, STEMI were 75.99%. INTERHEART-South Asia noted that nearly half of AMI cases in Indians were STEMI[9‑11] corroborating with CREATE registry.[12]

**Age**

In our study, the highest number of cases was among 51–60 years (34.21%). Mean age of survived cases was 56.75 ± 10.47 and among dead 58.01 ± 13.60; these findings were comparable to CREATE registry,[11,12] and two studies reported from Pakistan[13,14] and Chennai study[15]. On the contrary studies on migrant Asian Indians showed higher prevalence of AMI at relatively younger ages.[16,17] Research group from South India noted maximum patients in 51–60 years (31%), followed by 41–50 years (26%).[18] Another South Indian study showed comparable age distribution.[19] The mean age of ischemic heart disease (IHD) cases in Bengal was 52.8 years and increased with age; highest among 80 years or above (40.0%) and lowest in 40–49 year age group (5.4%).[20]
Gender

Males were 76.58% with male: female ratio 3.3:1 in our series, whereas Pakistani studies reported 78% and 88.5% males.[13,14] Kerala study reported 72.9% males and male: female ratio 2.68:1,[10] though contrast was in Chennai study.[15] Gujarat study reported 71.7% males among STEMI cases with the male: female ratio 3.6:1.[17] South Indian study noted maximum AMI among males (82%) with the male: female ratio 4.5:1.[18] In North Bengal study, higher prevalence of coronary artery disease (CAD) was noted among males.[20] Male preponderance among STEMI cases in all age groups was observed in North India.[21]

Diabetes

In our series, 52.95% had diabetes among AMI cases, which was supported by the global literature.[22] Kerala study reported 72.9% males and male: female ratio 2.68:1,[10] though contrast was in Chennai study.[15] South Indian study noted maximum AMI among males (82%) with the male: female ratio 4.5:1.[18] In North Bengal study, higher prevalence of coronary artery disease (CAD) was noted among males.[20] Male preponderance among STEMI cases with HTN was noted among males.[19] Male preponderance among STEMI cases with HTN was noted among males.[19]

Hypertension

In our series, 47.45% were hypertensive among AMI cases. Global researchers observed HTN as major risk factor for STEMI cases; with an exception in South Asian population. Indian studies noted significant association of CVD cases with HTN.[10,11,13,17,18,24] Studies reported higher numbers of females with STEMI, having HTN.[19]
Smoking/tobacco consumption

In our series, 34.22% reported tobacco smoking; International Research Groups noted smoking or smokeless tobacco as a major risk factor for STEMI. Researchers linked cigarette smoking with an increased risk of CHD among diabetic women; quitting smoking declined this additional risk.[24] In Kerala study, smoking was a risk factor among 52.55% of cases.[10] Gujrat study 28.3%,[17] South Indian study 76%,[18] yet smoking found no association with CAD cases in Chennai study.[13] In North Bengal study, the prevalence of IHD among smokers was significantly higher than in nonsmokers.[20] Other published literature correlated smoking to be an important risk factor for CAD in Indian population.[25]

Dietary habits

In our series, only 6.52% were vegan. International Research Group reported that vegetarian diet reduced the risk of CAD due to avoidance of meat.[22] Different research groups perceived that vegetarian diet reduces the incidence of CAD and recommended restriction of dietary saturated fats. Research groups in India observed that low consumption of fruits and vegetables was important determinants of CVD,[21,24,26] although North Bengal study could not find any such relationship.[20] “The Seven Countries Study” believed that the force of a risk factor such as dietary saturated fat and antioxidant deficiency may vary among population groups.[27] Rising incidence of ACS was related to Westernized food practices in India.[9]

Physical activity

In our series, 83.09% reported regular physical activity. Since last six decades, International Research Groups observed the protective role of physical activities with the onset of the CVDs; active people had lower rates of CVD.[28–31] “The Seven Countries Study” indicated the potential protective effect of physical activity on CAD.[27] Rising incidence of ACS in Indians has been related to lifestyle changes.[9] Literature reported sedentary lifestyles as important determinants of cardiovascular diseases in India.[11] It is also possible that the risk factors differed with lifestyle changes among migrants.[25] However, no significant relation was found between physical activities and IHD in a population-based study from North Bengal, India.[20]

Family history

In our series, 10.39% of the AMI cases reported having a family history. INTERHEART study indicated the importance of family history for CAD among young Indians.[9] Researchers from India reported less (7%) family history of among AMI cases.[9] The rising incidence of ACS in Indians may be related to familial hereditary factors acting upon modifiable risk factors,[10] an important independent risk factor for CAD in younger cases.[22–33]

Thrombolytic intervention

Thrombolytic therapy is indicated with evidence of STEMI within 12 h of the onset of symptoms, and the goal is a door-to-needle time of below 30 min to minimize the time to therapy. Although streptokinase/tenecteplase is available in our hospital free of cost to all the patients, yet 114 (23.65%) STEMI patients could be thrombolysed for the remoteness of this area, yet a good number of STEMI cases arrived early with survival benefit to the recipient compared to other studies.[8] Treatment in hospital with thrombolysis is more common in India than in other developing countries although injection streptokinase/tenecteplase to be administered under careful monitoring.[10] In centers with a higher prevalence of primary angioplasty, an estimated 7.5% of AMIs are treated with angioplasty in India to avoid prohibitive costs.[22] In Kerala study 68.97%[27] in Gujrat 79.7% of cases were thrombolysed, higher than CREATE registry.[17] A systematic review from India had shown that streptokinase is highly cost effective.[27] Despite the availability of guidelines, there is a need to evaluate striking practice variations in different centers present in the use of thrombolytic therapies.[28]

Death during stay at hospital

In our study, in-hospital mortality rate was 14.87% among admitted AMI cases; majority of deaths were in the age group 31–40 (30.43%) though survival probability was less among males; this was much higher than CREATE registry (5.6%).[12] Kerala study reported 8.04% death among MI cases, where coexistent cardiovascular risk factors, namely diabetes mellitus, HTN, and smoking history did not reveal any statistically higher risk for death.[19] CAD deaths change consequent to affluence and cultural changes due to migration.[13] Our mortality data correlated with literature from Pakistan[14] and India (Gujarat) both reported 13.2%.[32] Other studies also concurred high incidence of ACS among Indians, resulting in high mortality as compared to Global data.[33,40–43]

Strength of the study

This study was undertaken for the first time in Andaman and Nicobar Islands in the only teaching hospital, and the inclusion of census population covered all the seasons to discern seasonal trends.

Limitations of the study

This was a single center study with our limited resources. By this endeavor, we have only managed to scratch the surface of the problem of AMI fatalities in our study.

Future directions of study

A national level prospective longitudinal registry is required to throw light on risk factors for various cardiovascular endpoints.

| Table 4: Multivariate binary logistic regression of risk correlates of myocardial infarction deaths |
|--------------------------------------------------|
| Variable    | B  | SE  | Wald | df | Significant | Exp(B) |
| Diabetic    | 1.115 | 0.362 | 9.502 | 1  | 0.002      | 3.048  |
| HTN         | 1.060 | 0.358 | 2.814 | 1  | 0.009      | 2.887  |
| Smoking     | 0.842 | 0.348 | 1.461 | 1  | 0.023      | 2.321  |
| Family history | 1.901 | 1.051 | 3.274 | 1  | 0.030      | 6.693  |
| Constant    | 1.663 | 0.257 | 42.000 | 1  | 0.001      | 0.190  |

SE: Standard error; HTN: Hypertension
However, the basic problem in the AMI management in Indian infrastructure is a lack of logistics for which we need to improve prehospital care.

Conclusions

We attempted to identify various factors involved in AMI cases to enable us to improve future care. There is a need for early detection of a risk factor to prevent the progression of ACS, creating awareness in the community regarding risk factors, symptoms and signs of AMI for early referral to definitive care units to prevent morbidity and mortality in the community. Urgent strategies are required to modify lifestyle by enhancing physical activities, meditation, yoga, and others may be synergistic in controlling mind-body interactions that are important in the preventive strategy to lessen pathogenesis of cardiovascular diseases.

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Conflicts of interest

There are no conflicts of interest.

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