www.jmscr.igmpublication.org
Impact Factor (SJIF): 6.379
Index Copernicus Value: 79.54
ISSN (e)-2347-176x ISSN (p) 2455-0450
crossrefDOI: https://dx.doi.org/10.18535/jmscr/v6i8.73

IGM Publication
Journal Of Medical Science And Clinical Research
An Official Publication Of IGM Publication

Research Article

Clinical Outcomes of Acute Coronary Syndrome: In-Hospital Study in Rural Bengal

Authors

Durga Prasad Rai MD, DM[1], Biswarup Mukherjee. MD, DNB, DM[2*], Gautam Datta MD, DNB, DM[3], Biswakesh Majumdar MD, DM[4], Jayanta Pal MD, DM [5]

[1]Senior Consultant, Department of Cardiology, SMIMS, Gangtok, Sikkim 737102
[2]Associate Prof., Dept of Cardiology, NRS Medical College & Hospital. Kolkata
[3]Associate Professor, Department of Cardiology, Burdwan Medical College and Hospital
[4]Professor, Department of Cardiology, Burdwan Medical College and Hospital
[5]Department of Cardiology, Senior Consultant Gouri Devi Hospital & Research Institute, Rajbandh, GT Road Durgapur-713212,West Bengal
*Corresponding Author
Dr Biswarup Mukherjee
Email: *drbiswarup_mukherjee@yahoo.co.in*, Phone no. 09874424460

Abstract

Background: *Coronary artery disease is the leading cause of morbidity and mortality globally. Total thirty one million people are affected by the disease in India. Changing lifestyle, increasing prevalence of diabete , genetic factors may be related to rising incidence of CAD in India, Lack of data on ACS from rural setting prompted authors to study risk factors emerging clinical profile from rural Bengal.*

Materials and Method: *All cases admitted in cardiology ward and ICCU with clinical diagnosis of ACS between Jan 2013 to Dec 2014 at Burdwan Medical College and Hospital were enrolled, Total 2079 patients were included in study, Age .gender. various risk factors, comorbidities, time to delay to thrombolysis or PCI, complication during hospital stay and outcome were analysed. statistical analysis was performed with SPSS programme version 20.*

Results: *mean age of presentation is 58 years with no difference in two communities. hypertension more common in Hindus and diabetes in Muslim group. Older patients received less revascularisation because of co morbidities. 5.5% patients are age less than 40 yrs .most of the ACS patients are in age group 40 to 60 years. we found at least one risk factors in vast majority of young patients and one fourth had one or more risk factors.*

Conclusion: *Acute Coronary Syndrome in rural eastern India tends to present at much younger age Most of the patients presented with with STEMI. Late medical attention, lack of proper referral system leads to late presentation and increased morbidity and mortality.*

Keywords: *coronary artery disease. Acute coronary syndrome, risk factor, revasculirisation, thrombolysis*

Introduction

Coronary artery disease (CAD) manifested mainly as acute coronary syndrome (ACS), is the leading cause of morbidity and mortality globally, Between 1990 and 2020, these diseases are expected to increase by 120% for women and

137% for men in developing countries, compared with 30–60% in developed countries.[1,2]

Approximately 1.7 million people die of CAD in India. The prevalence of CAD and the incidence of ACS are very high among Indians.[3,4]

No prospective national cohort registries of CHD in India have published CHD incidence rates. CHD prevalence rates can be estimated from several studies over the past several decades in either rural or urban cohorts.. Unadjusted CHD rates have ranged from 1.6% to 7.4% in rural populations and 1% to 13.2% in urban populations. (Gupta et al., 2008)[5]

Ethnic differences in CHD prevalence within India are not consistent across studies.[6]

The health status of rural Indian population differs from that of urban owing to its higher literacy rate, better distribution of its healthcare manpower among urban areas, and its better access to healthcare institutions. The clinical spectrum, the age and gender-specific differences and the mortality rate in patients with ACS are not studied properly in rural India on a large scale basis in rural areas of Eastern India. Most of the major hospitals in West Bengal are in the state capital, Kolkata, and there are few medical colleges, and district hospitals providing health care services to those living elsewhere.

Aims & Objectives

To determine the clinical characteristics, clinical presentation, time delays, in- hospital courses, complications and mortality as well as possible risk factors for mortality among hospitalised patients with a wide spectrum of acute coronary syndromes in rural Bengal in a tertiary care teaching institute.

Materials and Methods

This is single centre institution based prospective study conducted in the Department of Cardiology, Super speciality Wing Hospital, Burdwan Medical College, Burdwan in Burdwan district (West Bengal).

All the cases admitted to the Cardiology Wards and ICCU with clinical diagnosis of ACS between January 2013 and December was included. Patients from urban background were excluded from the study.

Characteristics to be analysed

As per the clinical presentation of ACS, patients will be characterized as unstable angina (UA), ACS with ST-segment elevation (STEMI), ACS without ST-segment elevation (NSTEMI) or ischemic equivalent (atypical manifestations of ACS as dyspnea, malaise, confusion, syncope or pulmonary edema). Risk factors for CHD and its co- morbidities will be documented at the time of admission, by completing a questionnaire: diabetes mellitus, smoking, family history of CAD, cerebrovascular accident (CVA)/transient ischemic attack (TIA), chronic kidney failure, dyslipidemia, coronary history (if prior AMI, PCI or CABG).We recorded age, gender, religion, various risk factors and co-morbidities, direct admission through outdoor versus referral, time delays (symptom onset, medical contact, admission to Department of cardiology, BMCH,), thrombolysis or percutaneous coronary intervention (PCI), treatment during hospital stay and in-hospital outcome. Patients will be followed up during hospitalization, with the intent to highlight in- hospital death, complications associated with both diagnostic and therapeutic procedures

Statistical Analysis

Statistical analysis was performed using the software SPSS programme (Statistical Package of Social Science, Chicago) for Windows, Version 20. Categorical variables were compared by chi square 'χ^2' test and the continuous variables are presented as mean (+/- SD) and were compared by One-way ANOVA. A probability (p) value of <0.05 was considered statistically significant. Data are shown as continuous variables and percentage

Observation and Results

Demographics and baseline characteristics

A total of 2079 patients of acute coronary syndrome admitted to department of cardiology, Burdwan Medical College & Hospital, between January 2013 and December 2014 were enrolled.

Table-7 features the key baseline characteristics of the study population.

		Total	Hindu	Muslim	p-value
Patients enrolled, N (%)		2079 (100)	1467 (70.6)	612 (29.4)	
Male, n (%)		1696 (81.6)	1215 (82.8)	481 (78.5)	0.023
Age (in years), mean±SD		57.4 ± 10.8	57.8 ± 11.0	56.6 ± 10.2	0.021
	<40	115 (5.5)	68 (3.3)	47 (2.3)	0.005
Age Group, n (%)	40-60	1182 (56.9)	777 (37.4)	405 (19.5)	<0.001
	61-80	683 (32.9)	549 (26.4)	134 (6.4)	<0.001
	>80	99 (4.8)	73 (3.5)	26 (1.3)	0.477
BMI (in kg/m2) mean±SD		24.7 ± 6	24.3 ± 6	25 ± 6	0.375
Waist Circumference (in cm), mean±SD		66.19 ± 16.2	65.27 ± 16.7	68.26 ± 14.9	<0.001
Risk factors, n/N (%)					
Hypertension		930 (44.7)	666 (46.3)	264 (41.1)	<0.001
Diabetes mellitus		601 (28.9)	368 (25.6)	233 (36.3)	<0.001
Dyslipidemia		812 (39.0)	484 (32.9)	328 (53.5)	<0.001
Smoker		1376 (66.2)	953 (66.3)	423 (65.9)	0.067
Family history		249 (11.9)	137 (9.3)	112 (18.3)	<0.001
Known CAD		124 (5.9)	58 (3.9)	66 (10.7)	<0.001
CKD		153 (7.3)	117 (7.9)	36 (5.8)	0.095
Creatinine		1.32 ± 0.62	1.29 ± 0.52	1.38 ± 0.79	0.004
Total Cholesterol		134.6 ± 39.4	133.1 ± 40.3	138.1 ± 37.3	0.007
Triglycerides		107.4 ± 58.0	107.6 ± 62.4	107.0 ± 46.9	0.813
LDL		107.4 ± 58.0	107.6 ± 62.4	107.0 ± 46.9	0.813
HDL		37.2 ± 12.7	37.0 ± 12.92	37.2 ± 12.7	0.312
Total Leukocyte Count		9697 ± 3301	9687 ± 3554	9721 ±2650	0.829

The study had a strong gender bias with 81.6% males in total with significantly higher number of males both in Hindu (82.8%) and Muslim (78.5%) communities, (p- value= 0.023). The mean age of enrolled patients was 57 ± 10.8 years which was comparable in both the communities whereas the age distribution analysis has shown that significantly higher number of patients of hindu community have ACS as compared to muslim in age groups of <40 years (p=0.05) and 40 to 80 years (p=<0.001), but comparable inage group above 80 years (figure-7). The mean body mass index was 24.7 ±6 kg/m^2 and was similar among the two groups (p=0.357), whereas significant difference in waist circumference with mean 66.19 ± 16 cm which was lower in Hindu than Muslim (p=<0.001). The incidence of hypertension, dyslipidemia and diabetes mellitus among the patients of ACS were 44.7%, 39.0% and 28.9% respectively where hypertension was significantly higher among hindu (p= <0.001) whereas dyslipidemia and diabetes mellitus were significantly higher among muslim (p= <0.001). Overall, 66.2% of patients were current or past smoker (p= 0.067) and incidence of CKD was 7.3% (p= 0.095) with mean creatinine level of 1.32 ± 0.62 mg/dl were comparable in both the communities. Significantly higher number of patients had positive family history of cardiovascular disease 18.3% in muslim and 9.3% in hindu (p= <0.001). Patients of muslim communities exhibited the higher plasma total cholesterol levels (p= 0.007) as compared to hindu counterpart and the plasma triglycerides, Low-density lipoprotein (LDL) and high-density lipoprotein (HDL) levels were non-significantly

distributed. No significant difference was found in total leukocyte count among the two religious groups (p= 0.829).

Initial hemodynamic and clinical features

At the time of presentation in hospital, presenting symptoms and haemodynamic parameters were recorded and categorised based on the initial electrographic pattern. Table-8: The most common presenting symptom was mostly typical angina and it was least among the patients with unstable angina, 82.5% patients of STEMI, 77.7% of NSTEMI and 65% of unstable angina patients presented with typical chest pain. The second common presentation was symptoms of heart failure which was higher with NSTEMI and unstable angina, 11% and 17% respectively. The mean heart rate in patients with STEMIa was 81.47 ± 25 beats per minute and that of NSTEMI and unstable angina were 90 ± 13and 78 ± 11 beats per-minute respectively. Systolic as well as diastolic blood pressures (DBP) were lesser with STEMI patients with mean SBP of 109.3 ± 25 mmHg and DBP of 65.1 ± 15 mmHg. Most of the patients belonged to Killip class I, 56.3% of STEMI, 71% of NSTEMI and 98% of unstable angina whereas patients presenting with Killip Class III and IV were STEMI and NSTEMI in which 21% STEMI patients were in Class III and 14.6% in Class IV and similarly 10.7% NSTEMI patients were in Class III and 9.3% in Class IV.

Table—8 Haemodynamic and clinical features at presentation based on initial electrocardiographic pattern

	STEMI	**NSTEMI**	**Unstable Angina**
Presenting symptoms (%)			
Typical angina	82.5	77.7	65.4
Atypical angina	5	7	3.4
Heart failure	7	11	17
Syncope	1.5	2.3	6.2
Others	4	2	8
Heart rate, (beats.min-1)	81.47 ± 25	90 ± 13	78 ± 11
SBP (mmHg)	109.3 ± 30	137.1 ± 37	131 ± 28
DBP (mmHg)	65.1 ± 15	69.5 ± 22	72.7 ± 19
Killip Class (%)			
I	56.3	71	98
II	8.1	9	2
III	21	10.7	0
IV	14.6	9.3	0

Reperfusion in STEMI patients

Reperfusion therapy was carried out in 645 (42%) out of total 1519 patients of STEMI but most reperfusion by percutaneous coronary intervention (PCI) done late due to persistent ischemia or heart failure in 25.6% the patients. Fibrinolysis was administered in only 97(6.38%) cases similarly primary PCI was done only in 103 (6.78%) cases within window period. Fibrinolytic therapy was done with a median first medical contact to needle time of 60 minutes, with only 26.1% (28 cases) of these patients receiving fibrinolytic agent within 30 minutes. Primary angioplasty was performed with median medical contact to balloon time of 96 minutes, with only 20.1% (32 cases) done within 60 minutes. Fibrinolysis along with primary angioplasty was done in 0.65% (10 cases) and rescue angioplasty was performed in 3.02% (46 cases). The salient points of STEMI management are listed in Table-9.

Table-9: Reperfusion status in patients diagnosed with STEMI at the time of presentation

	STEMI	ACS	PERCENTAGE
Total STEMI patients, n/N (%)	1519	2079	73.0
Reperfusion therapy performed, n/N (%)	645	1519	42.4
Fibrinolysis	97	1519	6.38
Primary PCI	103	1519	6.78
Fibrinolysis + Primary PCI	10	1519	0.65
Rescue PCI	46	1519	3.02
Delayed PCI for persistent ischemia	329	1519	25.6
Total PCI	548	1519	36.0
Fibrinolysis			
Median first medical contact to needle time, min		60	
First medical contact to needle within 30 min, n/N (%)		28/107	26.1
Primary PCI			
Median first medical contact to Balloon time, min		96	
First medical contact to Balloon within 60 min, n/N (%)		32/159	20.1

Diagnostic and therapeutic procedures

In hospital mortality was at 7% and this was mainly due to cardiac complications. Mortality rate was higher in STEMI cases (8.2%) in comparison to NSTEMI cases (5.2%) and zero mortality in UA cases, (p= <0.001). No significant gender difference in mortality (p= 0.720), but there was significantly higher mortality among patients of significantly higher in STEMI (29.1%) than NSTEMI (19.7%) and UA (1.1%), p= <0.001), similarly Cardiogenic shock was observed in 12.4% cases which was significantly higher in STEMI (14.6%) and NSTEMI 99.3%), (p= <0;001).

Mechanical complications having highest mortality in the form of free wall rupture, ventricular septal rupture and acute mitral regurgitation were encountered in 0.62%, 0.81% and 1.2% respectively with no significantly difference among STEMI and NSTEMI patients. (table-12).

Table-12: In-hospital outcomes grouped by discharged diagnosis

In-hospital outcome		Total	STEMI	NSTEMI	UA	p-value
	Total	146/2079 (7%)	126/1519 (8.2)	20/384 (5.2)	0/176 (0)	<0.001
	Male	114 (78.1)	99 (67.8)	15 (10.3)	0	0.720
Death, n/N	Female	32 (21.9)	27 (18.5)	5 (3.4)	0	
(%)	Hindu	116/1467 (7.9)	105/1068 (9.8)	11/256 (1.1)	0	0.004
	Muslim	30/612 (4.9)	21/451 (4.6)	9/451 (1.9)	0	
Re-MI, n (%)		24 (1.1)	9 (0.5)	12 (3.1)	3 (1.7)	0.019
Strokes, n (%)		12 (0.5)	4 (0.2)	6 (1.5)	2 (12.5)	0.25
Ischemic		9/12 (75)	3/4 (75)	5/6 (83)	2/2 (100)	0.62
Major Bleeding, n (%)		17 (0.81)	9 (0.59)	6 (1.5)	2 (1.1)	0.05
Heart failure, n (%)						
Pulmonary edema		519 (24.9)	443 (29.1)	76 (19.7)	2 (1.1)	<0.001
Cardiogenic shock		259 (12.4)	223 (14.6)	36 (9.3)	0	<0.001
Mechanical complication, n (%)		13 (0.62)	9 (0.59)	4 (1.0)	0	0.332
Free wall rupture		17 (0.81)	12 (0.78)	5 (1.3)	0	0.275
Septal rupture		25 (1.2)	16 (1.05)	9 (2.3)	3 (1.7)	0.036
Arrhythmias, n (%)						
Asystole/VF		96 (4.6)	83 (5.4)	13 (3.3)	0	0.002
Sustained VT		41 (1.9)	27 (1.7)	12 (3.1)	2 (1.1)	0.167
Atrial fibrillation		28 (1.3)	17 (1.1)	11 (2.8)	0	0.008
CHB		356 (17.1)	337 (22.1)	19 (4.9)	0	<0.001
Acute renal failure, n (%)		187 (8.9)	151 (9.9)	30 (7.8)	6 (3.4)	0.010

Arrhythmias which were second most common complication encountered during hospitalisation. In-hospital cardiac arrest due to ventricular fibrillation (VF) or Asystole were encountered in 96 (4.6%) of patients which were higher in STEMI (5.45%) and NSTEMI (3.3%) and not encountered in UA, (p= 0.002) and revived well in goodproportion of patients in our setup. Sustained ventricular tachycardia (VT) was observed in 1.9% of cases and atrial fibrillation (AF) in 1.3% of cases which was significantly more in NSTEMI (2.8%), (p= 0.008). Complete heart block (CHB) was common occurrence in STEMI especially inferior wall myocardial infarction (IWMI), were encountered as 22.1% in STEMI and 4.9% in NSTEMI, (p= <0.001). Lastly incidence of acute renal failure was 8.9% over all, were significantly higher with 9.9% and 7.8% respectively in STEMI and
NSTEMI than 3.4% in UA cases, (p= 0.010).

Discussion

We assessed characteristic of patients, diagnostic and therapeutic practices, in-hospital course and the rates of major outcomes from rural patients of Eastern India Recent estimates suggest that 80 per cent of CVD deaths occur in developing countries with substantial contribution from India.[7] This high burden is largely ascribed to the industrial and technological progress and the associated economic and social transformations

In the present studied ACS population only two religions, Hindu and Muslim were present in proportional to rural population in the region in the tune of 70.6% and 29.4% respectively. The mean age at presentation of ACS cases (57.4 years) is comparable with mean ages of cases from the CREATE registry data (57.5 years)[8] with no difference in both religious communities. An important observation in this study is the comparison of common risk factors of cardiovascular diseases among the existing two religious groups in this region, that the significantly higher numbers of Hindu patients were hypertensive where as significantly higher numbers of Muslim patients were having diabetes, dyslipidemia and positive family history of cardiovascular diseases. Both the religious groups were having comparable mode of presentation in-hospital course and complications.

The present study was not specially designed to study ACS in elderly people. Being part of a larger project with focus on long-term prognosis and risk in an ACS population treated, elderly above 80 years were also included in the present study.

In contrast to the findings in the GRACE registry that older patients delay seeking care more than younger patients, we observed no significant differences in this respect between the three age groups[9] In accordance with previous reports, we found a history of heart failure, previous MI and hypertension to be more common with increasing age, while hyperlipidaemia, current smoking and prior PCI were considerably lower in the older age group.[10] Higher age was associated with less frequent use of coronary angiography and reperfusion therapy. Among all patients treated with reperfusion therapy, thrombolysis was the first preferred choice in elderly. Thus, also in our CCU, in line with suggestions from previous reports, elderly patients were less likely to undergo revascularization and to receive acute and long-term evidence-based medications when hospitalized with ACS.[10,11] The lower rate of aggressive treatment is due to the increased number of co- morbid conditions. The fact that evidence supporting the efficacy of acute reperfusion therapy in elderly with acute MI is not as strong as it is in younger groups may play some role. More data are available for thrombolysis than for PCI.[12]

In our study as in a number of previous reports, older patients had a more complicated clinical course and a higher mortality than younger ones, short- term mortality increased with age.[9,11,13] Although age is an independent predictor of morbidity and mortality following acute MI, suboptimal management may further contribute to

the high mortality in these patients. Our findings emphasize the ongoing need to better define and promote optimal therapeutic regimens for elderly patients with ACS. The present study showed 4.5 % of octogenarians and had higher in-hospital morbidity and mortality. This study also showed ACS in young patients of less than 40 years of age, 5.5% constituting significant proportion of the cases. We found at least one IHD risk factor (defined as current smoker, diabetes mellitus, hypertension and/or statin therapy before arrival) in the vast majority of these young patients and one forth had two or more risk factors. In the young male patients the majority had at least one previously known IHD risk factor than among women. The prevalence of smoking was 50% higher in young men.ACS cases of octogenarian constituting 4.8% of the cases. The most cases of ACS patients were between 40 to 60 years of age constituting 56.9% of the cases.

Gender: There is an ongoing debate whether women and men differ in baseline characteristics, as to use of medically proven therapies and revascularization procedures and in outcome after ACS.[14] On the whole, the differences we could demonstrate were smaller than expected. An important finding in our study was that early management strategies including reperfusion therapy, coronary angiographies and medical treatment in the acute phase seemed to be quite similar in women and men. However, out of the patients treated with reperfusion therapy, a tendency, although not significant, was observed where men to a larger extent achieved PCI as first preferred choice. Risk Factors: In our study, in contrast with data from developed countries and major cities of India in CREAT study, we recorded more cases of STEMI than NSTEMI or unstable angina, longer delays before admission to hospital and between hospital and reperfusion therapy, there are different practice pattern and outcomes. About 73 % of patients had STEMI in contrast to CREAT registry had 61 % whereas in developed countries including European Heart Survey and GRACE registry, fewer than 42% had STEMI patients. This suggests that the patients admitted to our centre with ACS were likely to have worse prognosis than other centres. Our patients reached the hospital late due to lack of proper referral system, socioeconomic reasons, lack of awareness of the importance of symptoms and different kind of health care provider that prevents rapid access to secondary and tertiary care hospitals. We recorded major difference in practice pattern of our study with large registries from India and developed countries. In patients in our study, rate of primary percutaneous coronary intervention were far lower in but comparable with Indian cites where as thrombolysis were also very significantly lower than Indian cites as recorded in CREATe registry (6.3% Vs 59%) which shows that patient reaching the hospital beyond window period which reflects in higher in-hospital complications and mortality. Reperfusion therapy was carried out in 645 (42%) out of total 1519 patients of STEMI but most reperfusion by percutaneous coronary intervention (PCI) done late due to persistent ischemia or heart failure in 25.6% the patients. Fibrinolysis was administered in only 97(6.38%) cases similarly primary PCI was done only in 103 (6.78%) cases within window period. Fibrinolytic therapy was done with a median first medical contact to needle time of 60 minutes, with only 26.1% (28 cases) of these patients receiving fibrinolytic agent within 30 minutes

Study Limitations

One of the limitations of this study is that it represents only survivors of acute coronary syndrome reaching the tertiary care centre and so many patients could have died at referral centres like health centres and nursing homes. Though this study have covered major risk factors like diabetes mellitus, hypertension, smoking, dyslipidemia and obesity, whereas physical inactivity and dietary habits were not taken into consideration but most of the subjects included in

this study were engaged in agriculture, daily labourers etc all of which involve high degree of physical activity.

Conclusions

The patients with acute coronary syndrome in rural eastern India tend to be of young productive ages and to have higher rate of STEMI than urban India as well as developed countries. They received medical attentions very late, lack of proper referral system and poor affordability so less often receive evidence-based therapies. Late presentation to tertiary care centre with worse baseline characteristics leading to worse prognosis and mortality.

Therefore, strategies to reduce delay in access to hospital would reduce morbidity and mortality from ACS in rural India, manpower building in rural areas, building awareness among people, coronary care training to all health care provider and extension of coronary care unit to all rural district, sub-divisional hospital with proper ambulance facilities. Both community based strategies and clinic based targeted approach to high risk subjects are required to address this problem.

Approved by ethical committee Burdwan Medical College and Hospital, Burdwan

References

1. Lopez AD, Mathers CD, Ezzati M, Jamison DT, Murray CJ. Global and regional burden of disease and risk factors, 2001: systematic analysis of population health data. Lancet 2006; 367: 1747–57.
2. Yusuf S, Reddy S, Ounpuu S, Anand S. Global burden of cardiovascular diseases: part I: general considerations, the epidemiologic transition, risk factors, and impact of urbanization. Circulation 2001; 104: 2746–53.
3. Prabhakaran D, Yusuf S, Mehta S, Pogue J, Avezum A, Budaj A, et al. Two-year outcomes in patients admitted with non-ST elevation acute coronary syndrome: results of the OASIS registry 1 and 2. Indian Heart J 2005; 57: 217-25.
4. Xavier D, Pais P, Devereaux PJ, Xie C, Prabhakaran D, Reddy KS, et al. Treatment and outcomes of acute coronary syndromes in India (CREATE): a prospective analysis of registry data. Lancet 2008; 371(9622): 1435-42.
5. Gupta R, Joshi P, Mohan V, Reddy KS, Yusuf S. Epidemiology and causation of coronary heart disease and stroke in India. Heart 2008; 94 : 16-26.
6. Gopianth N, Chandha SL, Jain P, et al. An epidemiological study of coronary heart disease in different ethnic groups in Delhi urban population. J Assoc Physicians India 1995; 43: 30–3.
7. Gupta R, Joshi P, Mohan V, Reddy KS, Yusuf S. Epidemiology and causation of coronary heart disease and stroke in India. Heart 2008; 94 : 16-26.
8. Xavier D, Pais P, Devereaux PJ, Xie C, Prabhakaran D, Reddy KS, et al. Treatment and outcomes of acute coronary syndromes in India (CREATE): a prospective analysis of registry data. Lancet 2008; 371(9622): 1435-42.
9. Avezum A, Makdisse M, Spencer F, Gore JM, Fox KA, Montalescot G, et al. Impact of age on management and outcome of acute coronary syndrome: observations from the Global Registry of Acute Coronary Events (GRACE). Am Heart J 2005;149(1):67-73.
10. Mahon NG, McKenna CJ, Codd MB, O'Rorke C, McCann HA, Sugrue DD. Gender differences in the management and outcome of acute myocardial infarction in unselected patients in the thrombolytic era. Am J Cardiol 2000;85(8):921-6.
11. Yan RT, Yan AT, Tan M, Chow CM, Fitchett DH, Ervin FL, et al. Age-

related differences in the management and out-come of patients with acute coronary syndromes. Am Heart J 2006 ;151:352-9.

12. Indications for fibrinolytic therapy in suspected acute myocardial infarction: collaborative overview of early mortality and major morbidity results from all randomised trials of more than 1000 patients. Fibrinolytic Therapy Trialists' (FTT) Collaborative Group. Lancet 1994;343(8893):311-22.
13. Rosengren A, Wallentin L, Simoons M, Gitt AK, Behar S, Battler A, et al. Age, clinical presentation, and outcome of acute coronary syndromes in the Euroheart acute coronary syndrome survey. Eur Heart J 2006;27(7):789-95.
14. Mahon NG, McKenna CJ, Codd MB, O'Rorke C, McCann HA, Sugrue DD. Gender differences in the management and outcome of acute myocardial infarction in unselected patients in the thrombolytic era. Am J Cardiol 2000;85 (8):921-6.