

Treatment Outcomes of Patients with Acute Coronary Syndrome Admitted to Tikur Anbessa Specialized Hospital, Addis Ababa, Ethiopia

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ABSTRACT

BACKGROUND: Acute coronary syndrome (ACS) refers to a spectrum of conditions compatible with acute myocardial ischemia and/or infarction that are usually due to an abrupt reduction in coronary blood flow.

OBJECTIVE: The objective of the study was to assess the treatment outcome and associated factors for ACS.

METHODS: A retrospective cross-sectional study was conducted from January 1, 2012 to December 31, 2014.

RESULTS: Of 124 ACS patients who were admitted during the 3 years' period, 90 (72.6%) were diagnosed with ST segment elevation myocardial infarction (STEMI). The mean age was 56.3 ± 13.7 years. The average length of hospital stay was 9.77 ± 6.42 days. The average time from onset of ACS symptoms to presentation in the emergency department was 3.8 days (91.7 hours). In about 76 (61.3%) patients, hypertension was the leading risk factor for development of ACS, and 36.4% of ACS patients were either Killip class III or IV. Biomarkers were measured for 118 (95.2%) patients, and 79.2% of patients had ejection fraction of less than 40% and 29.2% had less than 30%. In-hospital medication use includes loading dose of aspirin (79%), anticoagulants (77.4%), beta blockers (88.1%), statins (85.5%), morphine (12.9%), and nitrates (35.5%). The in-hospital mortality was 27.4%. The predictors for in-hospital mortality were age ($P = .042$), time from symptom onset to presentation ($P = .001$), previous history of hypertension ($P = .025$), being Killip class III and IV ($P = .001$), and STEMI diagnosis ($P = .005$).

CONCLUSIONS: The medical management of ACS patients in Tikur Anbessa Specialized Hospital (TASH) was in line with the recommendations of international guidelines but in-hospital mortality was extremely high (27.4%).

KEYWORDS: acute coronary syndrome (ACS), treatment outcomes of ACS, in-hospital mortality from ACS, Tikur Anbessa Specialized Hospital (TASH), Ethiopia

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Background

Acute coronary syndrome (ACS) refers to a spectrum of conditions compatible with acute myocardial ischemia and/or infarction that are usually due to an abrupt reduction in coronary blood flow.^{1,2} Acute coronary syndrome is most commonly caused by coronary atherosclerotic plaque and subsequent intracoronary thrombus formation, which leads to myocardial ischemia. If coronary blood flow is interrupted long enough, myocyte necrosis (infarction) can occur.^{3,4}

Over 7 million people every year die from coronary artery disease (CAD), accounting for 12.8% of all deaths.⁵ Coronary artery disease is the second leading cause of death in both men and women in Europe, accounting for 21% and 22% of all deaths, respectively.⁵ Every sixth man and every seventh woman in Europe will die from myocardial infarction (MI).⁶ According to the World Health Organization (WHO), cardiovascular disease (CVD) will be the leading worldwide cause of morbidity and mortality by the year 2020.^{7,8}

Ischemic heart disease (IHD) is the greatest single cause of mortality and loss of disability-adjusted life years worldwide, and a substantial portion of this burden falls on low- and middle-income countries (LMICs). Deaths from IHD and ACS occur, on average, at younger ages in LMICs than in high-income countries, often at economically productive ages, and similarly frequently affect the poor within LMICs.⁹ Whereas, the CAD death rate has declined in high-income countries, and the incidence of ACS is increasing in sub-Saharan Africa, where their management remains a challenge.¹⁰

Studies done in Ethiopia during late 1960s and 1970s showed CVD to account for 4% to 13% of medical admissions to hospitals in Addis Ababa.¹¹ During the period from September 1975 to August 1979, there were a total of 5667 patients admitted to the medical wards of Tikur Anbessa Specialized Hospital (TASH) of whom 381 (6.7%) admissions were due to CVD, whereas recent studies indicated the increasing frequency of CVD in residents of Addis Ababa.¹² In a



report released in 2001, in an autopsy study done on bodies brought by police to the Medico-legal Department of Menelik II Memorial Hospital, after sudden death, CAD accounted for 70% of those who died due to cardiac causes.¹³

According to a retrospective study conducted at Addis Cardiac Hospital (private hospital) in Ethiopia, ACS was the clinical diagnosis in 161 (53.7%) of patients, of which 100 patients (33.3% of the total) had ST segment elevation myocardial infarction (STEMI).¹² The care that acute myocardial infarction (AMI) patients receive during the relatively short emergency department (ED) stay can have a substantial effect on patient outcomes, such as in-hospital mortality.⁸

Data from the WHO multinational monitoring trends and determinants in CVD (MONICA) project showed that mortality rate can be decreased by about 25% by primary prevention, 29% by secondary prevention due to the reduction of risk factors, and 43% by other therapeutic improvements. The decrease in in-hospital case fatality may be linked to the increasing use of established treatment strategies such as thrombolytics, aspirin, and beta blockers.¹⁵

There is a large practice gap between optimal and actual patterns of care for patients with AMI in hospitals around the world.¹⁶ Early reperfusion therapy using either percutaneous coronary intervention (PCI) or fibrinolytics is very essential to decrease in-hospital mortality. But in Ethiopia, fibrinolytics are not available and PCI service is not given in governmental hospitals. This study aims to address the treatment outcomes of patients with acute coronary.

Methods

A retrospective cross-sectional study was conducted in patients who have a discharge diagnosis of ACS from January 1, 2012 to December 31, 2014 period. Tikur Anbessa Specialized Hospital is the largest hospital in Ethiopia with more than 800 beds.¹⁷ Patients above 18 years of age were included. The *outcome variable* was in-hospital mortality, whereas the *exposure variables* were age, sex, time from symptom onset until presentation to ED, prior medical history, blood pressure during admission, Killip class, serum lipid levels, ejection fraction, diagnosis type, use of aspirin on admission, use of beta blocker on admission, and use of anticoagulants.

EPI-info 3.5.4 software and SPSS version 20.0 were used. Statistical significance was measured by *P*-values less than .05 with 95% confidence interval (CI).

Results

During the 3 years' period, a total of 124 patients' charts with a diagnosis of ACS were reviewed for the study. The mean age was 56.3 (SD ± 13.65) years ranging from 28 to 93 years. Of which, 94 (75.8%) patients were male. The mean length of hospital stay was 9.77 (SD ± 6.42) days with the minimum 1 day and the maximum 25 days. From the symptoms suggestive for ACS, 106 (85.5%) patients experienced chest pain, 66 (53.2%) patients had

shortness of breath, 42 (33.9%) patients had nausea or vomiting, and 62 (50%) patients experienced diaphoresis during admission. The average time from onset of ACS symptoms to presentation in the ED was 91.7 hours (3.8 days) with a range of 2 hours to 20 days. No patient arrived within the first hour of symptom onset. In total, 24 patients (19.7%) arrived between 1- and 12-hour period, 52 patients (42.6%) arrived between 12 hours and 3 days period, and the rest 46 patients (37.7%) arrived at the ED after 3 days of symptom onset. Timing of presentation of two patients was not recorded as shown in Table 1.

Regarding the conventional risk factors, 76 (61.3%) patients had a previous history of hypertension, 26 (21%) patients had diabetes mellitus (DM), 20 (16.1%) patients had a previous history of MI, 12.9% of patients had a history of dyslipidemia, 6.5% had prior exertional angina pectoris, 8.1% had heart failure (HF) previously, and 14.5% of patients were either a current smoker or have a history of cigarette smoking previously as shown in Table 2. The average pack years for cigarette smokers was 18 (SD ± 13.82) with a range of 2 to 40 pack years.

Of the 124 ACS patients who were admitted during the 3 years' period, 90 (72.6%) were diagnosed as STEMI, 20 (16.1%) as non-STEMI (NSTEMI), and the rest 14 (11.3%) were unstable angina (UA) patients.

As shown in Table 2, the average systolic and diastolic blood pressure during admission was 135.5 (SD ± 30.33) and 84.6 (SD ± 21.11), respectively. The mean heart rate during admission was 93.2 (SD ± 16.6) with a minimum 59 and a maximum of 130. The random blood sugar (RBS) was measured in only 66 (54.8%) patients, and the average RBS was 183.2 (SD ± 90.33) with a minimum of 88 and a maximum of 441. The Killip class of patients was documented for 66 (54%) of patients. From those, 36.4% were on Killip class III and IV. High in-hospital mortality was documented from Killip class IV patients (87.5%). Biomarkers of cardiac injury including troponins and Creatine Kinase-Myocardial Band (CKMB) were measured for 118 (95.2%) of patients. Troponins and CKMB were at the normal range in 11.9% and 38.1% of patients, respectively.

Fasting serum lipid level was measured in 80 (64.5%) patients during their hospital stay. The mean total cholesterol, low-density lipoprotein (LDL), high-density lipoprotein (HDL), and triglyceride values were 182.5 ± 47.7, 118.5 ± 47.3, 40.5 ± 14.0, and 158.8 ± 84.7, respectively. High level of total cholesterol (>200 mg/dL) was documented in 26 (33.3%) patients, whereas LDL level was more than 100 mg/dL in 44 (62.9%) patients. Low amount of HDL was measured in 47.1% of patients. About 39.5% of patients were admitted with high amount of triglyceride level which was higher than 150 mg/dL. Echocardiography was done for about 86 (69.4%) patients. From those patients who had documented ejection fraction (EF) result, 29.2% had severe reduction in left ventricular ejection fraction (LVEF; EF < 30%), 37.5% had EF in between 30% and 49%, 20.8% had EF in between 50% and 59%, and the rest 12.5% had EF of more than 60% (Table 2).

Table 1. Socio-demographic characteristics and admission details of ACS patients in Tikur Anbessa Specialized Hospital, Ethiopia (2012-2014).

VARIABLES	IN-HOSPITAL MORTALITY		TOTAL
	YES FREQUENCY (%)	NO FREQUENCY (%)	FREQUENCY (%)
Sex			
Male	24 (25.5)	70 (74.5)	94 (75.8)
Female	10 (33.3)	20 (66.7)	30 (24.2)
Age (years)			
<55	12 (23.1)	40 (76.9)	52 (42.0)
55–64	6 (16.7)	30 (83.3)	36 (29.0)
≥65	16 (44.4)	20 (55.6)	36 (29.0)
Symptoms			
Chest pain			
Yes	26 (24.5)	80 (75.5)	106 (85.5)
No	8 (44.4)	10 (55.6)	18 (14.5)
Shortness of breath			
Yes	20 (30.3)	46 (69.7)	66 (53.2)
No	14 (24.1)	44 (75.9)	58 (46.8)
Nausea/vomiting			
Yes	14 (33.3)	28 (66.7)	42 (33.9)
No	20 (24.4)	62 (75.6)	82 (66.1)
Diaphoresis			
Yes	14 (22.6)	48 (77.4)	62 (50.0)
No	20 (32.3)	42 (67.7)	62 (50.0)
Time from symptom onset (hours)			
<1	0 (0)	0 (0)	0 (0)
1–12	2 (8.3)	22 (91.7)	24 (19.7)
13–72	10 (19.2)	42 (80.8)	52 (42.6)
>72	20 (43.5)	26 (56.5)	46 (37.7)
Total	32 (26.2)	90 (73.8)	122 (100)

Regarding the medications used, the loading dose of aspirin (162-325 mg) was given to 98 (79%) patients, while all patients had received the maintenance dose of aspirin. About 96 (77.4%) patients had received anticoagulants during their hospitalization, and 91.7% of patients had used un-fractionated heparin, whereas 8.3% of patients used enoxaparin. From patients who were treated with anticoagulants, 91.7% received the anticoagulant at the ED, whereas the rest 8.3% of patients received the anticoagulant after they were transferred to intensive care unit (ICU) or ward. The use of anticoagulants is very low in UA patients. From patients who were eligible for taking beta

blockers, 88.1% received beta blockers during hospitalization. From those, 94.2% received beta blockers immediately within the first 24 hours of admission at ED and the rest 5.8% received beta blockers later in the ward. The use of morphine and nitroglycerine in ED was 16 (12.9%) and 44 (35.5%), respectively. Statins were started for 85.5% of patients during their hospital stay. From those, 98.1% were having access for statins immediately at the ED. Atorvastatin was used in 83% of patients, simvastatin in 15.1%, and lovastatin in 1.9% (Table 3). From those patients who were discharged alive (N=90), only 61.1% had a combination of drugs comprising aspirin, clopidogrel, beta

Table 2. Risk factors, blood pressure, Killip class, serum lipids, ejection fraction, and medications used by the ACS patients admitted in Tikur Anbessa Specialized Hospital, Ethiopia (2012-2014).

VARIABLES	FREQUENCY	%
Hypertension		
Yes	76	61.3
No	48	38.7
Diabetes mellitus		
Yes	26	21.0
No	98	79.0
Previous MI		
Yes	20	16.1
No	104	83.9
Smoking history		
Yes	18	14.5
No	106	85.5
Dyslipidemia		
Yes	16	12.9
No	108	87.1
Heart failure		
Yes	10	8.1
No	104	83.9
Previous angina		
Yes	8	6.5
No	116	93.5
SBP (mm Hg)		
<90	6	4.9
90–119	28	23.0
120–139	26	21.3
140–159	30	24.6
≥160	32	26.2
DBP (mm Hg)		
<60	8	6.6
60–79	36	29.5
80–89	24	19.7
90–99	16	13.1
≥100	38	31.1
Killip class		
I	22	33.3

Table 2. (Continued)

VARIABLES	FREQUENCY	%
II	20	30.3
III	16	24.3
IV	8	12.1
Total cholesterol		
<200	52	66.7
≥200	26	33.3
LDL cholesterol		
<100	26	37.1
≥100	44	62.9
HDL cholesterol		
<40	32	47.1
≥40	36	52.9
Triglyceride		
<150	46	60.5
≥150	30	39.5
Ejection fraction (%)		
<30	14	29.2
30-49	18	37.5
50-59	10	20.8
≥60	6	12.5
Medications		
Aspirin	88	97.8
Clopidogrel	70	77.8
Beta blocker	82	91.1
ACEIs/ARBs	70	77.8
Statins	82	91.1
Nitrates	8	8.9
CCBs	2	2.2

Abbreviations: ACEI, angiotensin converting enzyme inhibitor; ARB, angiotensin receptor blocker; CCB, calcium channel blocker; DBP, diastolic blood pressure; HDL, high-density lipoprotein; LDL, low-density lipoprotein; MI, myocardial infarction; SBP, systolic blood pressure.

blocker, angiotensin converting enzyme inhibitor (ACEI), and statin (Table 2).

Overall, 20 patients (16.1%) had developed congestive HF in hospital, 10 patients (8.1%) major arrhythmia, and 6 patients (4.8%) experienced re-infarction during their hospitalization (Table 3). Cardiogenic shock (11.3%) was the major

Table 3. Medical treatment commenced and observed in-hospital events during hospital stay for ACS patients in Tikur Anbessa Specialized Hospital, Ethiopia (2012-2014).

DRUGS	DIAGNOSIS			TOTAL
	STEMI	NSTEMI	UA	
	FREQUENCY (%)	FREQUENCY (%)	FREQUENCY (%)	FREQUENCY (%)
Aspirin LD (162-325 mg)	76 (84.4)	15 (75)	7 (50)	98 (79)
Aspirin MD	90 (100)	20 (100)	14 (100)	124 (100)
Clopidogrel LD (300 mg)	66 (73.3)	10 (50)	4 (28.6)	80 (64.5)
Clopidogrel MD (75 mg)	88 (97.8)	16 (80)	8 (57.1)	112 (90.3)
Anticoagulant	76 (84.4)	16 (80)	4 (28.6)	96 (77.4)
Beta blocker	76 (88.4)	17 (89.5)	11 (84.6)	104 (88.1)
Morphine	14 (15.6)	2 (10)	0 (0)	16 (12.9)
Nitroglycerine	34 (37.8)	6 (30)	4 (28.6)	44 (35.5)
ACEIs/ARBs	66 (73.3)	13 (65)	9 (64.3)	88 (71)
Calcium channel blockers	6 (6.7)	0 (0)	2 (14.3)	8 (6.5)
Statins	76 (84.4)	18 (90)	12 (85.7)	106 (85.5)
CHF in hospital	18 (90)	2 (10)	0 (0)	20 (16.1)
Cardiogenic shock	14 (100)	0 (0)	0 (0)	14 (11.3)
Major arrhythmia in hospital	8 (80)	2 (20)	0 (0)	10 (8.1)
Re-infarction in hospital	6 (100)	0 (0)	0 (0)	6 (4.8)
Stroke in hospital	2 (100)	0 (0)	0 (0)	2 (1.6)
Major bleeding episode in hospital	2 (100)	0 (0)	0 (0)	2 (1.6)

Abbreviations: ACEI, angiotensin converting enzyme inhibitor; ARB, angiotensin receptor blocker; CHF, congestive heart failure; LD, loading dose; MD, maintenance dose; NSTEMI, non-ST segment elevation myocardial infarction; STEMI, ST segment elevation myocardial infarction; UA, unstable angina.

cause of hospital death. No complication was documented for UA patients in hospital. Considering mortality and discharge, 34 patients (27.4%) had died in hospital, whereas the rest 90 (72.6%) patients discharged alive. High in-hospital mortality (35.6%) was documented from patients who were diagnosed as STEMI. Bivariate analysis showed no relationship between in-hospital mortality and patients' sex, symptoms during admission, and previous history of DM and MI. However, there was a statistically significant association between in-hospital mortality and age of patients ($P=.024$), time from symptom onset to presentation at ED ($P=.002$), previous history of hypertension ($P=.005$), Killip class ($P=.001$), and class of diagnosis ($P=.004$) (Table 4). Multivariable analysis was carried out for variables which were having a P -value of $<.1$, and age ≥ 65 years ($P=.042$), time from symptom onset to presentation at ED ($P=.001$), a previous history of hypertension ($P=.025$), Killip class III and IV ($P=.001$), and diagnosis of STEMI ($P=.005$) were found to be statistically significant with in-hospital mortality.

Discussion

The age distribution of ACS patients in TASH was 56.3 ± 13.65 years which is in line with that of a study made in Kenya (59.7 ± 3.8 years)¹⁴ and India 60.1 ± 11.2 ¹⁸ but lower in a decade than that of the Global Registry of Acute Coronary Events (The GRACE registry).¹⁹ The length of hospital stay is expected to decrease with the improvement in therapies and implementation of evidence-based practices.¹⁴ However, in this study, the mean length of hospital stay was very high (9.77 ± 6.42 days) compared with a study done in Kenya, 5.3 ± 1 day;¹⁴ Brazil, 5.1 ± 8.0 days²⁰; and United States, 5.56 days.²¹ This may be due to the absence of services such as PCI and thrombolytics in TASH.

Patients with symptoms of ACS without chest pain were more likely to receive suboptimal treatment and experience a higher mortality across the spectrum of ACS than those who present with chest pain.²² High mortality was documented in TASH from ACS patients who did not have chest pain (14.5%) during admission (44.4% vs 24.5%). This is similar to the

Table 4. Predictors of in-hospital mortality for ACS patients admitted in Tikur Anbessa Specialized Hospital, Ethiopia (2012-2014).

VARIABLES	IN-HOSPITAL MORTALITY		COR (95% CI)	AOR (95% CI)
	YES (%)	NO (%)		
Age (years)				
<55	12 (23.1)	40 (76.9)	1.00	1.00
55–64	6 (16.7)	30 (83.3)	0.67 (0.23-1.98)	1.29 (0.28-6.03)
≥65	16 (44.4)	20 (55.6)	2.67 (1.06-6.70)*	4.72 (1.06-21.08)*
Time from symptom onset (hours)				
≤12	2 (8.3)	22 (91.7)	1.00	1.00
13–72	10 (19.2)	42 (80.8)	2.62 (0.53-13.02)	0.29 (0.03-2.66)
>72	22 (45.8)	26 (54.2)	9.31 (1.97-44.07)*	5.52 (1.05-32.22)*
Hypertension				
Yes	28 (36.8)	48 (63.2)	4.08 (1.54-10.82)*	5.10 (1.23-21.11)*
No	6 (12.5)	42 (87.5)	1.00	1.00
Diagnosis				
STEMI	32 (35.6)	58 (64.4)	8.83 (1.99-39.26)*	35.28 (2.88-432.27)*
NSTEMI + UA	2 (5.9)	32 (94.1)	1.00	1.00
Killip class				
I and II	6 (14.3)	36 (85.7)	1.00	1.00
III and IV	13 (54.2)	11 (45.8)	7.09 (2.18-23.07)*	11.92 (2.82-50.43)*

Abbreviations: AOR, adjusted odds ratio; COR, crude odds ratio; NSTEMI, non-ST segment elevation myocardial infarction; STEMI, ST segment elevation myocardial infarction; UA, unstable angina.

*Statistically significant at P -value < .05.

GRACE study in which 8.4% of patients had no chest pain during admission. The dominant presenting symptoms in these patients were shortness of breath (49.3%), diaphoresis (26.2%), and nausea or vomiting (24.3%). In addition, their hospital case fatality rates increased, with the death of 13.0% of atypical patients compared with 4.3% of typical patients.²³

Even though interventions to restore blood flow such as PCI and thrombolytics were absent in TASH, time from symptom onset until presentation in the ED had great impact on in-hospital mortality. This study shows a significant delay of patients seeking medical care (the mean time of presentation to ED was 3.8 days). No patient in TASH arrived to ED within the first hour of symptom onset. Only 19.7% of patients arrived within 12 hours of symptom onset, whereas 37.7% of patients arrived after 3 days of symptom onset (43.5% died in hospital). According to a study done in Kenya, 78% of patients arrived within 12 hours of symptom onset.²⁴ The average time delay before medical care was 14.5 hours in a study done in Dakar, Senegal.²⁵ The European Network for Acute Coronary Treatment (ENACT) study, a pan-European survey of ACS, had shown that most patients (65%) presented within 12 hours

of the onset of pain.²⁷ The proportion of patients presenting within 12 hours was highest in Scandinavia (79%) and in Belgium (77%) and lowest in Eastern Europe (51%).²⁷ This great delay in seeking medical care may be due to less knowledge about signs of ACS and or misinterpretation of symptoms.

In this study, 61.3% of ACS patients had hypertension, 21% had DM, and 16.1% had previous history of MI, which is in line with the Nepal study in which 64% of ACS patients were hypertensive and 19% were DM patients.²⁸ The Kenyan study reflected similar report as hypertension and DM were the leading risk.²⁴ The study in South African Indians with ACS showed that 82% of ACS patients had visceral obesity as the number one risk factor followed by family history of vascular disease (74%) and cigarette smoking (60%).²⁹ The Saudi Project for Assessment of Coronary Events (SPACE) registry reported that, history of DM was present in 58.1%, hypertension in 55.3%, hyperlipidemia in 41.1%, and 32.8% were current smokers.⁷

Dyslipidemia is a major risk factor for coronary heart disease (CHD). The mean fasting total cholesterol, LDL, HDL,

and triglyceride values measured immediately during admission for ACS patients in TASH were 182.5 ± 47.7 , 118.5 ± 47.3 , 40.5 ± 14.0 , and 158.8 ± 84.7 , respectively. This was in line with the finding from the Get with the Guidelines database (231 986 hospitalizations from 541 hospitals) which was analyzed for CAD hospitalizations from 2000 to 2006 with documented lipid levels in the first 24 hours of admission.³⁰ From many clinical studies, it is clear that phasic changes do occur in patients following AMI, and therefore, there is a recommendation for detection of hyperlipidemia in patients with AMI that the serum lipids should be assessed either within 24 hours after infarction or after 2 to 3 months of AMI.^{31,32}

Cardiac biomarkers complement clinical assessment and the 12-lead electrocardiogram (ECG) in the diagnosis, risk stratification, triage, and management of patients with suspected ACS. Measurement of a biomarker reflecting and quantifying cardiomyocyte injury, preferably cardiac troponin (cTn) I or T, is mandatory in all patients presenting with suspected ACS.⁴ Biomarkers were not measured for 4.8% of ACS patients in TASH. This may be due to financial issue or patient might have died before the measurements.

The Killip classification categorizes patients with an acute MI based on the presence or absence of simple physical examination findings that suggest left ventricular dysfunction. In this study, high Killip class (III and IV) patients accounted 54.2% which is in line with the Gulf Registry of Acute Coronary Events (22%).³³ But higher than the Second National Registry of MI (NRM-2) study (19%) had Killip class II or III HF on admission.³⁴ These patients had significantly higher in-hospital mortality than those without HF (21.4% vs 7.2%). Similar findings were noted in an analysis of international data on 4830 patients with STEMI from the GRACE registry.¹⁹ Of which, 16% had Killip class II or III HF on admission; patients with HF had increased in-hospital mortality (17% vs 4%).

The measurement of LVEF after AMI has both prognostic and therapeutic implications and is a class I clinical practice guideline recommendation by the American College of Cardiology/American Heart Association (ACC/AHA). Reduced LVEF is associated with greater mortality among patients with CAD and predicts increased risks of early all-cause mortality, as well as sudden cardiac death after AMI.³⁵ In this study, echocardiography was done for about 69.4% patients. From those, reduced EF (<50%) was documented for 66.7% of patients and 29.2% of patients had severely impaired LVEF (<30%). Among 128 845 AMI patients in ACTION Registry between January 2007 and September 2009, 93.0% had in-hospital assessment of LVEF. Among assessed patients, LVEF was abnormal (LVEF < 50%) in 45.6% of patients (42.3% of NSTEMI patients and 50.5% of STEMI patients) and moderately to severely impaired (LVEF < 40%) in 22.6% of patients (21.9% of NSTEMI patients and 23.7% of STEMI patients).³⁵

STEMI was the leading (72.6%) discharge diagnosis of ACS patients in TASH, whereas 16.1% of patients were

NSTEMI and 11.3% were UA patients. STEMI cases were relatively high in TASH compared with the GRACE study,²³ the ACCESS registry of South Africa,³⁶ and the SPACE registry.²⁶ The higher proportion of STEMI cases in TASH may be related to the delay in seeking medical care. NSTEMI and UA cases (due to partial occlusion) may progress to STEMI (due to complete occlusion).

Regarding the treatment commenced during hospitalization, loading dose of aspirin was given only for 79% of patients. It is very low compared with studies conducted in South Africa (94%), Kenya (98%), Italy (92.8%), and GRACE (92%).^{23,24,36,37} This may be due to problems on documentation. Patients may take the drug but it may not be documented on the chart.

Use of beta blockers in TASH during admission was 88.1% which was higher than that of GRACE (76%), South Africa (69%), and Italy (65%).^{24,36,37} The same is true for the use of statins for ACS patients in TASH: around 85.5% of patients had access for statins during hospitalization which was higher compared with the studies done in Kenya (73%), GRACE (58%), and Canada (43%).^{23,24,38} The use of morphine (12.9%) and nitrates (35.5%) during arrival at ED was very low in TASH which may be due to interruption on the availability of drugs.

The in-hospital mortality of ACS patients in TASH was very high (27.4%). High mortality (35.6%) was documented from STEMI patients. Mortality during admission was 9.6% in an observational study done in 32 hospitals in Spain.³⁹ According to a prospective survey of the characteristics, treatments, and outcomes of patients with ACS in Europe and the Mediterranean basin (Euro Heart Survey ACS), in-hospital mortality of STEMI was 7% and that of NSTEMI patients was 2.4%.⁴⁰ In the GRACE study, in-hospital mortality for STEMI was 7%, NSTEMI 4%, and UA 3%.²³ In India, in-hospital mortality was highest (8.2%) for STEMI.¹⁸ In all the previous studies, in-hospital mortality was low compared with that of TASH as the comparable studies were done in hospitals that have access for PCI and thrombolytics.

Regarding the predictors of in-hospital mortality, this study identified the presence of significant association between in-hospital mortality and factors such as old age, delayed time of presentation, patients who have previous history of hypertension, higher Killip class, and patients who were diagnosed to have STEMI. Predictors of hospital mortality in GRACE includes age, Killip class, systolic blood pressure, ST segment deviation, cardiac arrest during presentation, serum creatinine level, positive initial cardiac enzyme finding, and heart rate.²³

Discharge medications containing dual anti-platelet (aspirin and clopidogrel), beta blocker, ACEI, and statins were very helpful for reduction of complications such as re-infarction and death after discharge. In the current study, only 61.1% of patients who were discharged alive received all these five drug combinations during discharge. Result from Kerala ACS registry which is the largest ACS registry in India of 25 748 patients

showed that 80% of discharged patients had received appropriate discharge medications.¹⁸

According to multivariable analysis, patients with the age of more than 65 years were 4.72 times more likely to die in hospital compared with patients who were less than the age of 55 years (adjusted odds ratio [AOR]=4.72; 95% CI = 1.06–21.08). Patients who arrived at ED after 3 days of symptom onset were 5.52 times more likely to die compared with patients who arrived within 12 hours of symptom onset (AOR=5.52; 95% CI = 1.05–32.22). Patients who have a previous history of hypertension were 5.10 times more likely to die in hospital compared with patients who have not (AOR=5.10; 95% CI = 1.23–21.11). Patients with a diagnosis of STEMI were 35.28 times more likely to face hospital death compared with other ACS types (AOR=35.28; 95% CI = 2.88–432.27). Finally, Killip class III and IV patients were 11.92 times more likely to die in hospital compared with Killip class I and II patients (AOR=11.92; 95% CI = 2.82–50.43).

Conclusions

In this study, in-hospital mortality was very high in TASH (27.4%). The hospital stay of ACS patients in TASH was very long (9.77 ± 6.42 days). Most ACS patients (72.6%) in TASH were diagnosed with STEMI. Time for presentation to ED, previous history of hypertension, being diagnosed with STEMI, and higher Killip class were found to be independent predictors of in-hospital mortality in TASH.

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Author Contributions

All authors equally contributed to this study.

Ethical approval and consent to participants

Ethical clearance was obtained from the ethical review committee of School of Pharmacy and School of Medicine of AAU. Before data collection, permission was obtained from the out-patient directorate of TASH. The names of patients were replaced with codes to avoid individual identifiers.

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