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A HOSPITAL BASED PROSPECTIVE COMPARATIVE STUDY OF CLINICAL PROFILE OF ACUTE MYOCARDIAL INFARCTION WITH EMPHASIS ON THE ELDERY

Cardiology

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ABSTRACT

Introduction: The elder patients with acute myocardial infarction (AMI) have been reported to present with more atypical symptoms. Managing acute MI in the elder patients is challenging as they are more refractory to medical therapy **Material & Methods:** It is prospective comparative study conducted in the ICCU (Intensive coronary care unit) of Government General Hospital, Guntur among 150 each in two groups. All the data of AMI patients was collected from the emergency medical service data, reports and medical charts after admission of the patient in ICCU. During the Inpatient stay of patients, other parameters such as diagnosis, infarction locations, cardiac intervention, medical treatment, complications, discharge from hospital, and length of stay in the hospital were collected. **Results:** Single vessel disease is predominant in the adult age group and notably double and triple vessel disease is significant in elderly patients. Majority of the patients in our study group availed statin therapy and ACE inhibitors, young age patients respond well to the Statin, ACE-inhibitors than the elderly patients. Comparison of final Outcomes showed that significant mortality rate was observed with the elder age group. **Conclusions:** There exists a notable difference in the clinical presentation of AMI patients between elder and younger age groups. Elderly patients with acute MI were more prone to complications like cardiogenic shock and death comparing with adults. Therefore, the data can be utilized for prioritizing the different age group patients in treatment and management.

KEYWORDS

Acute Myocardial Infarction (MI), elderly, outcome, clinical profile

INTRODUCTION

Heart disease is the chief cause of hospitalization and mortality in elderly patients. [1] The elder patients with acute myocardial infarction (AMI) have been reported to present with more atypical symptoms such as acute confusion, syncope, atypical chest pain, vomiting, and weakness. [2,3] The key role of conventional cardiovascular risk factors in elderly people is not completely understood since the availability of incomplete and scarce data in most instances. The elderly aged patients also have a higher rate of complications and higher mortality. Managing acute MI in the elder patients is challenging as they are more refractory to medical therapy that is probably because of diastolic dysfunction, complex atherosclerotic disease and intolerance to treatment with multiple anti-ischemic agents. AMI is significantly associated with higher mortality rate in the elder age compared with the young [2,3] yet the elder patients are less aggressively treated than the young3. Thrombolytic therapy has its most effect in the elderly yet there is a greater risk of hemorrhagic stroke. Benefits of aspirin, angiotensin-converting enzyme (ACE) inhibitors and beta-blockers in AMI have been substantiated in numerous trials, but their usage in elderly AMI patients may be lower than in younger patients. Cardiovascular disease is a key health problem that has been attaining epidemic proportions. Previous studies have reported that there is an increasing prevalence of AMI in the young. [4]

Although the occurrence of acute MI is an uncommon entity in the young group; it constitutes a significant problem for those patients and their treating physicians because of its devastating effect on their more active lifestyle. Hence it is essential to identify and manage cardiovascular (CV) risk factors at a premature age to prevent cases of young MI

Acute Myocardial Ischemia or Infarction occurs when the myocardial oxygen supply is inadequate compared to the myocardial oxygen demand. Myocardial ischemia usually occurs in the setting of coronary atherosclerosis. Acute coronary syndrome (ACS) patients with new evidence of ST segment elevation on the presenting electrocardiogram are labeled as having ST elevation MI (STEMI) and those without ST segment elevation and with evidence of myocardial necrosis are diagnosed to have non ST elevation MI (NSTEMI). The patients without any evidence of myocardial necrosis are diagnosed to have unstable angina. Unstable angina / Non ST elevation MI is caused due to decline in oxygen supply and / or by an increase in myocardial oxygen demand superimposed on an atherosclerotic plaque4 with varying degrees of arterial obstruction. STEMI typically occurs when coronary blood flow decreases abruptly with onset of thrombotic occlusion which is exaggerated by atherosclerosis. [5]

OBJECTIVES

1. To determine the clinical presentation, complications, management and outcome of elderly and young patients with acute myocardial infarction.
2. To compare the above two age-wise divided groups of acute myocardial infarction, for the differences in clinical presentation, complications, management and outcomes.

MATERIAL & METHODS

Study Design: It is prospective comparative study. The design used for fulfilling aim and objectives of the study.

Study Setting: The study was conducted in the ICCU (Intensive coronary care unit) of Government General Hospital, Guntur. The study was a HOSPITAL BASED PROSPECTIVE COMPARITIVE STUDY. This study was conducted between March 2018 to April 2019. Patients satisfying the inclusion criteria were enrolled in this study after obtaining written informed consent.

Study Population: The study population of the study was both male and female patients admitted in ICCU of cardiology department.

In this study cases were categorized into two groups. Group I – age >60 years Group II- age ≤ 60 years

60 years of age was considered as elderly as per ICMR survey on Indian rural geriatric population.

Criteria for Sample selection

Inclusion criteria

According to fourth universal definition of myocardial infarction (ESC 2019),

(1) Myocardial infarction type 1 is acute myocardial injury related to acute atherothrombotic coronary artery disease. It is usually precipitated by atherosclerotic plaque disruption that reduces blood supply to the myocardium.

(2) Myocardial infarction type 2 is acute myocardial injury related to an imbalance between myocardial oxygen supply and demand secondary to stressors unrelated to acute coronary atherothrombosis.

(3) Myocardial infarction type 3 is related to patients who suffer cardiac death, with symptoms suggestive of acute myocardial ischaemia accompanied by new ischaemic ECG changes and die before biomarker values could be obtained.

(4) Myocardial infarction type 4a denotes PCI-related increases of cTn values >5 times the 99th percentile URL from a normal or if elevated, stable pre-procedural baseline. New myocardial ischaemia evidenced by ECG or imaging, or complications leading to reduced coronary blood flow are required.
Myocardial infarction type 4b is acute myocardial ischaemic injury related to stent thrombosis and MI type 4c is acute myocardial ischaemic injury associated with restenosis.

(5) Myocardial infarction type 5 is coronary artery bypass grafting (CABG)-related increases of cTn values >10 times 99th percentile URL from a normal or if elevated, stable pre- procedural baseline. New myocardial ischaemia or new loss of myocardial viability is

required.

ECG abnormalities for MI as per ESC/ACCF/AHA/WHF committee:

a. STEMI: New ST segment elevation at the J point in two contiguous leads with the cut-points: >0.1 mV in all leads other than leads V2-V3.For leads V2-V3, the following cut points apply: ≥0.2 mV in men ≥40 years, ≥0.25 mV in men <40 years, or ≥0.15 mV in women.
b. NSTEMI: Non Q- MI are included in this study with new horizontal or down-sloping ST depression ≥0.05 mV in two contiguous leads and/or T inversion ≥0.1 mV in two contiguous leads with prominent R wave or R/S ratio >1
c. Presence of new pathologic Q waves (>0.04s)[for Q - MI]
d. New onset LBBB.

Exclusion criteria: Patients with stable or unstable angina, Patients who did not consent to participate in the study, Severe anemia with Hb <7gm% and recent ACS / previous admission for heart failure within one year

Sample Size Estimation: Sample size was calculated by using the following formula n = 4pq/l2

The prevalence of Ischemic Heart Disease (Coronary Artery Disease) in various studies conducted in India from 1960 to 2013 are found to be in the range from 2% (1960) to 14% (2013) in urban population and from 1.7% to 7.4% in rural population.[1] Data also suggests that the prevalence of CVDs are about three-fold higher in the elderly age group of 60 to 69 years as compared to that of non-elderly (young adults) population, ranging from 13.5% in rural areas and 22% in urban areas of India.[2]

Hence by considering the averages of the above, the prevalence of Coronary Artery Disease is in non-elderly age group is taken as 6% and that of in elderly is considered to be 18% for calculating the sample size of the study population. The minimum sample size of each group in the study population is found to be 131, at a precision of 95% by considering the power of the study as 80%, using the formula for calculating the minimum sample size in each group when comparing the qualitative variables of two group. 10% of minimum sample is added in order to tackle the problem of attrition and loss to follow up of few subjects, making the required sample in each group as 144 (131 + 13 = 144), which can be rounded off to 150. Thus, a minimum of N=150 sample size in each group is considered to be statistically adequate for comparing them.

Ethical Clearance: This study was approved by Institutional ethical committee, Reg no. Ss17050803.

METHODOLOGY

The study included AMI patients of both ST-elevation myocardial infarction (STEMI) and non-ST-elevation myocardial infarction (NSTEMI). All the data of AMI patients was collected from the emergency medical service data, reports and medical charts after admission of the patient in ICCU. The data included demographic variables like age, gender, STEMI or NSTEMI, presenting symptoms, vital signs, risk factors, chest X-ray findings, interval period from the time the patient had initial symptoms to the time the patient reached the emergency department. During the Inpatient stay of patients, other parameters such as diagnosis, infarction locations, cardiac intervention, medical treatment, complications, discharge from hospital, and length of stay in the hospital were collected. All records were carefully reviewed and double checked by two physicians.

Statistical analysis: Following data collection, data were organized, tabulated, summarized and analyzed. Descriptive statistics including percentage, mean, and frequency were utilized. To test the significant between two groups, Group I and Group II, inferential statistics including chi-square, student's t- test was used.

RESULTS

The mean age of the study population is 58.35 ± 11.44 years ranging between a 28 years and 88 years. The mean age of the adult group (≤ 60 years) is 50.2 years and mean age of elderly group (> 60 years) is 69.0 years. Majority of the patients, 243 out of 342 study population (71%) were male patients, 99 (29%) were females. Majority of the AMI patients in both the groups fall under normal BMI , where mean BMI is 24.37 ± 2.89.

Chest pain presentation: 236 out of 342 participants (69%) have presented with typical angina and 24 (7.1%) with atypical angina, where as 82 participants (24.1%) have atypical presentation i.e, diaphoresis (56%), palpitations(24%), abdominal pain (11%), neck pain (5%), syncope (0.5%). Atypical angina presentation is significantly observed in elderly age group (16.9%) than younger age group. Shortness of breath (SOB) , Class IV was notably observed in elder age group (76%). Longer hospital stay (6.27 ± 2.33) was observed with female gender compared to the male.

General Examinations: Pallor is found to be significant, 126 (85.1%) in elderly patients whereas pedal edema is predominant in <60 years of patients(10.4%). 40 out of 243 (16.4%)males and 27 out of 99 (27%) females had moderate anaemia (Hb 8-10.9mg%)as per WHO criteria .

Table 1: Comparison of ECG findings between two groups

ECG Findings	Age ≤ 60 years N=192	Age > 60 years N=150	Total N=342	Chi Square test	Interpretation
AWMI	99 (55%)	60 (40%)	159	2 = 7.161, df = 3 p = 0.06	Statistically Not Significant
IWMI	49 (21.5%)	51 (34%)	100		
New Onset LBBB	0 (0%)	2 (1.3%)	2		
NSTEMI	44 (22.9)	37(24.6%)	81		

Table 2: Comparison of Severity of LV dysfunction based on EF

LV dysfunction EF (%)	Age ≤ 60 years N=192	Age > 60 years N=150	Chi-Square test	Interpretation
Mild (>45%)	76 (39.6)	37 (24.6)	2 = 11.36 P= 0.003	Significant
Moderate (30-45%)	115 (60.0)	108 (73.2)		
Severe(<30%)	1(0.5)	5(3.3)		

Diagnosis of CAD is significantly observed in adult age group compared to elder age group. While cardiogenic shock was predominantly observed in elder age group. Majority of the patients of both groups presented with STEMI. However, NSTEMI was notably observed in elder age group on ECG and Echo findings. LBBB in the elder age group was a characteristic manifestation in aged patients. Severe LV dysfunction in echocardiography was predominantly observed in elderly age (3.3%)group when compared with adults (0.5%).

Table 3: Risk Factors in two age groups

Risk factors	Age ≤ 60 years N=192	Age > 60 years N=150	Total N=342	P value
Diabetes Mellitus type 2	126(65.6)	87(58.0)	213(62.3)	0.1
Hypertension	171(89.0)	142 (94.6)	313(91.5)	0.04
Dyslipidemia	10(5.2)	20 (13.3)	10(2.9)	0.004
Smoking	95(49.5)	71(47.3)	166(48.5)	0.7

Hypertension was the predominant risk factor found in both groups of AMI patients. Smoking was the most observed behavioral risk factor among patients. Study observed SBP and DBP are higher and oxygen saturation is lower in the elder age group indicating the risk and complication of MI. Lipid parameters including total cholesterol, LDL-C and triglycerides were higher in elder age group compared to adult group while HDL levels were significantly decreased in elder age group.

Comparison of CAG report between two groups showed that SVD is the most common type of infarction observed in AMI patients while TVD infarction is significant in elder age group. Single vessel disease is predominant in the adult age group and notably double and triple vessel disease is significant in elderly patients.

With regards to renal parameters, increased serum creatinine was observed in elderly patients that indicated the risk of death. 6 out of 25 (24%) deaths in elderly group had serum creatinine more than or equal to 1.9mg%. And lipid parameters showed considerably high levels of LDL, total cholesterol and triglycerides in elderly patients compared to younger age patients. Study observed a higher value of fasting sugar in elder age group (mean 104 mg%) patients compared to adult group (92mg %) patients.

Treatment and Management: In present study, the elder age group received comparatively low β- blockers compared to the adult age group. In our study, the low frequency of β- blockers in the elderly can

be attributed to their advanced age, STEMI presentation, congestive heart failure, and diabetes. Majority of the patients in our study group availed statin therapy and ACE inhibitors, young age patients respond well to the Statin, ACE-inhibitors than the elderly patients.

Among our study groups, most of the patients from the <60 years age group underwent PCI compared to the elder age.

Complications: Only a few patients developed a complication of arrhythmia where CHB is considerably observed in elderly patients. Cardiogenic shock (25%) was found to be a major complication in the elder age group. There was considerably severe bleeding (GUSTO) complication observed in elder patients compared to younger patients.

Table 4: Comparison of Final Outcomes between two groups

Final Outcome	Age ≤ 60 years N=192	Age > 60 years N=150	Total N=342	Chi-Square test	Inter-pretation
Death	10 (5.2)	25 (16.6)	35 (10.2)	2 = 12.04, df= 1 p = 0.0005	Statistically Significant
Discharge	182 (94.8)	125 (83.3)	307 (89.7)		

Comparison of final Outcomes between two groups showed that significant mortality rate was observed with the elder age group compared to adult age group.

DISCUSSION

Acute myocardial infarction (AMI) has become a major cause of morbidity and mortality in all age groups and it is often a fatal condition in elderly aged patients. According to the epidemiological survey, more than half of the world population presenting AMI results from the Indian sub continent. [6] The clinical picture of AMI differs in many aspects of different age groups. There are many studies carried out to recognize different causes and risk factors of MI and its management. However, there exists limited data on clinical presentation and risk factors of AMI in elder age groups. The factors affecting the course of MI in elderly patients have not been studied in detail. We have carried out a prospective study to identify the clinical profile in acute coronary syndrome (ACS) including ST elevation (STEMI) and Non ST elevation myocardial infarction (NSTEMI). In the present study, we have attempted to cover up a complete clinical profile of AMI in two different age groups, ≤ 60 years and > 60 years with a special emphasis on elderly age group patients.

Treatment-related benefits should be raised in AMI patients especially with the elderly population. There exists a scarcity of data to confirm the benefits of treatment and heterogeneity in elderly patients increases the treatment-associated risks. Elderly patients are more likely to receive antiplatelet therapy and ACE inhibitors and less frequent to receive β- blockers compared to younger age group patients.[7] Similarly, in our study, the elder age group received comparatively low β- blockers compared to the adult age group. In our study, the low frequency of β- blockers in the elderly can be attributed to their advanced age, STEMI presentation, congestive heart failure, and diabetes. More research is warranted to determine the tolerability and benefit of β- blockers in elderly patients to improve the outcomes of AMI. However, the majority of the patients in our study group availed statin therapy and ACE inhibitors, young age patients respond well to the Statin, ACE-inhibitors than the elderly patients. Statins enhance NO bioavailability and exert potent anti-inflammatory effects besides cholesterol reduction. In the present study, CABG was majorly prescribed in elderly aged MI patients.

A number of considerations should be taken into account while adapting a specific treatment approach for elderly AMI patients. Initially, these patients are more likely to develop stroke, respiratory inconvenience, renal dysfunction, hemorrhage, infection, and severity of non- cardiac co-morbidities and these are to taken into account to determine the risk-benefit profile of alternative therapies.[8] Thus, older age patients are less likely to receive evidence-based treatment.[9]

PCI: It is reported that PCI procedure mediates beneficial effects compared to fibrinolysis in elder age patients. The selection of fibrinolytic or PCI in the elderly can be made by the presence or absence of cardiogenic shock, co-morbidity, time of presentation that often direct towards PCI. The efficacy and safety of reperfusion, specifically fibrinolytic therapy in the very elderly (>85 years of age) are of interest that requires future exploration.[10] Studies have proved that elderly patients benefit significantly from PCI in acute MI.[11,12] Primary PCI is capable of restoring normal epicardial coronary flow in the majority of patients that are associated with reduced rates of recurrent ischemia, infarction without the risk of severe bleeding complications. Very elderly patients with angiographically high risk showed procedural success rate compared to younger AMI patients. [13]

Despite the fact that elder patients constitute a high coronary risk and the number of studies has proved that elder patients benefit significantly from PCI in acute MI [11,12,14] invasive procedures in this group of patients are done rarely. Studies have shown that AMI patients undergoing primary PCI in the first 12 hours were successful in the majority of cases.PCI elective for an occluded coronary artery within 1-28 days in stable patients after AMI incidence has not shown the benefit of the procedure compared to medication constituting aspirin, beta blockers, angiotensin converting enzyme inhibitors, and statins. Among our study groups, most of the patients from the <60 years age group underwent PCI compared to the elder age

Mortality followed STEMI exponentially increase with age. In the GUSTO-I trial, the 30-day mortality rate was observed to be increased to 10-fold, from 3.0% among patients <65 years to 30.3% among those ≥85 years of age.[15] It is observed from studies that age is an important determinant of outcomes for patients with acute coronary syndromes. In particular, older age is more strongly predictive of poor outcome in female than male MI patients receiving PCI. In this study, mortality rate was more in elderly female (21%) when compared with elderly male (17%). A study by Jhih-Yuan Shih et al reveals that women patients are more likely to have worse prognosis especially elderly women who are at increased risk of post-MI HF.[16]

In our study, the clinical outcomes were analyzed are mortality, recurrent MI, ventricular arrhythmia, and revascularization. Cardiogenic shock was predominantly observed in elderly age group patients. Mortality rate, 25 (16.6%) was significantly in the elderly age group compared to the younger age group. Management of every individual patient presenting with STEMI should be personalized and a multi-disciplinary consultation should be practiced. Although data analysis of this research does not yield statistically significant results in the elderly AMI patients, we observed marked differences by age among patients 65 years of age and older that have clinical relevance.

From the research conducted, it was clear that AMI is one of the leading causes of death. The literature review revealed several studies that were supported by this research while some other studies contradicted the findings of this study. However, in order to overcome the risk of AMI, there must be a good practice of health by ensuring a healthy diet, exercise and seek of timely medical advice on time when the symptoms have been seen for the first time. The individual should know that AMI is a life threatening disease therefore one should be quick to get proper treatment on time.

Health education plays a great role to maintain the normal health of a person and also improve their ability to perform one's daily activities. One way of supporting the patients is by providing the required information about the disease and the symptoms. From the research, some of the patients are able to cope with the disease by sharing their acute condition with other patients and partners.

Based on the findings of this study, further research is warranted especially focusing on the elderly and their clinical presentations of ACS. Health education awareness of AMI is important for the general population. It should be noted that patients who already have symptoms of atherosclerosis, such as angina or intermittent claudication, or who have had a myocardial infarction, transient ischemic attack, or stroke are at very high risk of coronary, cerebral and peripheral vascular events and death. Those patients are given the top priority in clinical practice for the prevention of adverse effects. Thus, clinicians should pay more attention to the early detection of AMI in the elderly and provide aggressive management to improve their outcomes.

Study Limitations: The main limitation of the study findings is limited to a certain context. We have analyzed patients who reached the hospital that might not reflect the actual representation of the study population. The study was conducted in single center using the data collected within a limited period of time between March 2018 and April 2019 with a comparatively small sample size.

CONCLUSIONS

The present study provided a comprehensive clinical profile and characteristics of AMI patient by age and a focus on elderly patients. There exists a notable difference in the clinical presentation of AMI patients between elder and younger age groups. Hypertension was predominant conventional risk factor followed by DM. Target oriented control of HTN, DM, lipid levels and obesity was required in all groups. Smoking is a major behavioral risk factor observed in two groups which needs strict prevention. Elderly patients with acute MI were more prone to complications like cardiogenic shock and death comparing with adults. Therefore, the data can be utilized for prioritizing the different age group patients in treatment and management.

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