

## JOURNAL OF CLINICAL AND DIAGNOSTIC RESEARCH

**How to cite this article:**

KAMATH A , SHANBHAG T, SHENOY S.A DESCRIPTIVE STUDY OF INFLUENCE OF AGE AND GENDER ON DRUG UTILIZATION IN ACUTE MYOCARDIAL INFARCTION. Journal of Clinical and Diagnostic Research [serial online] 2010 February [cited: 2010 February 1]; 3:2041-2046.

Available from

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## ORIGINAL ARTICLE

# A Descriptive Study of the Influence of Age and Gender on Drug Utilization in Acute Myocardial Infarction

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### ABSTRACT

**Introduction:** Despite the presence of effective guidelines for the management of acute myocardial infarction, there is underuse of thrombolytics, antiplatelet drugs, angiotensin converting enzyme (ACE) inhibitors, beta blockers and hypolipidaemics. Gender and age based differences have been reported. Our aim was to determine the percentage of patients who were receiving these drugs during hospital admission and discharge.

**Method:** A case record study of 349 patients who were admitted to our hospital with a diagnosis of acute myocardial infarction during the year 2004-2006, was done. The age, gender, drugs prescribed during the three days following admission and on discharge, comorbidities, outcome and duration of stay, was noted for each patient.

**Results:** Of the 349 patients, 81% were males and 19% were females. The average ages of presentation were 57.98 years in men and 65.02 years in women. The percentages of patients who received antiplatelet agents, thrombolytics, beta blockers, ACE inhibitors, hypolipidaemics and anticoagulants on hospital admission were 95, 42, 43, 46, 79, 85%, respectively. The prescription rate of antiplatelet agents, beta blockers, ACE inhibitors, hypolipidaemics on discharge was 98, 66, 68, 92% respectively.

**Conclusions:** Our study showed that the initiation of treatment in both the gender and age groups varied. However, the use of drugs among the various groups was almost equal on discharge, except for hypolipidaemics. A majority of the females and elderly patients received all the drugs on hospital discharge, reflecting a lack of gender or age disparity. Although the use of thrombolytics, beta blockers and ACE inhibitors was low on admission, proper use after adjusting for confounding factors might be higher.

**Key Words** – Myocardial infarction, drug utilization, age, gender

### Key Messages

1. Previous studies have shown the underutilization of evidence based therapies in females and elderly patients with myocardial infarction.
2. In our study, there was underutilization of thrombolytics in females and elderly patients.
3. Adjustment for confounding factors is necessary to determine the presence of true underutilization of drugs.

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## Introduction

Acute myocardial infarction (MI) is a major cause of morbidity and mortality among all the socioeconomic strata of Indian population [1]. The guidelines for the treatment of acute myocardial infarction attempts to define practices that meet the needs of most people in most circumstances. The guidelines serve as a bridge to convert the science of evidence based medicine into clinical practice. However, the uptake of these guidelines has not been uniform. Studies from various parts of the world report that there is still a noteworthy underuse of reperfusion in acute myocardial infarction, as well as a deficit in the prescription of statins, antiplatelet drugs, angiotensin converting enzyme (ACE) inhibitors [2] or beta blockers [3]. Gender based differences have been reported with underutilisation of drugs in females [4]. Also, studies have shown a lack of adherence to therapeutic guidelines in the treatment of elderly patients [5]. The aim of our study was to determine the percentage of patients with acute myocardial infarction who received the above mentioned drugs during hospital admission and on discharge, with variations with regards to age and gender.

## Methods

A retrospective, case-record based descriptive study was carried out in a tertiary care hospital in South India after obtaining approval from the institutional ethics committee. The case record files of all patients who were admitted with a diagnosis of acute myocardial infarction under the categories I21.0 and I21.1 of the International classification of diseases, 10<sup>th</sup> revision (World Health Organization, 2007), during the year 2004-2006, were retrieved from the medical records department. The following information was collected from the patient files- age, gender, drugs prescribed during the first 3 days of hospital admission and on discharge, comorbidities, duration of hospital stay and outcome. All patients who were referred from other hospitals to our centre within 10 days of the episode were also included in the study. Information on the utilization of the following drugs on hospital admission and discharge were collected – oral antiplatelet agents, thrombolytics, beta blockers, ACE

inhibitors/angiotensin II receptor blockers (ARBs), lipid lowering drugs and anticoagulants (heparin and low molecular weight heparin only). Statistical analysis was performed using the Graphpad software for windows. The categorical variables were compared using the chi square test. A probability value of <0.05 was considered to be statistically significant.

## Results

The case record files of 349 patients who were admitted with acute MI during the years 2004 to 2006 were studied. 282 (81%) patients were males and 67 (19%) were females. Patients who were more than 65 years of age formed 40% (138) of the total cases, of which 98 (71%) were males and 40 (29%) were females. The mean age of presentation was 57.98 years in men and 65.02 years in women.

The overall mortality was 22.64% (79). The mortality was 21.63% (61/282) in males, 26.87% (18/67) in females and 34.78% (48/138) in elderly patients. Of the 270 patients at discharge, 221 (82%) were males and 90 (33%) patients were more than 65 years of age.

## Use of Drugs in the Entire Study Sample

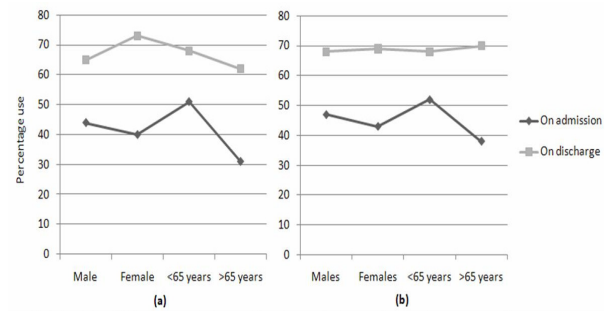
The percentage of patients who received antiplatelet agents, thrombolytics, beta blockers, ACE inhibitors, ARBs, hypolipidaemics and anticoagulants on hospital admission was 95.13, 42.41, 42.98, 44.69, 1.43, 79.08, 84.81 percent, respectively. The prescription rate of antiplatelet agents, beta blockers, ACE inhibitors, ARBs and hypolipidaemics on discharge was 98.15, 66.30, 65.19, 3.33, 91.85 percent, respectively. 90% of the patients received dual antiplatelet therapy (aspirin with clopidogrel).

## Use of Drugs According To Gender and Age

The gender and age-wise use of various classes of drugs on admission and discharge are shown in [Table/Fig 1] and [Table/Fig 2], respectively.

(Table/Fig 1) Use of medications in patients with acute myocardial infarction during the year 2004-2006 on hospital admission

Patient groups	Antiplatelet agents %	Thrombolytics %	Beta blockers %	ACE inhibitors/ARBs %	Hypolipidemics %	Anticoagulants %
Male n=282	94.68	45.74	43.62	47.16	78.72	85.11
Female n=67	97.01	28.36 (p=0.0096)	40.30	43.28	80.60	83.58
<65 years of age n=211	95.73	48.34	50.71	52.13	82.94	85.78
>65 years of age n=138	94.20	33.33 (p=0.0055)	31.16 (0.0003)	37.68 (p=0.0081)	73.19 (p=0.0285)	83.33

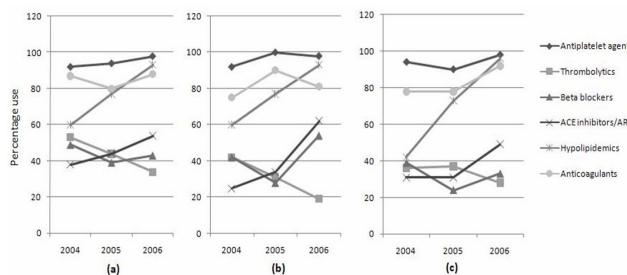


(Table/Fig 4) Use of (a) beta blockers (b) angiotensin converting enzyme inhibitors in patients with myocardial infarction on hospital admission and discharge according to gender and age

(Table/Fig 2) Use of medications in patients with acute myocardial infarction during the years 2004-2006 on discharge from hospital

Patient groups	Antiplatelet agents %	Beta blockers %	ACE Inhibitors/ARBs %	Hypolipidemics %
Male n=221	98.64	64.71	68.33	93.67
Female n=49	95.92	73.47	69.39	83.67 (p=0.0207)
<65 years of age n=180	97.78	68.33	67.78	95.00
>65 Years of age n=90	98.89	62.22	70.00	85.56 (p=0.0075)

The year wise change in the trend of drug prescription on hospital admission in the total sample, females and elderly patients, is shown in [Table/Fig 3]. The percentage of patients who received beta blockers and ACE inhibitors on hospital admission and discharge has been compared in [Table/Fig 4], depicting both the gender and age groups.



(Table/Fig 3) Year wise trend in the use of medication on hospital admission for myocardial infarction in (a) total sample (b) females (c) elderly people

### Prevalence of Co-Morbidities

Out of the 349 patients admitted, 45.56% had diabetes mellitus, 44.13% had hypertension, 40.40% had left ventricular dysfunction (left ventricular ejection fraction < 40%) or cardiogenic shock and 31.23% had dyslipidaemia.

### Duration of Hospital Stay

The average duration of hospitalization was 8.05 days.

### Discussion

Our results indicate that a majority of the patients who were admitted with acute MI during the period from 2004-2006 were males (81%). This is similar to the gender distribution seen in other similar studies (83.8%, 85%).(6,7) Patients who were more than 65 years of age formed 40% of the total cases, which is higher than the age distribution seen in the study by Jose and Gupta (33.33%) [6]. The overall mortality was 22.64%, which was higher than that reported by Jose and Gupta (16.9%).

The average age of presentation was 57.98 years in men and 65.02 years in women, which was higher than that reported in the study by Joshi et al (51 and 57.3 years, respectively), whose study aimed at assessing the risk factors for early myocardial infarction in south Indians [7]. An Indian multicentre study that analyzed data from 4081 subjects, reported that acute coronary syndromes occurred at a mean age of 56.6±12 years in men and 61.8±10 years in women [8].

The average duration of hospitalization was 8.05 days. Although more, as compared to the study

by Jose and Gupta, in the European Network for Acute Coronary Treatment (ENACT) study which provided pan-European reference data on acute coronary syndromes, the total hospital stay for acute myocardial infarction varied from 7.9 days in UK/Ireland to 12.6 days in Eastern Europe [9].

Most of the patients received dual antiplatelet medication with aspirin and clopidogrel (90%). The association of physicians of India recommends that all patients with MI, including those with ST segment elevation myocardial infarction (STEMI), should receive dual antiplatelet therapy [10]. The use of thrombolytics in our study was lower (42%) than that reported in the Clinical Trial of Reviparin and the Metabolic Modulation in the Acute Myocardial Infarction Treatment Evaluation (CREATE) registry, where the use of thrombolytics in tertiary care hospitals was 59.1%. [8]. In the study by Cohen M et al., the use of reperfusion therapy among 2741 STEMI patients from various geographic regions varied from 34.5% to 53.8%. (11) In the study by Schiele et al., the use of thrombolytics and beta blockers was 33.33 and 39%, respectively [2]. The prescription rate of antiplatelet agents, beta blockers, ACE inhibitors/ARBs and hypolipidaemics on discharge was higher than those in the CREATE registry (98, 66, 68, 92 versus 97, 60, 52, 44, respectively).

With respect to gender differences, a major disparity is seen in the use of thrombolytics which were more commonly administered in males as compared to females (45.74% vs 28.36%,  $p=0.0096$ ). The prescription rate of other drugs did not differ to a large extent. Although a treatment bias based on gender has been reported in many studies, others have attributed it to differences in clinical presentation, eligibility status or possible gender differences in the side effects which were associated with different therapies [12]. At discharge, a larger percentage of female patients received beta blockers as compared to males (73.47% Vs 64.71%), but hypolipidaemics were significantly less commonly prescribed (83.67% Vs 93.67%,  $p=0.0207$ ). Underutilisation of statins has been documented in women. In the

Heart and Oestrogen/Progestin replacement study, only half of those who met the NCEP II criteria for lipid-lowering therapy used statins or other lipid-lowering treatments [13]

With respect to age, a lesser percentage of elderly patients received thrombolytics (33.33 vs 48.34%,  $p=0.0055$ ), beta blockers (31.16 vs 50.71%,  $p=0.0003$ ), ACE inhibitors/ARBs (37.68 vs 52.13%,  $p=0.0081$ ) and hypolipidaemics (73.19 vs 82.94%,  $p=0.0285$ ) on admission as compared to the younger patients. In a study on patients with acute MI, the use of thrombolytics and beta blockers among the elderly (>60 years) were 35.8% and 7.8%, respectively [14]. On discharge, more than 60% of the elderly patients received beta blockers and ACE inhibitors, while more than 80% received antiplatelet drugs and hypolipidaemics, although the use of hypolipidaemics was still significantly less (85.56 vs 95%,  $p=0.0075$ ). Although the underutilisation of drugs in elderly patients has been documented, adjusting for the various confounding factors might reveal a higher drug use, as shown in the study by George et al. [15]

The year-wise trend in the prescription pattern showed that most of the patients who were admitted with acute MI during the 3 year period, received antiplatelet agents. Also, most of the patients received anticoagulants, averaging above 80% during the 3 year period. A marked increase was seen in the use of hypolipidaemics, especially in elderly patients. More than 90% of the patients received hypolipidaemics in the year 2006. A less prominent, but definite increase was also seen in the prescription of ACE inhibitors. A decrease in the use of beta blockers was seen in the year 2005 in the total sample, as well as in females and elderly patients. The lower use of beta blockers can be partly explained by the presence of left ventricular dysfunction (left ventricular ejection fraction <40%) or cardiogenic shock on presentation to the hospital (44.44, 63.4, 59.6% during the years 2004, 2005, 2006 respectively – data not shown in results). Guidelines recommend the initiation of beta blocker therapy once the patient's clinical condition has remained stable for at least 24-48 hours [10].

More than 60% of the patients received beta blockers on discharge, which might be due to initiation of the drug therapy following stabilization of the cardiovascular status. A consistent decrease in the use of thrombolytics was seen among all the groups. This may be due to the increasing use of percutaneous coronary intervention. Also, ours being a tertiary hospital, many patients were referred from other centers. So, the number of patients presenting after the time period for thrombolysis were high.

The year-wise prescription pattern in females was similar to the total sample. However, the use of thrombolytics, beta blockers and ACE inhibitors was found to be lesser during the year 2004. A similar pattern was also seen in the elderly group. However, all the groups received beta blockers and ACE inhibitors to almost the same extent on discharge.

The limitation of our study was, that it was a single center study with limited sample size. Also, we did not look for the presence of contraindications to drug treatment. However, similar studies done at multiple centers providing various levels of health care will more clearly reflect the use of evidence based treatment for MI in the general population. Particularly, in the future, widespread use of prescription databases and disease registries will serve as powerful tools to evaluate different therapeutic strategies and improve the quality of patient care.

## Conclusion

Our study showed that the initiation of treatment in both the genders and the various age groups varied. However, the use of drugs among the various groups was almost equal on discharge, except for hypolipidaemics. The difference in the use of drugs on hospital admission might be due to the varied clinical presentation, the differing prevalence of comorbidities or the time taken to present to the hospital following the acute episode. A majority of the females and the elderly patients received all the drugs on hospital discharge, thus reflecting the effective implementation of the treatment guidelines. Despite the presence of a statistically significant underuse, most of the women and elderly did

receive hypolipidaemics. Although the use of thrombolytics, beta blockers and ACE inhibitors was low on admission, proper use after adjusting for the various confounding factors might be higher.

## Acknowledgements

None

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