

Drug prescribing pattern in patients of myocardial infarction in a tertiary care teaching hospital of North India

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ABSTRACT

Background: The term acute myocardial infarction (MI) should be used when there is evidence of myocardial necrosis in a clinical setting consistent with acute myocardial ischemia. Aims of this study were to assess drug prescribing pattern in patients of myocardial infarction and to compare prevalence of MI according to age, gender, diet, smoker or non-smoker, alcoholic or non-alcoholic, family history of cardiovascular disease.

Methods: This observational study was conducted at department of pharmacology, in association with department of cardiology and included all patients of myocardial infarction visiting cardiology outpatient department or indoor patients and proforma was used to evaluate drug prescribing pattern.

Results: Total 200 patients of acute myocardial infarction were analysed. Incidence of MI was more common in males (76%); age group 51-60 years (28.5%); non-vegetarians (68.5%); smokers (52.5%) and reduced physical activity (70.5%). 59.5% of patients had family history of cardiovascular disease. Commonly prescribed drugs were antiplatelets (100%) followed by hypolipidemic (99.5%), proton pump inhibitors (92%), antianginal (90.5%), anticoagulants (68.5%), thrombolytics (24.5%).

Conclusions: This study provides insight towards drug prescribing pattern in MI patients. Most frequently prescribed drugs were antiplatelets followed by hypolipidemic and proton pump inhibitors. Patients had multiple risk factors and these can be reduced by lifestyle modifications.

Keywords: Myocardial infarction, Prescribing pattern, Drugs, Cardiovascular disease, Aspirin

INTRODUCTION

Cardiovascular disease (CVD) is now the most common cause of mortality accounting for approximately 16 million deaths worldwide (30%) in 2010, including nearly 40% of deaths in high-income countries and about 28% in low- and middle-income countries.¹ According to World Health Statistics in 2015, of total 56 million deaths, an estimated 40 million deaths (70%) occurred due to non-communicable diseases of which

cardiovascular diseases caused 17.7 million deaths (45%).²

Acute myocardial infarction (MI) is clinical syndrome that results from sudden occlusion of coronary artery which causes infarction of cardiac myocytes in region supplied by that artery.³ The area of the muscle that has either zero flow or so little flow that it cannot sustain cardiac muscle function is said to be infarcted. The term acute MI should be used when there is evidence of myocardial necrosis in a clinical setting consistent with acute myocardial ischemia.

The incidence of MI in India is 64.37/1000 people in men aged 29-69 years.⁴ Prevalence of coronary artery disease (CAD) has increased from 2% to 4% in rural India and from 3.45% to 9.45% in Urban India over last 60 years.^{3,5}

Dyslipidaemia, smoking, hypertension, type 2 diabetes mellitus, physical inactivity, low intake of fruits and vegetables, central obesity, type A personality, family history of CAD and psychological distress are common risk factors.^{3,6} Insulin resistance syndrome, lipoprotein a, atherogenic dyslipidaemia phenotype and some newer emerging risk factors (homocysteine, plasminogen activator inhibitor, fibrinogen, infection, inflammation) suggest genetic susceptibility.⁵ Cigarette smoking causes marked inhibition of substance P induced tissue plasminogen activator release *in vivo* and this could provide mechanism whereby endothelial dysfunction may increase risk of atherosclerosis through decrease in acute fibrinolytic capacity.⁷

Elevated blood pressure is an early indicator of the epidemiologic transition. Worldwide, approximately 62% of strokes and 49% of CAD are attributable to suboptimal (>115 mmHg systolic) blood pressure, which is believed to account for more than 7 million deaths annually.¹

The important complications of acute MI are arrhythmias, congestive heart failure, cardiogenic shock, mural thrombosis and thromboembolism, rupture, aneurysm, pericarditis and post MI syndrome.⁸

The aims of the present study were to assess drug prescribing pattern in patients of MI and to compare prevalence of MI according to age, gender, diet, smoker or non-smoker, alcoholic or non-alcoholic, family history of cardiovascular disease.

METHODS

It was prospective observational drug prescribing pattern study. The study was conducted at Department of Pharmacology, Government Medical College Jammu in association with Department of Cardiology, Superspeciality Hospital, Jammu for period of 6 months i.e. from February to July 2018. All observations were recorded in preformed proforma made to evaluate drug prescription pattern in MI patients.

Inclusion criteria

Inclusion criteria were all patients of MI visiting cardiology OPD/indoor patients during study period, patients of either sex will be included and patients of any age group will be included.

Study material used

Proforma to evaluate drug prescription pattern in MI patients.

Study was initiated after Institutional Ethics Committee approval. Demographic details of the patients, comorbid conditions, associated risk factors and drug related details such as most common drug groups, dosage form, route and frequency of administration were recorded.

Statistical analysis

Data were entered into microsoft excel (windows 7) and analysis was done. Descriptive statistics such as frequencies and percentages were calculated for categorical variables. Graphic representation is used for visual interpretation of analyzed data.

Ethical approval

The study was approved by the Institutional Ethics Committee of Government Medical College Jammu, India (vide no. I₃C/2018/532).

RESULTS

During the study period, total 200 patients of acute MI visiting cardiology OPD and indoor were analysed.

Age distribution of patients

All the patients under study aged more than 30 years. Highest incidence of MI was found in age group 51-60 (57, 28.5%) and lowest incidence in age group 31-40 (9, 4.5%) and 1 patient was found of more than 90 years age (Figure 1).

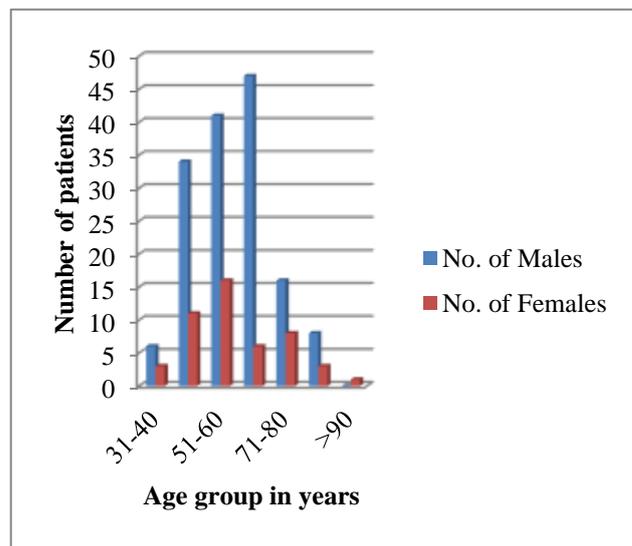


Figure 1: Age wise distribution of total patients of MI.

Gender distribution of patients

Incidence of MI was more common in males (152, 76%) than females (48, 24%) among 200 analysed patients suggesting that MI is more common in males.

Diet wise distribution of patients

Dietary history showed that 63 patients (31.5%) were vegetarians and 137 patients (68.5%) were non-vegetarians indicating that MI is more prevalent in non-vegetarians.

Smoking and alcoholic wise distribution of patient

105 patients (52.5%) were smokers and 95 patients (47.5%) were non-smokers. 65 patients (32.5%) were alcoholic and 135 patients (67.5%) were non-alcoholic.

Family history of patients

119 patients (59.5%) had family history of cardiovascular disease and 81 patients (40.5%) didn't have.

Physical activity wise distribution of patients

In our study, we found that 141 patients (70.5%) of MI don't do daily physical activity.

Comorbidities

Hypertension (188, 94%) and diabetes mellitus (51, 25.5%) were most common associated comorbidities. Others were congestive heart failure (10, 5%), chronic obstructive pulmonary disease (8, 4%), arrhythmia, cerebrovascular accident and previous MI (Table 1).

Table 1: Comorbidities associated with MI patients.

Comorbidities	No. of patients (N)	Percentage of patients (%)
Hypertension	188	94
Diabetes mellitus	51	25.5
Congestive heart failure	10	5
Chronic obstructive pulmonary disease	8	4
Arrhythmia	3	1.5
Hypothyroidism	3	1.5
Cerebrovascular accident	2	1
Previous MI	1	0.5
Drug induced parkinsonism	1	0.5

Drug prescription pattern

Commonly prescribed drugs were antiplatelets (100%) followed by hypolipidemic (99.5%), proton pump inhibitors (92%), antianginal (90.5%) and anticoagulants (68.5%) (Figure 2).

Among anti-platelet drugs, combination of aspirin and clopidogrel were given to 168 (84%) patients, 9 patients received combination of aspirin and ticagrelor and 3 patients were given combination of aspirin and prasugrel (Table 2).

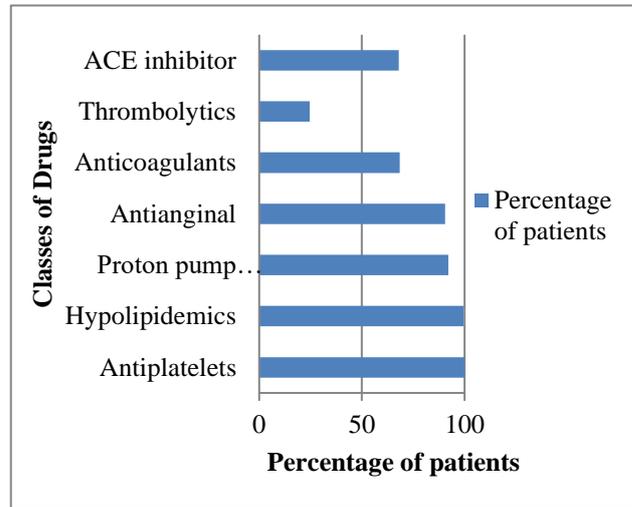


Figure 2: Common group of drugs prescribed to MI patients.

Table 2: Antiplatelet drugs given to MI patients.

Antiplatelet drug	No. of patients (N)	Percentage of patients (%)
Aspirin and clopidogrel	168	84
Aspirin and ticagrelor	9	4.5
Aspirin and prasugrel	3	1.5
Aspirin	8	4
Clopidogrel	12	6

Isosorbide dinitrate (147, 73.5%) and glyceryl trinitrate (35, 17.5%) were commonly prescribed antianginal drugs. Newer antianginal drugs such as nicorandil, ranolazine and trimetazidine were also prescribed (Table 3). About 49 patients (24.5%) were given thrombolytics. 47 patients were thrombolysis with streptokinase and 2 patients with reteplase. Majority were not thrombolysed due to late presentation (Table 3).

Among proton pump inhibitors (PPIs), pantoprazole (134, 67%) was most commonly prescribed. Other PPIs given were rabeprazole, omeprazole and esomeprazole. Atorvastatin (182, 91%) and rosuvastatin (17, 8.5%) were hypolipidemic drugs prescribed (Table 3).

Enoxaparin (135, 67.5%) and fondaparinux (2, 1%) were anticoagulants prescribed. Among angiotensin converting enzyme (ACE) inhibitors, ramipril (136, 68%) was most commonly prescribed.

Table 3: Other cardiovascular drugs prescribed to MI patients.

Class and name of drug	No. of patients (N)	Percentage of patients (%)	
Thrombolytics	Streptokinase	47	23.5
	Reteplase	2	1
Anti-anginal	Isosorbide dinitrate	147	73.5
	Glyceryl trinitrate	35	17.5
	Nicorandil	26	13
	Ranolazine	12	6
	Trimetazidine	1	0.5
Anti-coagulants	Enoxaparin	135	67.5
	Fondaparinux	2	1
Hypolipidemics	Atorvastatin	182	91
	Rosuvastatin	17	8.5
Anti-arrythmics	Diltiazem	3	1.5
	Atropine	4	2
Ace inhibitor	Ramipril	136	68
Angiotensin receptor blockers	Telmisartan	30	15
	Olmesartan	5	2.5
	Losartan	1	0.5
Calcium channel blockers	Amlodipine	23	11.5
	Cilnidipine	1	0.5
Beta-blockers	Metoprolol	93	46.5
	Carvedilol	7	3.5
	Nebivolol	1	0.5
	Labetalol	1	0.5
Diuretics	Torsemide	21	10.5
	Furosemide	19	9.5
	Eplerenone	2	1
	Chlorthalidone	1	0.5
Inotropic agents	Dobutamine	6	3
	Dopamine	2	1
	Digoxin	1	0.5
Adrenergic drug	Noradrenaline	6	3

Table 4: Other drugs given to MI patients.

Name of drug	No. of patients (N)	Percentage of patients (%)	
Opioids	Morphine	4	2
NSAIDS	Paracetamol	8	4
Proton pump inhibitors	Pantoprazole	134	67
	Rabeprazole	27	13.5
	Esomeprazole	16	8
	Omeprazole	3	1.5
H₂ blocker	Ranitidine	2	1
Anti-emetics	Ondansetron	6	3
	Domperidone	4	2
Benzodiazepines	Alprazolam	42	21
	Clonazepam	12	6
Bronchodilators	Budesonide	25	12.5
	Ipratropium bromide	34	17
	Salbutamol	11	5.5
	Theophylline	4	2

Continued.

Name of drug	No. of patients (N)	Percentage of patients (%)	
Anti-microbial agents	Ceftriaxone	26	13
	Metronidazole	2	1
	Piperacillin-tazobactam	3	1.5
	Azithromycin	1	0.5
	Linezolid	1	0.5
	Cefixime	1	0.5
	Levofloxacin	1	0.5
Hypoglycaemics	Insulin	36	18
	Metformin	11	5.5
	Glimepiride	9	4.5
Others	Thyroxine	3	1.5
	Potassium binding sachet	1	0.5
	Anti-parkinsonian drugs	1	0.5

Table 5: Adverse in-hospital events in MI patients.

Adverse in-hospital event	No. of patients (N)	Percentage of patients (%)
Cardiogenic shock	6	3
Heart block	4	2
Left ventricular failure	4	2
Bradycardia	2	1
Tachycardia	1	0.5
Hypersensitivity to streptokinase	1	0.5

Telmisartan (30, 15%) was most commonly prescribed angiotensin receptor blocker (ARB). Other ARBs prescribed were olmesartan and losartan (Table 3).

Metoprolol (93, 46.5%), carvedilol (7, 3.5%), nebivolol (1, 0.5%) and labetalol (1, 0.5%) were beta blockers prescribed. Among calcium channel blockers, amlodipine (23, 11.5%) and cilnidipine (1, 0.5%) were prescribed. 7 patients were given anti arrhythmias including diltiazem and atropine (Table 3).

Torsemide (21, 10.5%) was most common diuretic used followed by furosemide (19, 9.5%), eplerenone (2, 1%) and chlorthalidone (1, 0.5%). Dobutamine, dopamine and digoxin were inotropic agents given to 9 patients (Table 3).

Morphine was given to 4 patients. 18% patients were given antimicrobials of which ceftriaxone (26, 13.5%) was most common. Benzodiazepines such as alprazolam and clonazepam were given to 27% patients. Among bronchodilators, budesonide (25, 12.5%), ipratropium bromide (34, 17%) and salbutamol (11, 5.5%) were used. Insulin (36, 18%) was most common hypoglycemic used in diabetics and oral hypoglycemics used were metformin (11, 5.5%) and glimepiride (9, 4.5%) (Table 4).

Adverse in-hospital events

Various events were cardiogenic shock (6, 3%), heart block (4, 2%), left ventricular failure (4, 2%) and arrhythmias. 1 patient reported hypersensitivity to streptokinase (Table 5).

DISCUSSION

In this study, total 200 patients were included and their sociodemographic characteristics, risk factors, drug therapy and complications were studied and analyzed. Important risk factors were age, gender, physical inactivity, dietary characteristics, smoking, alcohol intake, family history of cardiovascular disease, hypertension and diabetes.

In our study, most common age group was of 51-60 years (28.5%) which is similar to another study by Chaudhari et al in which 26% patients were of age group 51-60 years and also similar to study by Deshmukh et al (36%).^{9,10} It suggests that advanced age is a major risk factor for MI.¹¹

Frequency of MI was more in males (76%) as compared to females (24%) which is in accordance with other studies such as 70.5% males and 29.5% females in study by Pandey et al.¹² More commonly, female patients were of age more than 50 years (17%).¹³ This increased incidence of MI may be because of loss of cardioprotective effect of estrogen after menopause.

Hypertension (94%) and diabetes (25.5%) were commonly associated comorbidities in our study. This is in accordance to study by George et al and Vakade et al.^{14, 15} In our study 31.5% patients were vegetarian and 68.5% patients were non-vegetarian. This is similar to study by Ramesh et al in which 26.67% patients were vegetarians and 73.33% were non-vegetarians but contradictory to study by Deshmukh et al where 60% of cases were strictly vegetarians and 40% were mixed diet

consumers.^{10,17} Smoking (52.5%), physical inactivity (70.5%) and positive family history (59.5%) were major risk factors similar to study by Ramesh et al.¹⁷

In study by Nagabushan et al, commonly prescribed drugs were anti-platelets (78.4%) followed by hypolipidemic (73.5%).¹⁸ Similar results were found in our study. Aspirin and clopidogrel combination were given to 84% patients. This is in accordance to association of physician's recommendation.¹⁹ In another study by Tanna et al, similar observations were made.²⁰

In our study, ACE inhibitors (68%) were prescribed more frequently than beta-blockers (51%) and CCBs (12%). This is similar to other studies.¹⁴⁻¹⁶ ACE inhibitors protect against fibrosis and cardiac re-modelling. Atorvastatin was prescribed to 91% patients and rosuvastatin to 8.5% patients. This is in accordance to other studies.^{9,14,17,21} Dopamine and dobutamine were two common inotropic agents used for congestive heart failure similar to study by Kumar et al.²²

Cardiogenic shock, left ventricular failure and arrhythmias were most common complications responsible for increased morbidity and mortality in accordance with other studies.¹¹

CONCLUSION

This study provides insight towards drug prescribing pattern and risk factors in MI patients. Predominance of male gender, age more than 50 years, history of smoking, sedentary lifestyle and polypharmacy were observed. Patients had multiple risk factors and people should be aware of them. Patients were prescribed prophylactic pharmacotherapy for prevention of further ischemic events along with advice for life style modifications. Most frequently prescribed drugs were antiplatelets followed by hypolipidemic, proton pump inhibitors, angiotensin converting enzyme inhibitors and beta blockers.

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REFERENCES

1. Gaziano TA, Gaziano JM. Epidemiology of cardiovascular disease. In: Kasper DL, Fauci AS, Hauser SL, Longo DL, Jameson JL, Loscalzo J, eds. *Harrison's Principles of Internal Medicine*. 19th ed. New York, NY: McGraw Hill; 2016: 266e1-266e5.

2. World Health Organization. Global Status Report on Non-Communicable Diseases 2014. Available at: <https://www.who.int/nmh/publications/ncd-status-report-2014/en>. Accessed on June 2020.
3. Anand IS, Chhabra ST. Ischemic Heart Disease. In: Munjal YP, Sharma SK, Agarwal AK, Gupta P, Kamath S, Nadkar MY, Singal RK, Sundar S, Varma S, eds. *API Textbook of Medicine*. 9th ed. Mumbai; 2012: 666-672.
4. Lim SS, Vos T, Flaxman AD, Danaei G, Shibuya K, Rohani AH, et al. A comparative risk assessment of burden of disease and injury attributable to 67 risk factors and risk factor clusters in 21 regions, 1990-2010: a systematic analysis for the Global Burden of Disease Study 2010. *Lancet*. 2012;380:2224-60.
5. Gupta R, Mohan I, Narula J. Trends in Coronary Heart Disease Epidemiology in India. *Ann Glob Health*. 2016;82(2):307-15.
6. Yusuf S, Hawken S, Ounpuu S, Dans T, Avezum A, Lanas F, et al. Effect of potentially modifiable risk factors associated with myocardial infarction in 52 countries (the inter heart study): case-control study. *Lancet*. 2004;364(9438):937-52.
7. Newby DE, Wright RA, Labinjoh C, Ludlam CA, Fox KA, Boon NA, et al. Endothelial dysfunction, impaired endogenous fibrinolysis, and cigarette smoking: A mechanism for arterial thrombosis and myocardial infarction. *Circulation*. 1999;99:1411-5.
8. Mitchell RN. The Heart. In: Kumar V, Abbas AK, Aster JC, eds. *Robbins Basic Pathology*. 8th ed. Elsevier; 2013: 365-406.
9. Chaudhari P, Agrawal JM, Malhotra SD, Patel VJ. Drug utilization pattern in acute coronary syndrome at tertiary care hospital: a prospective cross-sectional observational study. *Int J Basic Clin Pharmacol*. 2016;5(2):513-16.
10. Deshmukh S, Deshpande A, Kulkarni ND. Clinical profile of Acute Myocardial Infarction patients from Rural India. *JMSCR*. 2017;5(11):30106-11.
11. Ghosh A, Das AK, Pramanik S, Saha UK. Drug utilization study in patients of Acute Coronary Syndrome on follow-up visits at a Tertiary Care Centre in Kolkata. *Asian J Pharm Life Sci*. 2012;2(2):155-65.
12. Pandey S, Pandey S, Jhanwar P, Jhanwar A. A prospective study of Myocardial Infarction patients admitted in a tertiary care hospital of south-eastern Rajasthan. *Int J Biol Med Res*. 2012;3(2):1694-96.
13. Gan SC, Beaver SK, Houck PM, MacLehose RF, Lawson HW, Chan L. Treatment of Acute Myocardial Infarction and 30 days Mortality among Women and Men. *N Engl J Med*. 2000;343(1):8-15.
14. George J, Devi P, Kamath DY, Anthony N, Kunnoor NS, Sanil SS. Patterns and determinants of cardiovascular drug utilization in coronary care unit patients of a tertiary care hospital. *J Cardiovasc Dis Res*. 2013;4(4):214-21.
15. Vakade KP, Thorat VM, Khanwelkar CC, Jadhav SA, Sanghishetti VM. A study of prescribing pattern of drugs in patients of cardiovascular emergencies at

- a tertiary care hospital of Western Maharashtra. *Int J Res Med Sci*. 2016;4(2):556-61.
16. Pendhari SR, Chaudhari DR, Burute SR, Bite BM. A study on the drug utilization trends in the cardiovascular emergencies in a tertiary care hospital. *J Clin Diagn Res*. 2013;7(4):666-70.
 17. Patel R, Jawaid T, Shukla PK, Singh MP. Evaluation of Drug utilization pattern in patient of Myocardial Infarction and Prevalence of the MI by comparison of Age, Sex, Diet, Smokers and Non-smokers, Alcoholic and Non-alcoholic. *Am J Pharmacol Pharmacother*. 2015;2(1):72-80.
 18. Nagabushan H, Roopadevi HS, Prakash GM, Pankaja R. A prospective study of drug utilization pattern in cardiac intensive care unit at a tertiary care teaching hospital. *Int J Basic Clin Pharmacol*. 2015;4(3):579-83.
 19. Association of Physicians of India. API expert consensus document on management of ischemic heart disease. *J Assoc Physicians India*. 2006;54:469-80.
 20. Tanna PJ, Hotha PP, Thakkar SC. A study on prescribing pattern of drugs prescribed in patients of acute myocardial infarction admitted in ICCU at a tertiary care hospital. *Int J Res Pharmacol Pharmacother*. 2019;8(1):97-104.
 21. Vyas A, Ahamed J, Batar KK, Gehlot A. To study Prescription pattern of drugs and other prophylactic measurements for survivors of acute myocardial infarction at tertiary care teaching hospital, western Rajasthan. *Int J Sci Res*. 2019;8(7):9-11.
 22. Jewargi PKB, Mala RD. Drug utilization study in Congestive Heart Failure at a Tertiary Care Hospital. *Sch J App Med Sci*. 2015;3(2):857-62.

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