



Prescription Pattern in Patients with Coronary Artery Disease – A Prospective Observational Study

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Abstract

Background & Objective: Cardiovascular diseases are the leading cause of death globally. Coronary Artery Disease is being the most common cause of it. The major health concern is the rational use of drugs. The study's objective is to evaluate the prescription pattern of drugs used in coronary artery disease.

Methods: A prospective observational study was conducted in the cardiology department of Rajah Muthiah Medical College and Hospital, Chidambaram for a duration of one year. A total of 151 prescriptions for both outpatient and in-patient were taken and analyzed.

Results: Among 151 patients, the most common age group affected with CAD falls between 51-60 years. Males (55.6%) were more prone to CAD than females (44.4%). The risk factors most commonly associated with CAD were Hypertension (61.5%) and Diabetes (47.6%). The commonly prescribed drugs were Anti-platelet drugs (96.6%), Hypolipidemic agents (92.7%), Anti-hypertensive drugs (61.5%), Anti-anginal drugs (49.67%), Anti-diabetic drugs (47.6%), Drugs in Heart failure (45.70%), and Anti-coagulant drugs (29.1%) for CAD.

Conclusion: Antiplatelet drugs, hypolipidemic drugs, and antihypertensive drugs were the most commonly prescribed drugs. These drugs were prescribed in accordance with standard treatment guidelines.

Keywords: Coronary Artery Disease (CAD), Prescription pattern, Antiplatelet drugs, Hypolipidemic drugs, Antihypertensive drugs

Introduction

Globally, cardiovascular diseases (CVD) are the leading cause of death.^[1] Coronary artery disease contributes one-third to one-half cases of CVD.^[2] Not only in developed countries, but coronary artery disease is also the leading cause of death even in developing countries.^[3] Coronary Artery Disease (CAD) is the largest contributor to CVD accounting for over 43% of the disease burden according to the global burden of disease study in India.^[4] Around 17.9 million people died from CVDs in 2019, which contributed to 32% of all global deaths. Almost 85%

of these deaths were mainly because of heart attack and stroke.^[5]

CAD occurs as a result of atheromatous changes in the heart. It can be asymptomatic atherosclerosis, stable angina, or Acute coronary syndrome (unstable angina, NSTEMI, STEMI). Treatment will be based on the individual patient's clinical presentation; it can vary from medical management to coronary interventions such as stenting.^[6]

The extent and profile of drug use, trends, quality of drugs, compliance with standard treatment guidelines, usage of drugs from essential medicine

list, and use of generic drugs explain the prescription pattern.^[7] One of the main reasons for major health issues is irrational and unnecessary prescribing of drugs which also leads to an economic burden on the patients. In a few cases, this also results in adverse drug interactions and the development of resistance to a certain group of drugs.

Prescription pattern analysis can be used as a tool to detect these drug-related problems encountered by patients while seeking treatment for their illnesses.

This study aims at generating data on the prescription pattern of CAD patients as there is a paucity of the available information in the Tamilnadu region. This will help the physicians to improve the quality of the prescriptions and avoid any unexpected drug interactions. This in turn will greatly help in reducing the economic burden on patients and society.

Materials And Methods

This prospective observational study commenced after the approval from Institutional Human Ethics Committee, Rajah Muthiah Medical College and Hospital, Chidambaram.

Study site: This study was carried out in the Department of Cardiology, Rajah Muthiah Medical College and Hospital, a tertiary care hospital under Annamalai University, Chidambaram, Tamilnadu, India.

Study period: July 2021- June 2022, One year.

Sample size: A total of 151 patients diagnosed with CAD from both outpatient and in-patient units in the Department of Cardiology were taken for the study.

Study Participants:

Inclusion Criteria:

1. Patients with the established diagnosis of CAD, attending outpatient department or admitted in the ward of Cardiology unit, RMMCH.
2. Older than 18 years of age and younger than 80 years of age of either gender
3. Patients with/without mild and moderate co-morbidities, such as Diabetes Mellitus, Bronchial Asthma, Hypertension, or any other diseases.
4. Patients who are willing to give written informed consent.

Exclusion Criteria:

1. Patients who are not willing to participate in the study.
2. Patients with severe co-morbidities, such as chronic kidney disease stage 4 and those in critical condition.

Data Collection and analysis:

The patient data were collected with Name, Age, Gender, Occupation, Comorbidities, and drugs prescribed with their dosage and schedule. The data was collected directly through patient interviews, after getting their informed consent, and then analyzed descriptively through Microsoft Excel 2016.

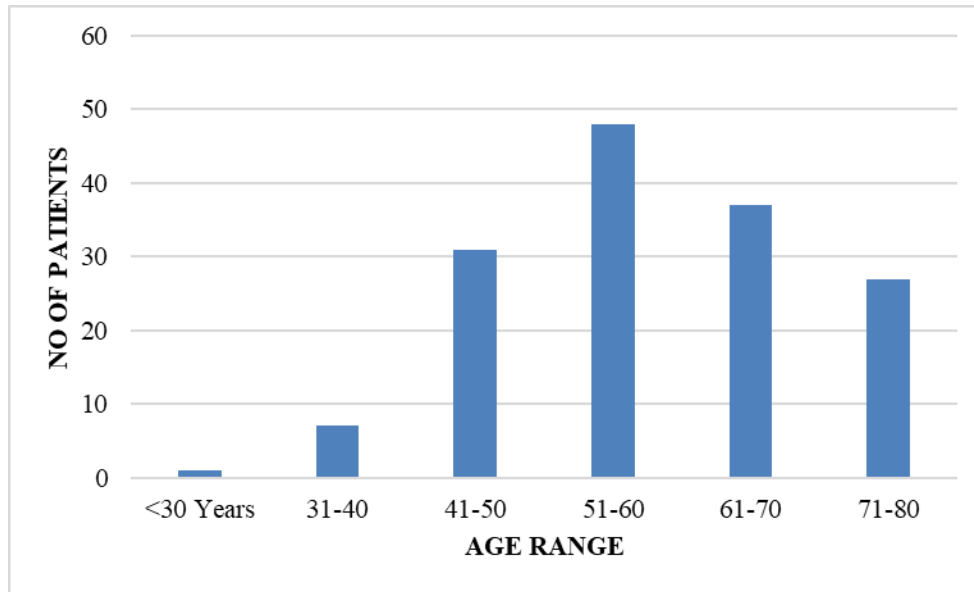
Results

Age Distribution: This study involves a sample size of 151 patients. Out of which, the most common age group affected with CAD was found to be between 51-60 which is 31.8%.

Table 1: Age distribution

Age Groups (in years)	Number of Patients (n=151)	Percentage
<30	1	0.6%
31-40	7	4.6%
41-50	31	20.6%
51-60	48	31.8%
61-70	37	24.5%
71-80	27	17.9%

Fig 1: Age Distribution Pattern

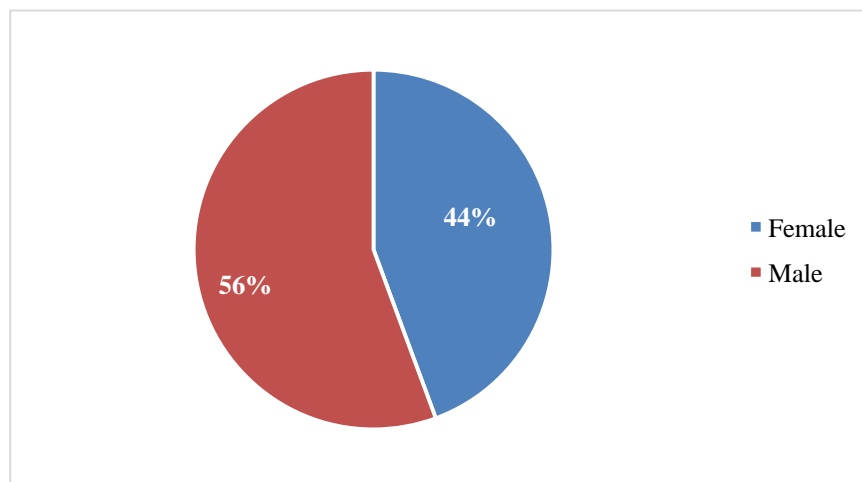


Gender Distribution: Among the 151 patients, 56% were male and 44% are female. Males were more affected by CAD than females.

Table 2: Gender Distribution

Gender	No of patients (n=151)	Percentage
Male	84	55.6%
Female	67	44.4%

Fig 2 - Gender Distribution Pattern



Comorbidity Distribution: Various comorbidities associated with CAD are shown in *Table 3*. Hypertension (61.5%) was the most common comorbid condition associated with CAD.

Table 3 – Comorbidity distribution

Comorbidities	Number of patients (n=151)	Percentage
Hypertension	29	19.21%
Hypertension + Others (Asthma, Previous CAD, CKD, Hypothyroidism)	19	12.58%
Hypertension + Diabetes	27	17.88%
Hypertension + Diabetes + Others (Anaemia, Asthma, Previous CAD, TB, Hypothyroidism)	18	11.92%
Diabetes	13	8.61%
Diabetes + Others (TB, Hypothyroidism, AKI, Previous CAD)	14	9.27%
Others (Asthma, COPD, Previous CAD, TB, Hypothyroidism)	10	6.62%
No comorbidities known previously	21	13.91%

(**CKD** – Chronic Kidney Disease, **AKI** – Acute Kidney Injury, **TB** – Tuberculosis, **COPD** – Chronic Obstructive Pulmonary Disease)

Drug Type Distribution: The drug type distribution has been illustrated in *Table 4*. The patients have been prescribed various drugs namely anti-hypertensive, anti-anginal, anti-platelet, anti-coagulant, anti-diabetic, hypolipidemic, and diuretics.

Table 4: Drug Type distribution

Drug Type Distribution	Number of prescriptions (n=151)	Percentage
Anti-Hypertensive drugs	93	61.59%
Anti-Anginal drugs	75	49.67%
Anti-Platelet drugs	146	96.69%
Anti-Coagulant drugs	44	29.14%

Drugs used in Heart failure	69	45.70%
Anti-Diabetic drugs	72	47.68%
Hypolipidemic drugs	140	92.72%

PRESCRIPTION PATTERN OF ANTI-PLATELET DRUGS: Table 5 provides the Anti-Platelet drugs prescription pattern. 52.06 % of the patients have received prescriptions for both aspirin and clopidogrel.

Table 5: Prescription Pattern of Anti-Platelets

Anti-platelets	No. of patients (n=146)	Percentage
Aspirin alone	55	37.67%
Clopidogrel alone	15	10.27%
Aspirin + clopidogrel	76	52.06%

PRESCRIPTION PATTERN OF ANTI-COAGULANT DRUGS: Table 6 shows the Anti-Coagulants prescription pattern. Low molecular weight Heparin (Enoxaparin) was prescribed for 50% of the patients.

Table 6: Prescription Pattern of Anti-Coagulants

Anti-Coagulants	No. of Patients (n=44)	Percentage
Heparin	21	47.73%
Enoxaparin	22	50.00%
Warfarin + Heparin	1	2.27%

PRESCRIPTION PATTERN OF HYPOLIPIDEMIC DRUGS: Table 7 shows the pattern in the prescription of hypolipidemic drugs. Atorvastatin was predominantly prescribed to 93.57% of the patients.

Table 7: Prescription Pattern of Hypolipidemic Drugs

Hypolipidemic	No. of Patients (n=140)	Percentage
Atorvastatin	131	93.57%

Rosuvastatin	7	5.00%
Atorvastatin + Fenofibrate	2	1.43%

PRESCRIPTION PATTERN OF ANTI-ANGINAL DRUGS: Isosorbide dinitrate was the most commonly prescribed Anti-anginal drug which accounts for 68% of the patients as shown in *Table 8*.

Table 8: Prescription Pattern of Anti-anginal Drugs

Anti-anginal drugs	No. of Patients (n=75)	Percentage
Isosorbide dinitrate	51	68.00%
Isosorbide mononitrate	1	1.33%
Nitroglycerine	8	10.67%
Ranolazine	1	1.33%
Trimetazidine	5	6.67%
Nicorandil	6	8.00%
Ivabradine	3	4.00%

PRESCRIPTION PATTERN OF DRUGS IN HEART FAILURE ASSOCIATED WITH CAD: The prescription pattern of Heart Failure Drugs is shown below in *Table 9*. Furosemide was prescribed to 60.8% of the patients.

Table 9: Prescription Pattern of Drugs in Heart Failure

Heart failure drugs	No. of Patients (n=69)	Percentage
Parenteral Furosemide	20	28.99%
Oral Furosemide	22	31.88%
Oral Spironolactone	10	14.49%
Oral Torsemide	3	4.35%
Carvedilol	6	8.70%

Digoxin	6	8.70%
Carvedilol + Digoxin	2	2.90%

PRESCRIPTION PATTERN OF ANTI-HYPERTENSIVE DRUGS: Table 10 depicts the pattern of Anti-hypertensive drug prescriptions. ACE Inhibitors were prescribed to 80.6% of the patients.

Table 10: Prescription Pattern of Anti-Hypertensive Drugs

Anti-hypertensive drugs	No. of Patients (n=93)	Percentage
ACE Inhibitors + Beta blockers	27	29.03%
ACE inhibitors	41	44.09%
Beta blockers	3	3.23%
ARB	2	2.15%
ARB + beta blockers	2	2.15%
ARB +calcium channel blockers	5	5.38%
Calcium channel blockers	4	4.30%
ACE Inhibitors + calcium channel blockers	4	4.30%
ACE Inhibitors + Beta blockers + Calcium channel blockers	3	3.23%
Calcium channel blockers + ARB + Diuretics	1	1.08%
ARB + calcium channel blockers + beta blockers	1	1.08%

(ACE – Angiotensin Converting Enzyme, ARB – Angiotensin Receptor Blocker)

PRESCRIPTION PATTERN OF ANTI-DIABETIC DRUGS: Table 11 illustrates the pattern of Anti-diabetic drug prescriptions. 65.29% of the patients have been prescribed Metformin.

Table 11: Prescription Pattern of Anti-Diabetic

Anti-Diabetic	No. of Patients (n=72)	Percentage
Dapagliflozin + Glimepiride + Metformin + Vildagliptin	1	1.39%
Dapagliflozin	1	1.39%
Glibenclamide + Metformin	1	1.39%
Gliclazide + Metformin	1	1.39%
Glimepiride + Metformin	12	16.67%
Glimepiride + Metformin + Pioglitazone + Voglibose	1	1.39%
Glimepiride + Metformin + Teneligliptin	1	1.39%
Glimepiride + Metformin + Voglibose	2	2.78%
Glipizide + Metformin	2	2.78%
Insulin	22	30.56%
Insulin + Dapagliflozin	1	1.39%
Insulin + Glimepiride + Metformin	1	1.39%
Insulin + Glimepiride + Metformin + Voglibose	1	1.39%
Insulin + Metformin	1	1.39%
Insulin + Vildagliptin	1	1.39%
Metformin	23	31.94%

PRESCRIPTION PATTERN OF ANTIBIOTICS: The prescription pattern of Antibiotics has been depicted in Table 12. Cephalosporins have been prescribed to 58.13% of the patients.

Table 12: Prescription Pattern of Antibiotics

Antibiotic drugs	No. of Patients (n=43)	Percentage
Macrolide Antibiotics	5	11.62%
Nitroimidazoles	4	9.30%
Nitrofurans Antibiotics	2	4.65%
Penicillin antibiotics	4	9.30%
Fluoroquinolones	3	7%
Cephalosporins	25	58.13%

PRESCRIPTION PATTERN OF MISCELLANEOUS DRUGS: Table 13 depicts the pattern at which miscellaneous drugs were prescribed to the patients.

Table 13: Prescription Pattern of Miscellaneous Drugs

Miscellaneous Drugs	No of Patients (n=151)	Percentage
Vitamins (B-Complex, Calcium, FST, Vitamin C)	70	46.36%
Proton pump Inhibitors	47	31.13%
H2 Blockers	55	36.42%
Antacid	13	8.61%
Laxatives (Lactulose, Bisacodyl, Liquid Paraffin, Milk of Magnesia)	41	27.15%
Benzodiazepines	36	23.84%
NSAIDS	8	5.30%
5-HT ₃ Antagonist	17	11.26%
Bronchodilators	15	9.93%
Thyroxine	14	9.27%
Anti-Histamine	8	5.30%

Discussion:

In our study, the total number of patients included was 151. From *Table 1* we can find out that the greater number of patients, most prone to CAD were between the age group of 51-60 (31.8%). As mentioned in *Sharma et al study*,^[8] the mean age of developing CAD was 53 years. We could see the same pattern in our study with the common age group between 51-60 years.

Males (55.6%) were more prone to get CAD than females (44.4%) as seen in *Table 2*, which was similar to what has been mentioned in *Jousilahti et al study of CAD*.^[9]

As illustrated in *Table 3*, the most common comorbidities in the patients with CAD were found to be hypertension (61.5%) and Type II diabetes (47.6%), As mentioned in *Marie-Isabel K Murray et al study*,^[10] hypertension and diabetes were the most common co-morbidities likely to be associated with CAD, and this study shows the same results as well.

Table 4 depicts the most common drugs prescribed for CAD were Anti-platelet drugs (96.6%), Hypolipidemic agents (92.7%), Anti-hypertensive drugs (61.5%), Anti-anginal drugs (49.67%), Anti-diabetic drugs (47.6%), Drugs in Heart Failure (45.70%) and Anti-coagulant drugs (29.1%)

As stated in *table 5*, the two Antiplatelet drugs, Aspirin and Clopidogrel were largely prescribed which accounts for 52.06%, followed by Aspirin alone (37.67%) and Clopidogrel alone (10.27%) which was similar to the study conducted by Yu HR et al.^[11]

In our study, Enoxaparin was prescribed in 50% followed by Heparin (47.7%) and Heparin combined with warfarin (2.27%) as seen in *table 6*. As in the Lee LV et al study,^[12] low molecular weight heparin like enoxaparin was frequently employed in our study as well.

As seen in *Table 7*, the most commonly prescribed hypolipidemic drug was atorvastatin (93.57%), followed by Rosuvastatin (5%). A combination of Atorvastatin with fenofibrate accounts for 1.43%. According to Lim SY et al.,^[13] statins are very safe and helpful in preventing and treating CAD regardless of cholesterol levels. Statins were almost

recommended for all CAD patients in our study, especially Atorvastatin.

Isosorbide di nitrate was the most commonly used antianginal drug, accounting for 68%, followed by nitro-glycerine (10.67 %), Nicorandil (8 %), trimetazidine (6.67 %), Ivabradine (4 %), isosorbide mononitrate (1.33 %), and ranolazine (1.33 %) as seen in *Table 8*. In this study, nitrates were most frequently used which was similar to the study conducted by Wei J et al.^[14]

As shown in *table 9*, The most common diuretic used in both oral and parenteral preparations was Furosemide (60.87 %) – Oral form (31.88 %) and parenteral form (28.99 %) followed by Spironolactone (14.49%), Torsemide (4.35%). These findings were similar to the study conducted by *Casu G et al.*^[15] Carvedilol and Digoxin both account for 8.70%, and carvedilol in combination with Digoxin accounts for 2.90%. These drugs were used in Heart Failure, the same has been indicated in Spencer et al,^[16] and Keating et al.^[16]

As shown in *table 10*, among the anti-hypertensive drug prescribed, the most common anti-hypertensive drug was ACE Inhibitors (80.6%). The prescribed drugs were ACE inhibitors alone (44.09%), Calcium channel blockers (4.31%), ARB (2.15%) and Beta blockers (3.23%). The prescribed combination of antihypertensive drugs were ACE Inhibitors with Beta-blockers (29.03%), ACE Inhibitors with calcium channel blockers (4.30%), ACE Inhibitors + Beta blocker + Calcium channel blocker (3.23%), ARB with calcium channel blockers (5.38%), and ARB + Beta-blockers (2.15%), Calcium channel blockers + ARB + Diuretic and ARB + calcium channel blocker + beta-blocker (1.08%). Enalapril was the most commonly prescribed medication in our study which was similar to Yusuf et al.^[18]

Metformin was the most commonly prescribed anti-diabetic medicine in the study, as shown in *table 11*. Metformin alone (31.94%), Insulin (30.56%), and Metformin were combined with Glimepiride in 16.67% followed by Glimepiride + Metformin + Voglibose and Glipizide + Metformin (2.78%) and other combinations were tabulated which accounts for 1.39%. These study results were similar to the studies conducted by Han Y et al.,^[19]

Cellulitis, upper respiratory tract infections, and urinary tract infections were associated with CAD among these 151 patients for which the following antibiotics were prescribed. The most commonly prescribed antibiotics in this study, as indicated in *Table 12*, were Cephalosporins - Injection Ceftriaxone (58.13%), followed by Macrolide antibiotics (11.62%), Nitroimidazole & Penicillin antibiotics (9.30%), Fluoroquinolones (7%), and Nitrofurantoin antibiotics (4.65%).

Miscellaneous drugs prescribed were tabulated in *Table 13*. Vitamins and proton pump inhibitors were the most prescribed drugs.

Conclusion:

In our study, CAD was more prevalent between the ages of 51 and 60, predominantly involving males than females, having hypertension and diabetes as the most common comorbid conditions. Antiplatelet drugs, hypolipidemic medications, and antihypertensive medications were the most prescribed drugs. In accordance with accepted medical standards, the medications were prescribed. The doctors would better be able to advise the patients on how to improve their quality of life by knowing the prescription trends in the treatment of CAD.

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