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## A Study on Drug Utilization Evaluation in Patients Admitted with Cardiovascular Diseases at A Tertiary Care Hospital



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### ABSTRACT

Cardiovascular diseases have become a major cause of morbidity and mortality globally. A prospective observational study was carried out in an inpatient department of cardiology in a tertiary care hospital. The duration of the study was 4 months i.e., from October 2018 to January 2019. The data was obtained from the patient's medical record and was documented in the especially designed data collection form. One hundred and forty four patients were enrolled in the study. In our study 70.1% were male and 29.9% were female. Maximum number of patients i.e., 35.4% was in the age group of 51-60 years. In the present study, the prevalence of coronary artery disease was high. Hypertension and Diabetes were the most common co-morbid conditions observed. The study showed higher incidence of drug use as single agents (83.36%) which is appreciable. Most commonly prescribed categories of cardiovascular drugs were antihypertensives (24.06%) and antiplatelets (23.31%) indicating high prevalence of hypertension and coronary artery disease in patients. Along with brand name, Generic name of the drug was mentioned in every prescription. Antibiotics were prescribed in 32.64% patients and injection was prescribed in 76.39% patients. Extensive polypharmacy (10.2 drugs per prescription) was noticed in the prescriptions. The prescribing pattern of drugs can be improved by reducing the number of drugs per prescription.

## INTRODUCTION:

According to World Health Organization, health is defined as the state of complete physical, mental and social well-being and not merely the absence of disease or infirmity.<sup>[1]</sup>

Medicines play an essential role in health care delivery and disease prevention. Good quality drugs that are easily accessible and cost-effective along with rational use are needed for effective healthcare.<sup>[2]</sup>

Rational drug prescribing is defined as “the use of the least number of drugs to obtain the best possible effect in the shortest period and at a reasonable cost.”<sup>[3]</sup>

It is an organized approach, which involves identifying a disease, estimating prognosis, establishing therapeutic goals, adopting the most suitable treatment, and monitoring the effects of that treatment.<sup>[4]</sup>

Irrational prescribing refers to prescribing that fails to follow good standards of treatment.<sup>[5]</sup> Irrational or bad prescribing habits lead to inefficient treatment, worsening of disease, distress to patients, and higher costs.<sup>[6]</sup>

Prescription pattern monitoring studies are drug utilization studies, which mainly concentrate on prescribing, dispensing, and administering drugs.<sup>[7]</sup>

It provides feedback to the prescribers and recommends necessary modifications to promote rational and cost-effective medical care.<sup>[8]</sup> As irrational use of drugs is a serious issue across the world these studies aim to promote rational use of drugs in a population.<sup>[7]</sup>

Cardiovascular disorders are expected to continue to increase with the general aging of the world's population and are already the leading cause of mortality worldwide.

It is a major health problem and has become a major cause of morbidity and mortality globally.<sup>[8]</sup> Nearly 80% of cardiovascular deaths occur in low and middle-income countries worldwide, which include most of the countries of Asia. World Health Organization (WHO 2009) reported that by 2015 about 20 million people might die due to CVDs.<sup>[9]</sup>

The mortality rate due to cardiac diseases has significantly decreased over the past 15 years in US, but has shown to get higher in India with cardiovascular disease being the primary reason for death, which demands the country to develop population-level strategies to reduce risk

factors. The mortality rate due to cardiovascular diseases has remarkably declined by 41 percent in US between 1990 and 2016. Meanwhile, in India, it raised by about a 34percent from 155.7 to 209.1 deaths per one lakh population in the same instance.<sup>[10]</sup> The majority of CVD deaths in India (83%) are due to ischemic heart disease (IHD) and stroke with IHD being predominant.<sup>[11]</sup> Premature mortality in terms of years of life lost because of CVD has increased by 59%, from 23.2 million to 37 million in India.<sup>[11]</sup>

As there is an increase in irrational and improper utilization of drugs, it is necessary to identify prescribing behavior in cardiovascular conditions.<sup>[12]</sup>

The study on drug utilization helps to evaluate problems in prescribing patterns. It provides favorable feedback to the prescriber and helps to modify treatment strategies, identify and correct the weak point if any, thus providing a patient with appropriate drug therapy.<sup>[13]</sup>

These studies help to reduce medication errors, prevent adverse drug reactions, evaluate drug interactions and avoid therapeutic duplication.<sup>[14]</sup>

The pharmacist has a crucial role in this process because of their expertise in the area of medication therapy management. In association with the physicians and other healthcare professionals, they can improve drug therapy for the patient.<sup>[15]</sup>

Therefore, this study attempts to assess the drug utilization pattern in the inpatient department of cardiology in a tertiary care hospital.

## **METHODOLOGY:**

A prospective observational study was carried out in an inpatient department of cardiology in a tertiary care hospital. The duration of the study was 4 months i.e., from October 2018 to January 2019. One hundred and forty-four patients were enrolled in the study.

### **Study criteria:**

#### **Inclusion criteria:**

Patients in 18 years and above. Patients of either gender.

Patients with cardiovascular disease with or without co-morbid conditions.

**Exclusion criteria:**

Patients below 18 years.

Patients in other departments of the hospital. Pregnant and lactating women.

**Data collection:**

The data was obtained from the patient's medical record and was documented in the data collection form, which was specially designed for this study. The data collection form comprised of patient demographics like age and gender, medical history, lab investigations, final diagnosis, treatment details such as the name of the drug, dosage form, frequency, route of administration.

**Data analysis:**

WHO core prescribing indicators and other additional parameters were used to assess the rationality of prescriptions:

**Who core prescribing indicators <sup>[16]</sup> includes:**

- The average number of drugs per encounter
- Percentage of drugs prescribed by generic name
- Percentage of encounters with an injection prescribed
- Percentage of encounters with an antibiotic prescribed

**Other parameters assessed were as follows:**

- Distribution of CVDs in the study population.
- Genderwise distribution.
- Agewise distribution.
- Common co-morbid conditions observed in patients with CVDs.
- Common cardiovascular Fixed Dose Combinations (FDC) prescribed.

- Common cardiovascular individual drugs prescribed.
- Drug-drug interactions.

### Statistical analysis:

Data obtained was then entered into MS excel 2010. Descriptive statistics were used to analyze data and were expressed as counts and percentages.

### RESULTS:

In our study, it was observed that out of 144 patients, 70.1% were male and 29.9% were female **Fig.No.1**. Maximum numbers of patients i.e., 35.4% were in the age group of 51-60 years followed by 25.7% were in the age group of 61-70 years. **Table No.1**

In our study, the most common cardiovascular diseases observed were coronary artery disease (37.5%) followed by Myocardial infarction + Coronary artery disease (13.9) as shown in **Table No. 2**.

Our study observed a variety of co-morbidities (**Table No.3**). The majority of patients had both hypertension and type 2 diabetes mellitus (33.3%) as a co-morbid condition. About 19.4% of patients did not have any co-morbidity.

In 144 prescriptions analyzed, a total number of 1466 drugs were prescribed. Among these, 885 were cardiovascular drugs, and 581 were non-cardiovascular drugs.

A total of 1222 drugs were prescribed as a single drug. Of these cardiovascular single drugs were 798 and non-cardiovascular single drugs were 424. A total of 244 drugs were prescribed as Fixed-Dose Combinations. Of these, cardiovascular FDCs were 87 and non-cardiovascular FDCs were 157. Details of drug therapy are represented in **Table No. 4**.

In this study, the average number of drugs per prescription was 10.2. The generic name of the drugs was mentioned in every prescription. Antibiotics were prescribed in 32.64% of patients and injection was prescribed in 76.39% of patients. Data related to prescribing indicators are shown in **Table No. 5**.

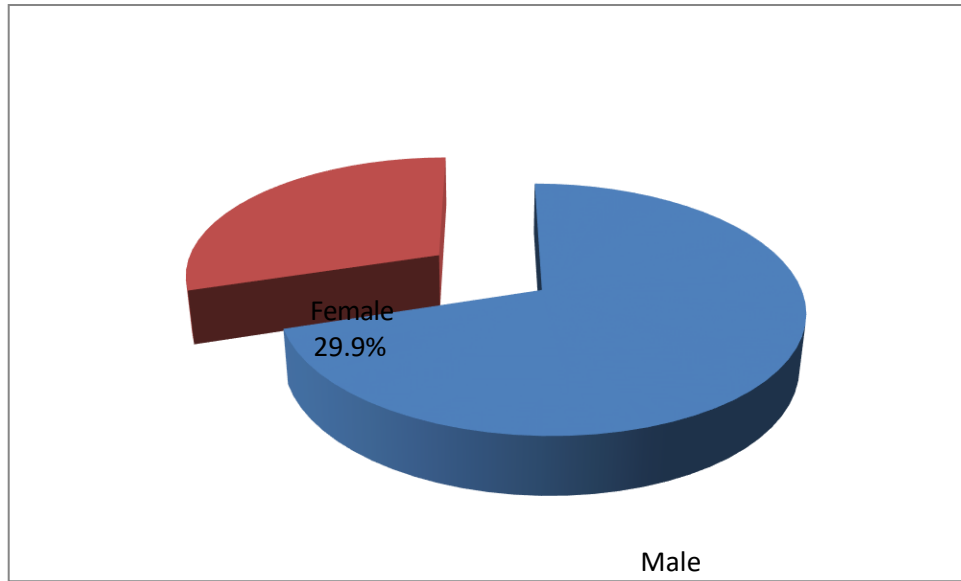


Fig. No. 1: Genderwise distribution

Table No. 1: Agewise distribution

AGE GROUP (years)	N	%
21-30	3	2.1
31-40	8	5.6
41-50	29	20.1
51-60	51	35.4
61-70	37	25.7
71-80	9	6.3
81-90	6	4.2
91-100	1	0.7
total	144	100

Table No. 2: Distribution of Cardiovascular diseases

S. No.	Cardiovascular diseases	N	%
1	ACS+CAD	2	1.4
2	ACS+MI +CAD	3	2.1
3	ADHF+CAD	1	0.7
4	<b>ANGINA+CAD</b>	<b>17</b>	<b>11.8</b>
5	ANGINA+ACS+CAD	3	2.1
6	ARRHYTHMIAS+ANGINA+CAD	1	0.7
7	ARRHYTHMIAS+CAD	2	1.4
8	<b>CAD</b>	<b>54</b>	<b>37.5</b>
9	CAD+LVF	1	0.7
10	HB+MI+CAD	1	0.7
11	HF+LVF+ACS+CAD	1	0.7
12	LVF+ACS+MI +CAD	1	0.7
13	LVF+MI+ADHF+CAD	1	0.7
14	LVF+ANGINA+ CAD	3	2.1
15	LVF+CAD	8	5.6
16	LVF+CMP	2	1.4
17	LVF+CMP +CAD	2	1.4
18	LVF+ HF+ CAD	1	0.7
19	LVF+MI+ ANGINA+CAD	2	1.4
20	<b>MI + CAD</b>	<b>20</b>	<b>13.9</b>
21	MI+CMP+CAD	1	0.7
22	MI +LVF+CAD	16	11.1
23	RHD+CAD	1	0.7
	TOTAL	144	100

Table No. 3: Distribution of co-morbidities

S. No	Co-morbidities	N	%
1	No Co-morbidities	28	19.4
2	CKD	1	0.7
3	DM	10	6.9
4	DM+CKD	2	1.4
5	DM+CKD+ HYPOTHYROID+ ANEMIA	1	0.7
6	DM+ COPD	1	0.7
7	HTN	22	15.3
8	HTN+CKD	1	0.7
9	HTN+CKD+ HYPOTHYROID	1	0.7
10	HTN +COPD	2	1.4
11	HTN +DM	48	33.3
12	HTN+ DM+ ANEMIA	2	1.4
13	HTN+DM+CHOLELITHIASIS	1	0.7
14	HTN+ DM+ CKD	4	2.8
15	HTN+ DM+CKD + COPD	1	0.7
16	HTN+ DM+ CKD+ HYPOTHYROID	1	0.7
17	HTN +DM+COPD	1	0.7
18	HTN+ DM+DYSLIPIDEMIA+ ANEMIA+STROKE	1	0.7
19	HTN+DM+HYPOTHYROIDISM	8	5.6
20	HTN+ DM+ HYPOTHYROIDISM+ ANEMIA	1	0.7
21	HTN+DM+NEPHROLITHIASIS	1	0.7
22	HTN +EPILEPSY+HERNIA	1	0.7
23	HTN+HYPOTHYROIDISM	3	2.1
24	HTN+SPONDYLITIS	1	0.7
25	HYPOTHYROIDISM	1	0.7
	TOTAL	144	100



**Table No. 4: Drug therapy details in cardiovascular disease patients**

<b>Drug therapy details in cardiovascular disease patients</b>	<b>N (%)</b>
<b>Total number of prescriptions analyzed (Number)</b>	144
<b>The total number of drugs prescribed</b>	1466 (100)
<b>The total number of Cardiovascular drugs prescribed</b>	885 (60.37%)
<b>The total number of noncardiovascular drugs prescribed</b>	581 (39.63%)
<b>The total number of single drugs prescribed</b>	1222 (83.36%)
<b>The total number of single cardiovascular drugs prescribed</b>	798 (65.31%)
<b>The total number of single noncardiovascular drugs prescribed</b>	424 (34.69%)
<b>The total number of fixed-dose combinations prescribed</b>	244 (16.64%)
<b>The total number of cardiovascular FDC prescribed</b>	87 (35.66%)
<b>The total number of noncardiovascular FDC prescribed</b>	157 (64.34%)

**Table No. 5: Assessment of Prescribing indicators as per WHO:**

<b>S. No.</b>	<b>Prescribing indicators as per WHO</b>	<b>%</b>
<b>1</b>	The average number of drugs per prescription (number)	10.2
<b>2</b>	Percentage of drugs prescribed by generic name	100%
<b>3</b>	Percentage of encounters with an antibiotic prescribed	32.64%
<b>4</b>	Percentage of encounters with an injection prescribed	76.39%

**Details of single cardiovascular drugs prescribed:**

The most commonly prescribed categories of single cardiovascular drugs were Antihypertensive 192 (24.06%) followed by Antiplatelets 186 (23.31%) as shown in Table No. 6.

**Table No. 6: Categories of single cardiovascular drugs prescribed:**

Categories	No. of Drugs Prescribed	%
<b>Antiplatelets</b>	<b>186</b>	<b>23.31</b>
Anticoagulants	85	<b>10.65</b>
Antianginals	161	<b>20.18</b>
Antihyperlipidemics	123	<b>15.41</b>
<b>Antihypertensives</b>	<b>192</b>	<b>24.06</b>
Inotropes	28	<b>3.51</b>
Antiarrhythmics	4	<b>0.50</b>
Vasopressin receptor antagonists	2	<b>0.25</b>
Others	17	<b>2.13</b>
Total	798	100

**Details of single Antiplatelets drugs:**

The most commonly prescribed antiplatelets were Aspirin 85 (45.70%), followed by Clopidogrel 55 (29.57%). Data is represented in Table No. 7.

**Table No. 7: Details of single antiplatelet drugs prescribed:**

Antiplatelets	No. of Drugs Prescribed	%
Aspirin	<b>85</b>	<b>45.70</b>
Clopidogrel	<b>55</b>	<b>29.57</b>
<b>Ticagrelor</b>	<b>30</b>	<b>16.13</b>
<b>Prasugrel</b>	<b>15</b>	<b>8.06</b>
<b>Cilostazol</b>	<b>1</b>	<b>0.54</b>
<b>Total</b>	<b>186</b>	<b>100</b>

**Details of Anticoagulant drugs:**

The most commonly prescribed anticoagulants were Enoxaparin 39 (45.88%) and Heparin 39 (45.88%). (Table No. 8).

**Table No. 8: Details of Anticoagulants prescribed:**

Anticoagulants	No. of Drugs Prescribed	%
<b>Enoxaparin</b>	<b>39</b>	<b>45.88</b>
<b>Heparin</b>	<b>39</b>	<b>45.88</b>
Fondaparinux Sodium	4	4.71
Dabigatran	0	0.00
Dalteparin	1	1.18
Nicoumalone	2	2.35
<b>Total</b>	<b>85</b>	<b>100</b>

**Details of antianginal drugs:**

The most commonly prescribed antianginals were Nitroglycerin 64(39.75%), followed by Nicorandil 39 (24.22%) (Table No. 9).

**Table No. 9: Details of antianginals prescribed:**

Antianginals	No. of Drugs Prescribed	%
Trimetazidine	25	15.53
Nitroglycerin	<b>64</b>	39.75
Ivabradine	17	10.56
Isodorbide mononitrate	3	1.86
Nicorandil	39	24.22
Ranolazine	10	6.21
Isosorbide dinitrate	3	1.86
<b>Total</b>	<b>161</b>	<b>100</b>

**Details of Anti-hyperlipidemic:**

The most commonly prescribed antihyperlipidemic were Atorvastatin 103 (83.74%), followed by Rosuvastatin 20 (16.26%). (Table No.10)

**Table No. 10: Details of Anti-hyperlipidemic prescribed:**

Antihyperlipidemic (Statins)	No. of Drugs Prescribed	%
<b>Atorvastatin</b>	<b>103</b>	<b>83.74</b>
Rosuvastatin	<b>20</b>	<b>16.26</b>
<b>Total</b>	<b>123</b>	<b>100</b>

**Details of antihypertensive drugs:**

Among Antihypertensives, the most commonly prescribed class was Beta-blockers 68 (35.42%) followed by Diuretics 47 (24.48%), ACE inhibitors 28 (14.58%), Angiotensin Receptor Blockers 21 (10.94%), Calcium Channel Blockers 17 (8.85%), and  $\alpha$  blockers and  $\alpha+\beta$  blockers 11 (5.73%) (Table No. 11).

**Table No. 11: Details of classes of Antihypertensive drugs:**

Antihypertensive Class	No. of Drugs Prescribed	%
ACE Inhibitors	28	14.58
Angiotensin Receptor Blockers	21	10.94
Calcium Channel Blockers	17	8.85
$\alpha$ Blockers And $\alpha+\beta$ Blockers	11	5.73
<b>Beta Blockers</b>	<b>68</b>	<b>35.42</b>
<b>Diuretics</b>	<b>47</b>	<b>24.48</b>
<b>Total</b>	<b>192</b>	<b>100</b>

Among ACE inhibitors, Ramipril 20 (71.4%) was most commonly prescribed followed by Enalapril 8 (28.6%) (Table No. 12).

Among ARB inhibitors Telmisartan 18 (85.7%) was most commonly prescribed followed by Losartan 3 (14.3%) (Table No. 13).

Among Calcium channel blockers, the most commonly prescribed drugs were Diltiazem 7 (41.18%) followed by amlodipine 6 (35.29%) (Table No. 14).

Among beta-blockers, Metoprololsuccinate ER43 (63.24%) was most commonly prescribed followed by Bisoprolol 11 (16.18%) (Table No. 15).

Carvedilol was the most commonly prescribed A+B blocker (Table No.16).

Furosemide 26 (55.32%) followed by Torsemide 12 (25.53%) were the most commonly prescribed diuretics.

**Table No. 12: Details of ACE inhibitors Prescribed:**

ACE Inhibitors	No. of Drugs Prescribed	%
<b>Ramipril</b>	<b>20</b>	<b>71.4</b>
Enalapril	8	28.6
Total	<b>28</b>	<b>100</b>

**Table No. 13: Details of ARB inhibitors prescribed:**

ARB Inhibitors	No. of Drugs Prescribed	%
<b>Telmisartan</b>	<b>18</b>	<b>85.7</b>
Losartan	3	14.3
Total	<b>21</b>	<b>100</b>

**Table No. 14: Details of Calcium channel blockers prescribed:**

Calcium Channel Blockers	No. of Drugs Prescribed	%
Diltiazem	7	41.18
Amlodipine	6	35.29
Verapamil	1	5.88
Benedipinehcl	3	17.65
Total	17	100

**Table No. 15: Details of beta blockers prescribed:**

Beta Blockers	N	%
Metoprolol Succinate Er	43	63.24
Metoprolol	10	14.71
Bisoprolol	11	16.18
Nebivolol	4	5.88
Total	68	100

**Table No. 16: Details of  $\alpha$  blockers and  $\alpha+\beta$  blockers prescribed:**

A blockers and $\alpha+\beta$ blockers	No. of drugs prescribed	%
Prazosin	2	18.18
Tamsulosin	1	9.09
Carvedilol	8	72.73
Total	11	100

**Table No. 17: Details of Diuretics prescribed:**

Diuretics	No. of drugs prescribed	%
Furosemide	26	55.32
Torseamide	12	25.53
Spirolactone	3	6.38
Epleronone	6	12.77
<b>Total</b>	<b>47</b>	<b>100</b>

**Details of Inotropic agents:**

In our study, Digoxin 15 (53.57%) followed by Dobutamine 10 (35.71%) were the most commonly prescribed inotropic agents.

**Table No. 18: Details of inotropic agents prescribed:**

Inotropic agents	No. of drugs prescribed	%
Digoxin	15	53.57
Dobutamine	10	35.71
Noradrenaline	3	10.71
<b>Total</b>	<b>28</b>	<b>100</b>

**Details of Cardiovascular Fixed-dose combinations prescribed:**

Table No. 19 represents the most commonly prescribed category of the cardiovascular fixed-dose combination was Antihypertensives 46 (52.87%) followed by Antiplatelets 24 (27.59%) and antihyperlipidemic + antiplatelets 17 (19.54). Further detailed data related to cardiovascular FDCs are represented in Table No. 20, Table No. 21, and Table No.22.

**Table No. 19: Details of Categories of Cardiovascular FDCs prescribed:**

Category	No. of Drugs Prescribed	%
<b>Antihypertensives</b>	<b>46</b>	<b>52.87</b>
Antihyperlipidemic+Antiplatelet	17	19.54
<b>Antiplatelets</b>	<b>24</b>	<b>27.59</b>
Total	<b>87</b>	<b>100</b>

**Table No. 20: Details of Antihypertensive FDCs prescribed:**

Antihypertensives	No. of Drugs Prescribed	%
Telmisartan+ Hydrochlorthiazide	8	17.39
Sacubitril+ Valsartan	9	19.57
Telmisartan+ Metoprolol	4	8.70
Furosemide+ Spironolactone	5	10.87
Eplerenone+ Torsemide	2	4.35
Torsemide+ Spironolactone	4	8.70
Olmesartan+ Metoprolol	1	2.17
Perindopril+ Indapamide	1	2.17
Olmesartan+ Medoxomil	2	4.35
Furosemide+ Amiloride	1	2.17
Azilsartan+ Medoxomil	1	2.17
Olmesartan+ Medoxomil+Chlorthalidone	1	2.17
Metoprolol+ Clinidipine	1	2.17
Telmisartan+ Clinidipine	1	2.17
Metoprolol+ Amlodipine	3	6.52
Amlodipine+ Atenolol	2	4.35
Total	46	100



**Table No. 21: Details of Antihyperlipidemic+Antiplatelet FDCs prescribed:**

Antihyperlipidemics+Antiplatelets	No. of Drugs Prescribed	%
<b>Atorvastatin+Aspirin</b>	<b>10</b>	<b>58.82</b>
Atorvastatin+Clopidogrel	4	23.53
Rosuvastatin+Clopidogrel	1	5.88
Rosuvastatin+Clopidogrel+Aspirin	2	11.76
Total	17	100

**Table No. 22: Details of Antiplatelet FDCs prescribed:**

Antiplatelets	No. of Drugs Prescribed	%
<b>Prasugrel+Aspirin</b>	<b>3</b>	<b>12.5</b>
Clopidogrel+Aspirin	21	87.5
Total	24	100

**Details of single Non-cardiovascular drugs prescribed:**

Out of 424 non-cardiovascular single drugs, 113(26.65%) were antacids, 91(21.46%) were other drugs, 67(15.80%) were antidiabetics, 51(12.03%) were antibiotics, 34(8.02%) were stool softeners, 28(6.60%) were bronchodilators, 22(5.19%) were benzodiazepines and 18(4.2) were NSAIDs as shown in the Table No. 23. Further detailed data on categories of single noncardiovascular drugs are depicted in Table No. 24, Table No. 25, Table No. 26, Table No. 27, Table No. 28, Table No. 29, Table No. 30, Table No. 31.

**Table No. 23: Details of categories of single noncardiovascular drugs prescribed:**

Category	N	%
Antacids	113	26.65
Antibiotics	51	12.03
Antidiabetics	67	15.80
Benzodiazepines	22	5.19
NSAIDs	18	4.25
Bronchodilators	28	6.60
Stool softeners	34	8.02
Other drugs	91	21.46
<b>Total</b>	<b>424</b>	<b>100.00</b>

**Table No. 24: Details of Antacids prescribed:**

Antacids	N	%
Pantoprazole	108	95.6
Esomiprazole	1	0.9
Cinitapride	1	0.9
Rabeprazole	1	0.9
Ranitidine	2	1.8
Total	113	100

Table No. 25: Details of antibiotics prescribed:

Antibiotics	N	%
Azithromycin	1	2.0
Ceftriaxone Sodium	9	17.6
Cefuroxime Axetil	9	17.6
Meropenem	3	5.9
Vancomycin	1	2.0
Amphotericin B	1	2.0
Cholistimethate Sodium	1	2.0
Levofloxacin	9	17.6
Gentamycin	2	3.9
Cefpodoxime	1	2.0
Doxycycline	4	7.8
Moxifloxacin Hcl	1	2.0
Metronidazole	4	7.8
Piperacillin	1	2.0
Ofloxacin	3	5.9
Rifaximin	1	2.0
Total	51	100

**Table No. 26: Details of Antidiabetics prescribed:**

Antidiabetics	N	%
Insulin	46	68.7
Empagliflozin	2	3.0
Metformin	6	9.0
Dapagliflozin	1	1.5
Canagliflozin	2	3.0
Linagliptin	2	3.0
Teneligliptin	3	4.5
Glimeperide	3	4.5
Gliclazide	2	3.0
Total	67	100

**Table No. 27: Details of Benzodiazepines prescribed:**

Benzodiazepines	N	%
Alprazolam	18	81.8
Zolpidem	1	4.5
Chlordiazepoxide	1	4.5
Lorazepam	1	4.5
Clonazepam	1	4.5
Total	22	100

**Table No. 28: Details of NSAIDs prescribed:**

NSAIDS	N	%
Diclofenac	1	5.6
Paracetamol	14	77.8
Choline Salicylate	1	5.6
Etodolac ER	1	5.6
Aceclofenac	1	5.6
Total	18	100

**Table No. 29: Details of bronchodilators prescribed:**

Bronchodilators	N	%
Budesonide	17	60.7
Levosalbutamol	5	17.9
Theophylline	1	3.6
Doxophylline	5	17.9
Total	28	100

**Table No. 30: Details of stool softeners prescribed:**

Stool Softeners	N	%
Lactulose	12	35.3
Lactilol Monohydrate	18	52.9
Liquid Paraffin	4	11.8
Total	34	100

**Table No. 31: Details of other drugs prescribed:**

<b>Other Drugs</b>	<b>N</b>	<b>%</b>
Thyroxine	18	19.8
Levetiracetam	4	4.4
Probiotic	7	7.7
Alpha Ketone Analogue	2	2.2
Ondansetron	6	6.6
Methyl Prednisolone	1	1.1
N Acetyl Cysteine	7	7.7
Febuxostat	1	1.1
Beta Histine	1	1.1
Allopurinol	4	4.4
Neomol	1	1.1
Sucralfate	7	7.7
Thiamen Hcl	1	1.1
Calcitriol	6	6.6
Citicoline	1	1.1
Levocarnitine	5	5.5
Methdilazine	4	4.4
Fentanyl Citrate	1	1.1
Modafinil	1	1.1
Montelukast	2	2.2
Benzocaine	1	1.1
Levocetizine	2	2.2
Racecadotril	2	2.2
Nicotine	1	1.1
Glutathione	2	2.2
Tramadol	2	2.2
Metoclopramide	1	1.1
Total	91	100

**Details of non-cardiovascular fixed-dose combinations prescribed:**

Out of 157 non-cardiovascular fixed-dose combinations, 62 (39.49%) were nutritional supplements, 23(14.65%) were antibiotics, 19(12.10%) were bronchodilators, 18(11.46%) were antiallergic/expectorants/mucolytics, 15(9.55%) were antidiabetics, 11(7.01%) were antacids and 9(5.73%) were other drugs as shown in the Table No. 32. Further detailed data on categories of non-cardiovascular fixed-dose combinations are depicted in Table No. 33, Table No. 34, Table No. 35, Table No. 36, Table No. 37, Table No. 38, Table No. 39.

**Table No. 32: Categories of non-cardiovascular FDCs prescribed:**

Category	N	%
Antiallergic/Expectorants/Mucolytics	18	11.46
<b>Nutritional Supplements</b>	<b>62</b>	<b>39.49</b>
<b>Antibiotics</b>	<b>23</b>	<b>14.65</b>
Antacids	11	7.01
Antidiabetics	15	9.55
Bronchodilators	19	12.10
Other Drugs	9	5.73
Total	157	100.00

**Table No. 33: Details of Antiallergic/Expectorants/Mucolytics FDCs prescribed:**

Antiallergic/Expectorants/Mucolytics	N	%
Acebrophylline+Terbutaline+Guaiphenacin	1	5.6
Montelukast+Fexofenadine	3	16.7
Dextromethorphan+Guaiphenasin	4	22.2
Levocloperastine+Fendizoate	1	5.6
Etiophylline+Theophylline	1	5.6
Dextromethorphan+Phenylepinephrine+Chlorpheniramine	2	11.1
Acebrophylline+Montelukast	1	5.6
Montelukast+Levocitrazine	3	16.7
Diphenhydramine+ Ammonium Cl+ Na Citrate	2	11.1
Total	18	100

**Table No. 34: Details of nutritional supplements FDCs prescribed:**

Nutritional Supplements	N	%
Coenzyme Q10+Carnitine+VitE	26	41.9
N Acetyl Cysteine+Pyridoxine	4	6.5
Multivitamin	21	33.9
Lactobacillus+Multivitamin	6	9.7
Gabapentine+Methylcobalamine	2	3.2
Pregabalin+Methylcobalamin	1	1.6
Caco3+Calcitrol+Methylcobalamin+Fa	1	1.6
Diosmin+Hesperidin	1	1.6
Total	62	100

**Table No. 35: Details of Antibiotics FDCs prescribed:**

Antibiotics	N	%
Ceftriaxone Na+Sulbactum	1	4.3
Cefipime+Tazobactum	1	4.3
Cefoperazone+Tazobactum	3	13.0
Arterolane+Piperaquine	1	4.3
Piperacillin+Tazobactum	1	4.3
Norfloxacin+Tinidazole	1	4.3
Cefpodoxime Proxetil+K Clavulanate	1	4.3
Cefoperazone+ Sulbactum	12	52.2
Amoxicillin+Clavulanate	2	8.7
Total	23	100



**Table No. 36: Details of Antacids FDCs prescribed:**

Antacids	N	%
Cintrapride+Pantoprazole	3	27.3
Pantoprazole+Domperidone	4	36.4
Megaldrate+Simethicone	1	9.1
Esomeprazole+Domeperidone	3	27.3
Total	11	100

**Table No. 37: Details of anti-diabetic FDCs prescribed:**

Antidiabetics	N	%
Glimepride+Metformin	6	40.0
SitagliptinPo4 +Metformin Hcl	3	20.0
Tenigliptin+Metformin	2	13.3
Glimepride+Metformin+Voglibose	3	20.0
Vildagliptin+Metformin Hcl	1	6.7
Total	15	100

**Table No. 38: Details of bronchodilators FDCs prescribed:**

Bronchodilators	N	%
Ipratropium Br +Salbutamol	18	94.7
Formeterol Fumarate+Budesoide	1	5.3
Total	19	100

**Table No. 39: Details of other drugs prescribed:**

Other Drugs	N	%
Ibuprofen+Paracetamol	1	11.1
Acetaminophen+Tramadol	1	11.1
Etoricoxib+Thiocolocside	1	11.1
Gabapentin+Nortryptiline	4	44.4
Escitalopram+Clonazepam	1	11.1
Liquid Paraffin+ Mg Hydroxide	1	11.1
<b>Total</b>	<b>9</b>	<b>100</b>

**Drug-Drug interactions:**

In this present study, out of 144 prescriptions, major interactions were found in 26 (17.22%) prescriptions and moderate interactions were found in 125 (82.78%) prescriptions. Data is represented in Table No. 40.

**Table No. 40: Number of prescriptions in which DDIs were noticed:**

Interactions	No. of prescriptions	%
Major interactions	26	17.22
<b>Moderate interactions</b>	<b>125</b>	<b>82.78</b>
<b>Total</b>	<b>151</b>	<b>100</b>

**DISCUSSION:**

In the present study, cardiovascular diseases were higher in males (70.1%) than in females (29.9%) which is by the study conducted by Vakade K Petal where the frequency of cardiovascular diseases was higher in males (64.63%) than in females (35.37%).[3]

In the present study, it was found that cardiovascular diseases were most common in the age group of 51-60 years (35.4%) followed by 61-70 years (25.7%). These results were in

concordance with the study conducted by Patil SB *et al* where a maximum number of patients were in the age group of 51-60 years (39%) followed by 61-70 years (27%).<sup>[17]</sup> One of the reasons for this might be associated with co-morbidities and various risk factors at this age.

The present study results showed that coronary artery disease (37.5%) was most commonly found cardiovascular disease followed by myocardial infarction + coronary artery disease (13.9%) which by the study conducted by Kerker SS *et al* in which ischemic heart disease (41%) was the most commonly observed cardiovascular disease in patients.<sup>[13]</sup>

The present study observed that majority of patients had both hypertension and type 2 diabetes mellitus (33.3%) as a co-morbid condition. The present study results were similar to the study conducted by Vakade K Petal.<sup>[3]</sup>

In the present study, the average number of drugs per prescription was found to be 10.2, which indicates extensive polypharmacy. The study results were similar to the study conducted by Pendhari *et al* where the average number of drugs per prescription was 9.<sup>[18]</sup> However, the study conducted by Kerker SS *et al* observed that the average number of drugs per prescription was 5.04, which is less when compared to the present study results.<sup>[13]</sup>

In the present study, drugs were prescribed by generic name. It is appropriate to prescribe drugs by generic name as prescribing drugs by brand names not only inflates the cost but also evokes an adverse drug response due to confusing drug nomenclature.<sup>[19]</sup>

In the present study, the percentage of encounters with an antibiotic prescribed was 32.64% which was in contrast to the study conducted by Slathia I *et al.*, in which it was 0.73%.<sup>[12]</sup> Antibiotics are one of the most commonly used and misused drugs. They should not be prescribed for self-limiting infections or viral infections. They should only be prescribed after assuring that the condition is due to treatable infections (mostly bacterial) and is not likely to dissolve by itself or local measures only. Unnecessary use of antibiotics increases the risk of antibiotic resistance, adverse effects, and toxicity.<sup>[20]</sup>

In the present study, injections were prescribed in 76.39% of patients which is higher when compared to the study conducted by Ravi Shankar P *et al.*, where the frequency of use of injectable was 7.89%.<sup>[21]</sup>

In the present study, single drugs and FDCs were prescribed in a percentage of 83.36% and 16.64% respectively. It was by the previous study by Slathia I *et al* which reported that 79.88% of drugs were prescribed as single drugs and 20.12% were prescribed as FDCs.<sup>[12]</sup>

In the present study, the most commonly prescribed category of single cardiovascular drugs was antihypertensives (24.06%) followed by antiplatelets (23.31%). The study results were similar to the study conducted by Boggula *et al.*, in which Antihypertensives (38.4%) were commonly prescribed, followed by Antiplatelets (34.2%).<sup>[22]</sup>

In the present study, the most commonly prescribed antiplatelets were Aspirin (45.70%), followed by Clopidogrel (29.57%). This study was by the study conducted by Pranay Wal *et al.*, were aspirin and clopidogrel were the most prescribed antiplatelet drugs.<sup>[23]</sup>

In the present study, the most commonly prescribed anticoagulants were Enoxaparin (45.88%) and Heparin (45.88%). It was by the study conducted by Dawalji Setal., where Enoxaparin (47.27%) was more frequently prescribed, followed by Heparin (40%)<sup>[24]</sup> In the present study, Nitroglycerin (39.75%) was the most commonly prescribed antianginal drug which is by the study by Kerker Setal where Nitroglycerin (45.45%) was most commonly prescribed.<sup>[13]</sup>

In the present study among Statins, Atorvastatin (83.74%) was more commonly prescribed followed by Rosuvastatin (16.26%). The results were similar to the study by Slathia I *et al.*, where atorvastatin was the most commonly prescribed drug among statins.<sup>[12]</sup>

In the present study most commonly prescribed antihypertensive class was Beta-blockers (35.42%) followed by Diuretics (24.48%). The study results were similar to the study conducted by Abdul Muhit *et al*, which documented that beta-blockers (51.16%) followed by diuretics (37.21%) were the most commonly prescribed antihypertensive class.<sup>[25]</sup>

In the present study, Digoxin (53.57%) was the most commonly prescribed ionotropic agent which was by the study conducted by Thomas B *et al.*, where digoxin was the most frequently prescribed ionotropic drug.<sup>[26]</sup>

In the present study, the most commonly prescribed category of cardiovascular fixed-dose combination was Antihypertensives (52.87%) followed by Antiplatelets (27.59%) and antihyperlipidemic+antiplatelets (19.54). In the present study, aspirin+clopidogrel (87.5%)

was the most commonly prescribed FDC among antiplatelets. The results were similar to the study conducted by Rathod P *et al*, which reported that aspirin and clopidogrel combination (46.90%) was the most commonly prescribed antiplatelets because this combination is synergistic in preventing ischaemic episodes and reduces cardiovascular mortality, non-fatal MI, and stroke.<sup>[8]</sup>

In the present study commonly prescribed non-cardiovascular single drugs were 113 (26.65%) antacids (26.65%), antidiabetics (15.80%) and non-cardiovascular fixed-dose combinations were nutritional supplements (39.49%), antibiotics (14.65%) and bronchodilators (12.10%). These drugs were prescribed to treat associated medical conditions as per the need.

In the present study, the commonly encountered drug interactions in prescriptions were moderate (82.78%) followed by major (17.22%). The results were similar to the study conducted by Boggula *et al.*, in which moderate drug interactions were 81.09% and major drug interactions were 9.14%.<sup>[23]</sup>

## CONCLUSION:

In the present study it was observed that cardiovascular disease was more common in male compared to female and the risk for CVD increased with increasing age. In the present study, the prevalence of coronary artery disease was high. Hypertension and Diabetes were the most common co-morbid conditions observed. From the study, it can be concluded that co-morbidities can be the major risk factor for cardiovascular diseases and their complications. By controlling the co-morbid conditions there could be a substantial decline in cardiovascular diseases and their complications. In this study, the most commonly prescribed categories of cardiovascular drugs were antihypertensives and antiplatelets indicating a high prevalence of hypertension and coronary artery disease in patients. Extensive polypharmacy (10.2 drugs per prescription) was noticed in the prescriptions. The prescribing pattern of drugs can be improved by reducing the number of drugs per prescription.

The study showed a higher incidence of drug use as single agents (83.36%) which is appreciable.

In addition to prescribing drugs, through patient counseling we can educate patients about risk factors of cardiovascular diseases as many of them do not understand the best way to take care of themselves and prevent disease.

## CONFLICT OF INTEREST:

All the authors declare that there is no potential conflict of interest in the study.

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