

## Research Article



## A Study on Drug Utilization Pattern and Cardiovascular Disease Prevalence in a Tertiary Care Hospital

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### ABSTRACT

The aim of the present study was to evaluate the drug utilization pattern and prevalence of cardiovascular diseases in the cardiology department in a tertiary care hospital. The study was a retrospective Observational study, carried out in cardiology department at Viveka nandha Medical Care Hospital, Elayampalayam, Tiruchengode for a period of six months from December 2020 – June 2020. 200 subjects were included in our study. The data like demographic details of patients, indication, disease prevalence, comorbidities and prescribing pattern were collected. In our study out of 100 patients, 65% were male and 35% were female. The cardiac disease was highest in patients of the age group 61-70 years. The most common cardiovascular disease treated was myocardial infarction (31%) and the most common associated comorbidity was hypertension. The top three prescribed cardiovascular drugs were aspirin (15.5%), atorvastatin (13.7%) and clopidogrel (11.44%). The presence of polypharmacy leads to the occurrence of potential DDIs which increase the risk in patients with cardiovascular diseases. The present study will provide feedback to the health care professionals to achieve rational drug therapy.

**Keywords:** Drug utilization pattern, Rational drug therapy, Polypharmacy, Cardiovascular disease.

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### INTRODUCTION

Cardiovascular diseases are the leading cause of death in the world.<sup>1</sup> In India, drug utilization study demonstrates the existence of a wide range of cardiovascular drugs for prophylaxis and therapeutic use.<sup>1</sup> Drug utilization study is a solid investigational measure to estimate the current model of drug usage and the relevance of prescriptions.<sup>3</sup> DUS evaluates the safety and rationality of the drug therapy. It has a positive impact on the prescribing physician and improves the prescribing pattern of the physician and assist them in changing the treatment strategies whenever required, identify and make an appropriate decision for safe and cost-effective therapy.<sup>4</sup>

Multiple drugs are often required due to several comorbidities which turn out to be a barrier to get appropriate therapy. Drug interactions may occur as a result of polypharmacy, complicating the diagnosis and leading to other undesirable outcomes.<sup>5</sup> Comorbidities related to cardiovascular diseases include diabetes mellitus, obesity, COPD, HTN, CAD, CVA, arrhythmia, OA, thyroid disease, hyperlipidaemia, renal dysfunction and anemia.

Drug-drug interaction (DDI) arises mostly whenever a patient receives more than one drug and chances in increase with number of drugs taken. There are a variety of DDIs that can cause toxicity, alteration of the desired therapeutic effects or even result in a life-threatening condition. Polypharmacy used to treat the patient's comorbidities, is one of the risk factors for drug-drug interactions.<sup>6</sup> Drug-drug interactions is the one of major cause of adverse drug reactions (ADR) resulting in hospital and emergency department.<sup>7</sup> Polypharmacy plays a key role in drug interaction and which leads to further complications.<sup>8</sup>

### MATERIALS AND METHODS

The study was performed to assess the prevalence of cardiovascular diseases, drug utilization Pattern and clinical comorbidity interaction in patient with cardiac disease. The current study was a retrospective observational study which was done in cardiology department at Vivekanandha Medical Care Hospital, Elayampalayam, Tiruchengode. Both male and female inpatients with CVDs and age more than 20 years were included in our study. Data and records with incomplete information, Pregnant women were excluded in our study.

### Study procedure

Case reports of 100 patients were randomly selected for the study as per the inclusion and exclusion criteria. The demographic data, indication for drug use, comorbidities present, duration of hospital stay, number of medications, names of individual medications, fixed dose combination (if any), route of administration, dosing schedule, duration of treatment and average number of the medications

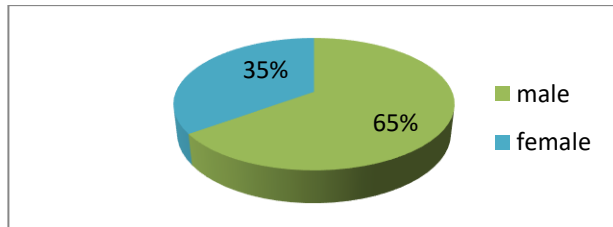


prescribed per encounter were collected from the respective patient case files and entered into the specifically designed data entry form.

**RESULTS**

**Gender wise distribution of cardiac diseases**

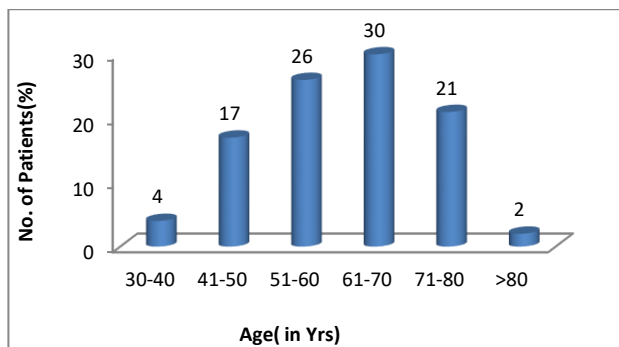
Figure – 1 shows that out of 100 patients, 65 (65%) were male and 35 (35%) were female. Male patients had a high incidence of CVDs as compared to female patients.



**Figure 1:** Gender wise distribution of cardiac disease

**Age wise distribution of cardiac diseases**

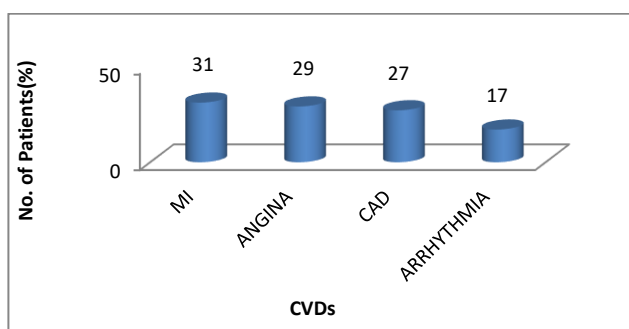
Figure- 2 shows that the cardiovascular incidence was highest in patients who belonged to the age group 61-70 years. Out of 100 patients, 30 (30%) belonged to 61-70 years. The incidence of cardiovascular emergencies in male patient (24 patients) in age group 61-70 years was found significantly higher than female patient (6 patients) in age group 61-70 years.



**Figure 2:** Age wise distribution of cardiac disease

**Common cardiovascular diseases treated**

Figure-3 shows that the most common cardiovascular disease treated in patients was myocardial infarction in 31 patients (31%) followed by angina in 29 (29%), CAD in 27 (27%) and arrhythmia in 17 patients (17%).



**Figure 3:** Commonly treated cardiovascular diseases

**Comorbidities associated with cardiovascular disease**

In our study, the most commonly associated comorbidity was hypertension (45%), followed by DM (33%), COPD (7%), CAD (5%), Hyperlipidemia (5%) and ARF (5%) shown in Table 1.

**Table 1:** Common comorbidities associated with CVDs (N=100)

COMORBIDITY	NUMBER OF PATIENTS
HTN	45
DM	33
CAD	5
HYPERLIPIDEMIA	5
COPD	7
ARF	5

**Number of co-morbidities associated with cvds**

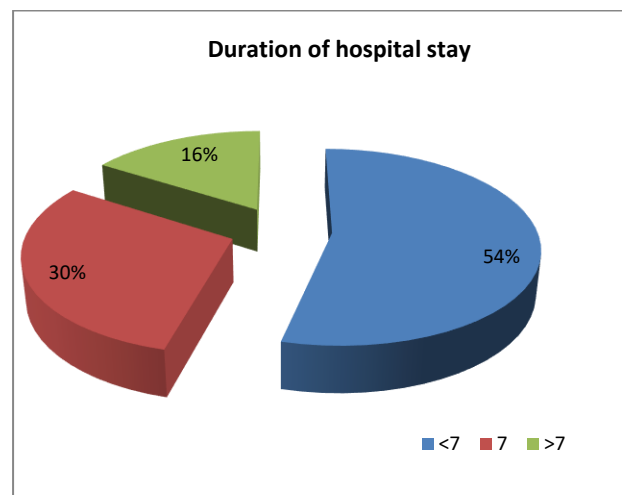
Out of 100 prescriptions, about 44 prescriptions (44%) had two co-morbidities followed by 43 prescriptions (43%) with one co-morbidity, 8 (8%) prescriptions had three co-morbidities and 5 (5%) prescriptions had four co-morbidities during the hospital admission (Table 2).

**Table 2:** Number of comorbidities associated with CVDs

NO. OF COMORBIDITY	NO. OF PRESCRIPTIONS
ONE	43
TWO	44
THREE	8
FOUR	5
TOTAL	100

**Duration of hospital stay**

The duration of hospital stay varied according to the related conditions. In our study, 54 patients (54%) were admitted for less than 7 days in hospital, 30 patients (30%) for 7 days and 16 patients (16%) spent more than 7 days in hospital (Figure 4).



**Figure 4:** Duration of hospital stay

**Class wise utilization of cardiovascular drugs**

Out of the 437 cardio vascular drug prescriptions, antiplatelets (31.80%) were the most commonly

prescribed class followed by antihyperlipidemic (15.5%), anticoagulants (11.2%), vasodilators (9.15%), calcium channel blockers (9.15%), diuretics (8%), beta blockers (6.86%) (Table 3 and Figure 5).

**Table 3:** Class wise utilization of cardiovascular drugs

S. No.	Drug class	Frequency of prescription	Percentage (%)
1.	Antiplatelets	139	31.80
2.	Anti-hyperlipidemic	68	15.5
3.	Anticoagulants	49	11.21
4.	Vasodilators	40	9.15
5.	Calcium channel blocker	40	9.15
6.	Diuretics	35	8.0
7.	Beta blocker	30	6.86
8.	Ace inhibitors	17	3.2
9.	Cardiac glycosides	7	1.6
10.	Arb blockers	10	2.28
11.	Fibrinolytics	2	0.45
	Total	437	

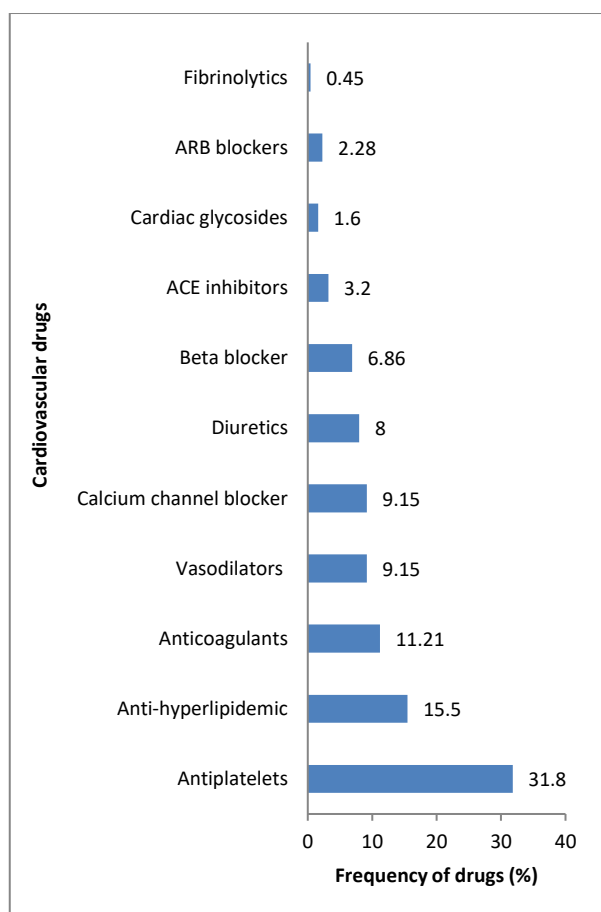
**Figure 5:** Class wise utilization of cardiovascular drugs**Utilization pattern of cardiovascular drugs**

Table-4 shows that out of the 100 prescriptions, 29 cardiovascular drugs were prescribed frequently among which the top three prescribed drugs were aspirin (15.5%), atorvastatin (13.7%) and clopidogrel (11.44%). The most

preferred class of antihypertensive drugs was diuretics, beta blockers, calcium channel blockers, ACE inhibitors and ARBs. Furosemide (5.72%), amlodipine (4.57%), metoprolol (4.57%) and ramipril (3.2%) were the commonly prescribed antihypertensive drugs. The combination of aspirin and clopidogrel were also prescribed for the synergistic activity. Cardiac glycoside like digoxin was prescribed to only 1.6% patients. Most commonly prescribed vasodilators were isosorbidedinitrate (8.23%) and nitroglycerin (5.03%). Anticoagulants such as heparin (4.34%), fondaparinux (3.20%) and enoxaparin sodium (2.74%) were also prescribed commonly (Figure 6).

**Table 4:** Utilization pattern of cardiovascular drugs

S. No.	Drug name	No. of patients prescribed	Percentage (%)
1.	Metoprolol	20	4.57
2.	Carvedilol	2	0.45
3.	Atenolol	4	0.91
4.	Bisoprolol	4	0.91
5.	Atorvastatin	60	13.7
6.	Rosuvastatin	8	1.83
7.	Clopidogrel	50	11.44
8.	Aspirin	68	15.5
9.	Aspirin+ clopidogrel	17	3.89
10.	Ticagrelor	12	2.74
11.	Streptokinase	2	0.45
12.	Warfarin	4	0.91
13.	Heparin	19	4.34



14.	Enoxaparin sodium	12	2.74
15.	Fondaparinux	14	3.20
16.	Nitroglycerin	22	5.03
17.	Isosorbidedinitrate	36	8.23
18.	Glyceryldinitrate	2	0.45
19.	Ramipril	17	3.2
20.	Digoxin	7	1.6
21.	Nicorandil	8	1.83
22.	Amlodipine	20	4.57
23.	Clinidipine	5	1.14
24.	Diltiazem	2	0.45
25.	Amiodarone	2	0.45
26.	Verampamil	3	0.68
27.	Furosemide	25	5.72
28.	Spironolactone	10	2.28
29.	Telmisartan	10	2.28
Total		437	

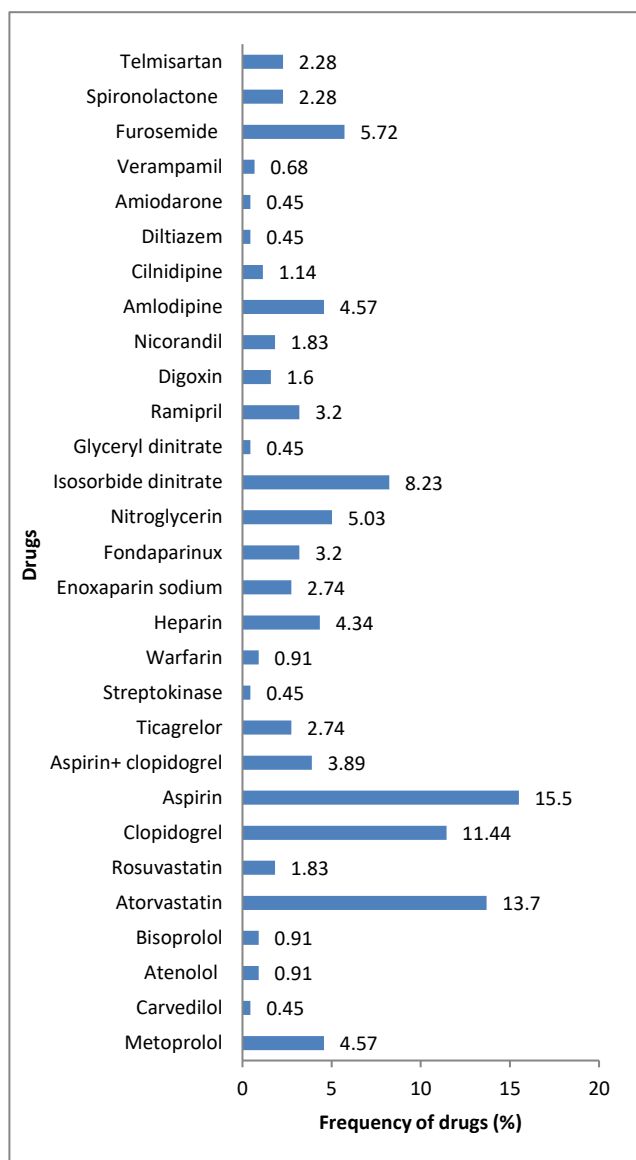


Figure 6: Utilization pattern of cardiovascular drugs

### Class wise utilization of non-cardiovascular drugs

Other than cardiovascular drugs, antiulcers (31.19%), antidiabetic drugs (15.13%), antibiotics (12.38%), anxiolytics (10.1%), antiemetics (10.1%), glucocorticoid (9.17%), laxatives (6.88%), analgesics (5.04%) were also prescribed to the patients. Single agents were prescribed more than combinations (Table 5 and Figure 7).

Table 5: Utilization of non-cardiovascular class

S. No.	Drug category	Frequency of prescription	Percentage (%)
1.	Anxiolytics	22	10.01
2.	Anti-emetics	22	10.01
3.	Analgesics	11	5.04
4.	Anti-ulcers	68	31.19
5.	Anti-diabetic agents	33	15.13
6.	Laxatives	15	6.88
7.	Glucocorticoid	20	9.17
8.	Antibiotics	27	12.38
Total		218	

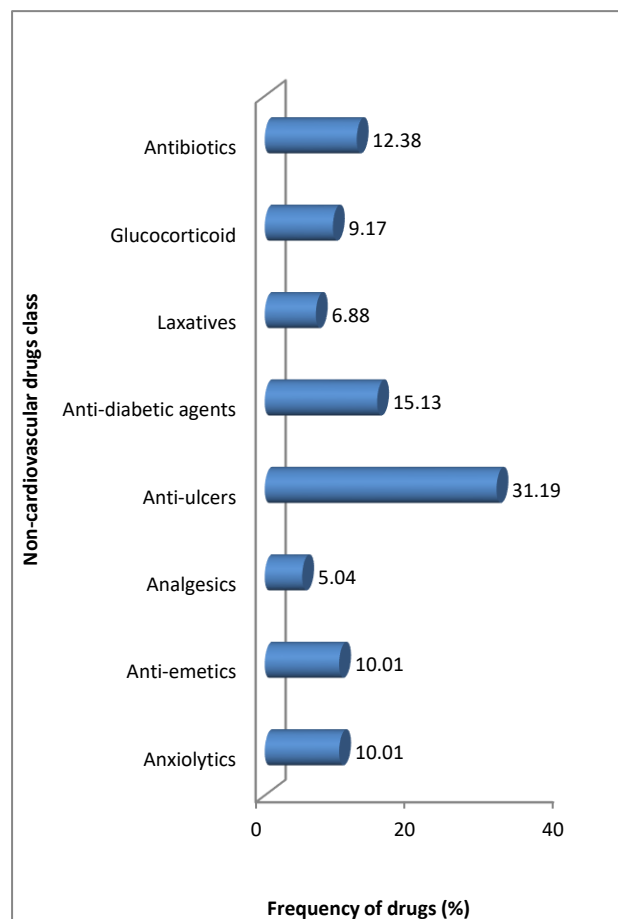


Figure 7: Utilization of non-cardiovascular class

### Prescriptions with non- cardiovascular drugs

Table-6 shows that other than the cardiovascular drugs pantoprazole (27.52%), hydrocortisone (9.17%), metformin (6.88%), alprazolam (6.88%), domperidone



(5.04%), ondansetron (5.04%), piperacillin + tazobactam (4.58%), lactulose (4.58%), cefoperazone+ sulbactam (3.66%), metformin + glimepride (3.66%), ranitidine (3.66%) were mostly prescribed.

#### Drug-drug interaction found in the cardiovascular emergencies

Among the 100 cases collected, 200 DDIs were identified and majority of potential DDIs were pharmacodynamic in nature. The drug pairs reported with highest frequency of drug-drug interactions were aspirin + clopidogrel (in 54 patients), pantoprazole + clopidogrel (in 45 patients), clopidogrel + atorvastatin (in 30 patients). The number of DDIs increased when the number of prescribed drugs increased (Table 7). Moderate DDIs (60%) were found be more than the minor (7%) and major (33%) (Figure 8).

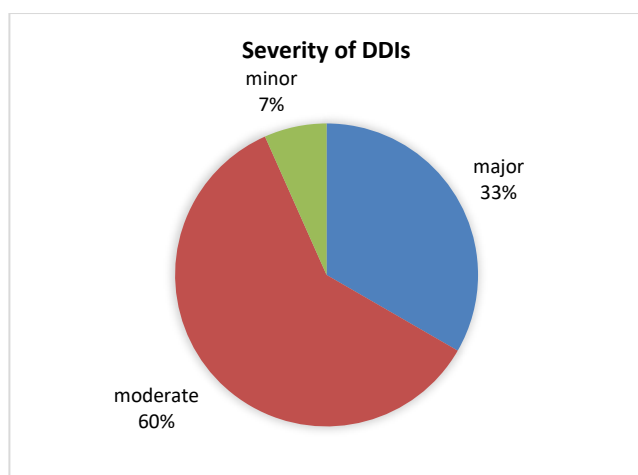


Figure 8: classification of DDIs according to their severity

Table 6: Non-cardiovascular drugs prescribed

S. no.	Drug class	Frequency of prescription	Percentage (%)
1.	Alprazolam	15	6.88
2.	Levitracetam	1	0.45
3.	Piracetam	2	0.91
4.	Clonazepam	4	1.83
5.	Ondansetron	11	5.04
6.	Domperidone	11	5.04
7.	Diclofenac	1	0.45
8.	Tramadol	5	2.29
9.	Acetaminophen	5	2.29
10.	Pantoprazole	60	27.52
11.	Ranitidine	8	3.66
12.	Metformin	15	6.88
13.	Glimepride	5	2.29
14.	Metformin+ glimepride	8	3.66
15.	Regular insulin	5	2.29
16.	Lactulose	10	4.58
17.	Bisacodyl	5	2.29
18.	Hydrocortisone	20	9.17
19.	Piperacillin+tazobatum	10	4.58
20.	Cefoperazone + sulbactam	8	3.66
21.	Amikacin	6	2.75
22.	Ceftriaxone	3	1.37
	Total		218

Table 7: DDIs found in the medication chart

S. no.	DDIS	Effects	No. of patients
1	Aspirin + clopidogrel	Increase the risk of bleeding	54
2	Aspirin + metoprolol	Decrease antihypertensive effect	12
3	Pantoprazole + clopidogrel	Increase risk of bleeding	45
4	Furosemide + ramipril	Reduce blood pressure	2
5	Furosemide + telmisartan	Alter serum potassium level	2
6	Atorvastatin + clopidogrel	Decrease antiplatelet effect	30
7	Aspirin + heparin	Increase the toxicity and risk of bleeding	10
8	Aspirin + ramipril	Decrease antihypertensive efficacy	12
9	Aspirin + fondaparinux	Increase bleeding and swelling	7
10	Ramipril + metformin	Increase risk of hypoglycaemia	3
11	Spironolactone + ramipril	Increase risk of hyperkalaemia	2
12	Insulin + aspirin	Increase hypo/ hyperglycemia risk	10
13	Digoxin + atenolol	Effect on potassium level by antagonism	4
14	Enoxaparin + aspirin	Increases anticoagulation	3
15	Verapamil + aspirin	Increase antiplatelet activity	4
Total			200

## DISCUSSION

In the last few decades, several research on the safety and efficacy of drugs have been performed all over the world. Drug utilization studies have proven to be a useful tool in overcoming inappropriate drug use and irrationality of drug patterns, as well as in maintaining the quality of life. The aim of this research was to look at the drug prescribing patterns in the cardiovascular disorders in a tertiary care hospital.

Total 100 patients were enrolled and the data were collected and analyzed. The results pointed out that the frequency of the cardiovascular events was more in male patients (65%) as compared to female patients (35%). These results were supported by the similar study conducted by Mukesh Kumar et al. and Zafar.F et al.in which 61% of cases were males and 39% were female.<sup>9,10</sup>

The incidence of CVDs was higher in the patients aged 61-70 years (30 out of 100) followed by 51-60 years (26 out of 100) which was in concordance to the study conducted by Shabbir Rafiq Pendhari et al.<sup>11</sup>

Majority of the patients stayed for less than 7 days (54%), (30%) of patients stayed for 7 days and less than (16%) of patients stayed more than 7 days. These findings are in the accordance with Bandla Aswani et al.<sup>12</sup>

Our study shows that, the most common diagnosis was myocardial infarction (31%) followed by angina, coronary artery disease and arrhythmia which shows similarity with studies of Saranya et al.<sup>13</sup>

In our study, we noticed hypertension (45%) and type 2 diabetes mellitus (33%) as frequently associated co-morbid conditions which was in concordance to the findings of Saranya et al. and Rohan et al.<sup>13,14</sup>

Out of total 655 drugs prescribed, 437 cardiovascular drugs were prescribed and the majorly prescribed category was anti-platelets 139 (31.80%), anti-hyperlipidemic 68 (15.5%), anticoagulants 49(11.21%). Other than cardiovascular drugs, 218 other classes like antacids 68(31.19%), anti-diabetic 33(15.13%), antibiotics 27(12.18%) were prescribed. These results correlate with the study reported by Nilay Solanki et al showing the most commonly prescribed drugs in the same sequence.<sup>15</sup>

The report from our study states that the most common drugs used in CVE are aspirin 68 (15.5), atorvastatin 60 (13.7%), pantoprazole 60 (27.52%) followed by clopidogrel 50(11.44%). In the study conducted by Blessy Rachel et al, the prescribing frequency of aspirin and atorvastatin was majorly seen.<sup>16</sup>

Out of 100 patients, majority were of pharmacodynamic in nature followed by pharmacokinetic interactions. Level of major severity was found in aspirin + clopidogrel, pantoprazole+ clopidogrel, atorvastatin+ clopidogrel, aspirin + ramipril which was in accordance to the reports of Virendra k patelet.al and Kumar et al.<sup>17,18</sup>

## CONCLUSION

The present study reveals the higher prevalence of myocardial infarction and angina in male patients of age group 61-70 years. Hypertension and DM were the most commonly associated co-morbidities. The use of antiplatelets and anticoagulants help in the effective treatment and prevention of most CVDs. The presence of polypharmacy leads to the occurrence of potential DDIs which increase the risk in CVD patients. So, targeted education in prescribers is required. Moreover, time to time studies is necessary for assessing the drug utilization pattern and improving the quality of life in patients.

## Limitation

The study was limited to the in-patients so the generalized pattern of drug utilization in the institution could not be evaluated. Our study was retrospective so, interaction with the patients was not done and the patients were not followed after their discharge. Information about over-the-counter drugs was not included in the study.

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