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INVESTIGATION ON DRUG UTILIZATION PATTERN AND COMPARATIVE ANALYSIS OF CARDIOVASCULAR DRUGS

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ABSTRACT

The aim of the present study was to investigate the drug utilization pattern and the comparative analysis of cardiovascular drugs in the cardiology department in a tertiary care hospital. The study was a prospective, cross sectional observational study, carried out in cardiology department at pk das hospital, vaniyamkulam, ottappalam for a period of three months from December 2021-February 2022. The main objective of this study was to determine the drug utilization pattern using WHO core prescribing indicators.100 prescriptions were included in our study. The data like demographic details of patients, indication, disease prevalence, comorbidities, and prescribing pattern were collected and the collected data was assessed to determine the prescribing trends. The study included 100 patients suffering from various cardiovascular diseases from which 56% were male and 44% were female. The cardiac disease was highest in patients of age group 51-60 years. The most common cardiovascular disease treated was COPD (72%) and most common associated comorbidity was hypertension .The use of antiplatelets ,anticoagulants ,antihyperlipidemics and diuretics was very common Aspirin(12.96%) ,Atorvastatin (16.20%), Clopidogrel (11.11%), furosemide (9.25%) are the top four prescribed cardiovascular drugs. Drugs from the NLEM were 81.45%. The price distribution for most commonly used cardiovascular drugs along with their brands was also documented. The study concluded that the antiplatelets dominating the prescribed pattern and expected to overtake the anticholesterol agents as the sales leader. The Present study help the health practitioners to optimize the appropriate use of cardiovascular drugs.

INTRODUCTION

Drug utilization research (DUR) were defined by the WHO, as the marketing ,distribution, prescription and use of drugs in the society, with special emphasis on the resulting medical, social, and economic consequences. The principal aim of DUR is to facilitate the rational use of drugs in populations, which implies the prescription of a well- documented drug at an optimal dose, with correct information, at an affordable price. The Drug utilization study in government clinical setup, a chief health care option in developing countries like India, is instrumental in developing effective health care system of the country. The drug utilization pattern, when compared between different regions /times may help generate hypotheses for investigating the reasons for and implications of the differences found. Thus the drug

utilization study is a descriptive and analytical method of collection, quantification, understanding and evaluation of the prescribing pattern , as well as dispensing and consumption for the development of existing therapy and increasing of patient safety.

The drug utilization studies are classified mainly into three types and is as follows:

Prospective: It is the evaluation of a patients therapy before medication is dispensed.

Concurrent: It is the ongoing monitoring of drug therapy during the course of treatment.

Retrospective: It is the review of therapy after the patient has received the medication.

The drug utilization research program play a key role in helping manage health care systems understand , interpret , and improve the prescribing , administration, and use of medications.[1]

CARDIOVASCULAR SYSTEM

The cardiovascular system found one of the major coordinating and integrating systems of the body. The cardiovascular system sometimes called the blood vascular, or simply the circulatory system. It consist of heart which is a muscular pumping device and a closed system of vessels called arteries, veins, and capillaries. As the name implies , blood contained in the circulatory system is pumped by the heart around a closed circle or circuit of vessels as it passes again through the various “circulations” of the body.

The vital role of the cardiovascular system in maintaining homeostasis depends on the continuous and controlled movement of blood through the thousands of miles of capillaries that permeate every tissues and reach every cell in the body. Numerous controlled mechanism help to regulate and integrate the diverse functions and component part of the cardiovascular system in order to supply blood to the specific body areas according to need. These mechanisms ensure a constant internal environment surrounding each body cell regardless of differing demands for nutrients production and of waste products.[2]

CARDIOVASCULAR DISEASES

Cardiovascular disease (CVDs) is the main cause of mortality globally, accounting for 35% of all deaths that is almost one million deaths each year especially in India it accounts for around one fourth of all deaths. Various studies from India have shown high prevalence of the disease, approaching approximately 11% in the urban population and 7% in the rural population around. In India cardiovascular disease progression is very high in and leading cause of mortality in people of age group 25 to 69 years. Males are affected more than females. The elevated levels of blood cholesterol, smoking, sedentary life style ,hypertension, diabetes, obesity, and malnutrition, etc are some of the risk factors for cardiovascular disease.

Cardiovascular diseases commonly consist of coronary heart disease , myocardial infarction, angina pectoris, heart failure , cardiac arrythmia, peripheral vascular disease, rheumatic heart disease, valvular heart disease etc. In this study we focused on mainly five diseases commonly and it defined as below;

Coronary heart disease: It is a condition that affects the supply of blood to the heart .

Myocardial infarction: is a result of critical imbalance between the coronary blood supply and myocardial demand(myocytes die due to myocardial ischemia.

Angina pectoris: It is a chest pain or discomfort that occurs when the heart muscle does not get enough blood.

Congestive heart failure: It is disorder where the heart loses its ability to pump blood efficiently.

Arrythmia: It is defined as loss of cardiac rhythm , especially irregularity of heart beat. [3]

In India , drug utilization study demonstrate the existence of a wide range of cardiovascular drugs for prophylaxis and therapeutic use. Drug utilization study is a solid investigational measure to guess the current model of drug usage and the connection of prescriptions. DUS assess the safety and rationality of the drug therapy. Drug utilization study is important to realize that inappropriate use of drugs represent a potential hazard and an unnecessary expense to the patients .It has a positive impact on the prescribing physician and enhance the prescribing pattern of the physician and help them in changing the treatment strategies whenever required, point out and make an appropriate decision for safe and cost effective therapy.[4]

A prescription based survey is regard to be one of the most effective methods which have been used to estimate and evaluate the prescribing attitude of physicians. Therefore that was the method which we assume for this study. The age, sex, diagnosis,(only cardiovascular) and the drugs which were prescribed and the brand names of the prescribed drugs , were recorded for each patient. And the collected data was analyzed to study the drug utilization trends.[5]

The study of prescription patterns is an important to determine rationality of drug therapy and to maximize the utilization of resources. The prescribing pattern reflects the physicians knowledge about the disease process and application of pharmacotherapeutics. studies on drug utilization pattern have become a potential tool to be used in the evaluation of health care system. drug utilization research uplift rational prescribing of drug contributes to the knowledge of current use of drugs in the society and explore whether a particular intervention affects the drug use in the population by detecting the drug use pattern. Hence this study was planned to evaluate the drug utilization pattern and their comparative analysis of the drugs used in cardiovascular diseases in the cardiology department in tertiary care hospital and from other sources. And the study was carried out with objectives to study the pattern of usage of drugs in cardiovascular disease in patients and to have information about the current trends with CVDs by using a cross sectional , observational drug utilization studies.[6]

Key words: Cardiovascular disease, Drug utilization, Coronary heart disease, myocardial infarction, Rationality

METHODOLOGY

SOURCES OF DATA

- Physicians prescribing records
- Patient medication profile
- Patient profile(age,sex,height,weight)
- Drugs prescribed(generic/brand names)
- Doses and frequency of drugs.
- Wholesale and retail pharmacy shops.

STUDY DESIGN

The present prospective, cross sectional observational study was conducted in selected tertiary care hospital. prescriptions from the patients attending the cardiology OPD from the beginning of 2020-2021 were included in this study. And information about the prescribing pattern, price, dose and frequency regarding of cardiovascular drugs were also included in this study.

STUDY PROTOCOL

- INCLUSION CRIERIA:

  - Adult patients of either sex with cardiovascular disease with or without comorbidity.
  - Patient willing to participate and give voluntary informed consent.

- EXCLUSION CRITERIA:

  - Age <18 year and >85 years.
  - Patient not willing to participate and give informed consent.
  - Patient with non cardiovascular diseases.

A total of 100 prescriptions of the patients attending cardiology OPD of the selected hospital over a period of 12 months were randomly identified and included in this study according to the inclusion criteria Then criticaly analysed using WHO core prescribing indicators, particularly different types of drugs prescribed and their prescribing pattern was determined.

PRESCRIBING INDICATORS

WHO core prescribing indicators for evaluation:

- Average number of drugs prescribed per prescription.
- Commonest type and class of drugs prescribed .
- The percentage of drugs prescribed by generic v/s brand name.
- Percentage of drugs prescribed from national essential drug list.
- Percentage of encounter with different dosage forms prescribed.
- Percentage of encounters with an antibiotic prescribed.
- Percentage of encounters with an injection prescribed.
- Percentage distribution of different classes of cardiovascular drugs.

RESULTS

1.GENDER WISE DISTRIBUTION

GENDER	NO.OF PATIENTS(N)	PERCENTAGE(%)
Male	56	56%
Female	44	44%
Total	100	100%

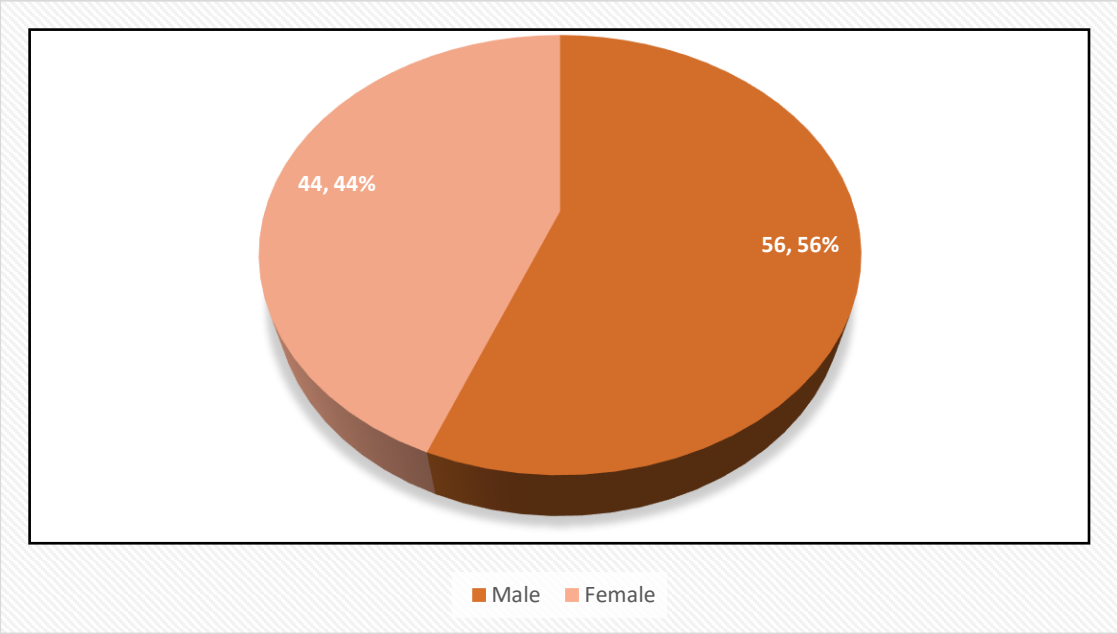


Figure 1:Gender wise distribution of CVD patients

2.AGE WISE DISTRIBUTION

AGE	NO.OF CASES(N=100)	PERCENTAGE
40-50	24	24%
51-60	27	27%
61-70	16	16%
71-80	14	14%
>80	5	5%

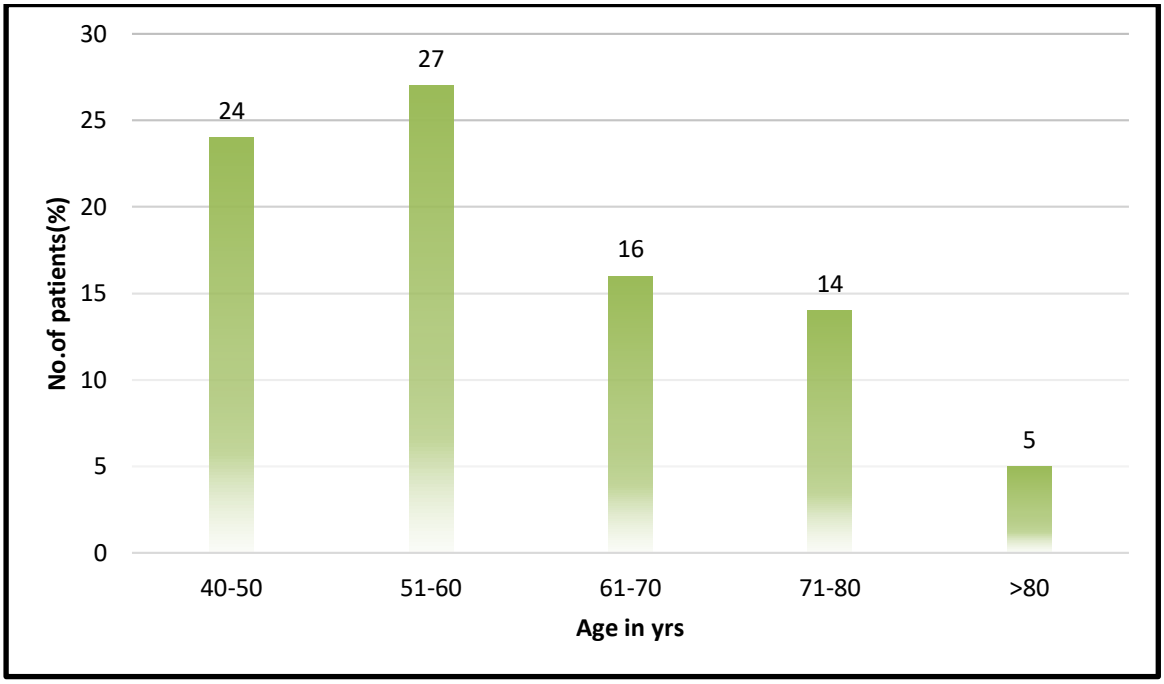


Fig 2:Age wise distribution of cardiac patients

3.COMMON CARDIOVASULAR DISEASE TREATED

SL.NO	CARDIOVASCULAR DISEASES	NO.OF PATIENTS
1	Coronary artery disease	72
2	Myocardial infarction	44
3	Anginapectoris	23
4	Congestive cardiac faliure	17

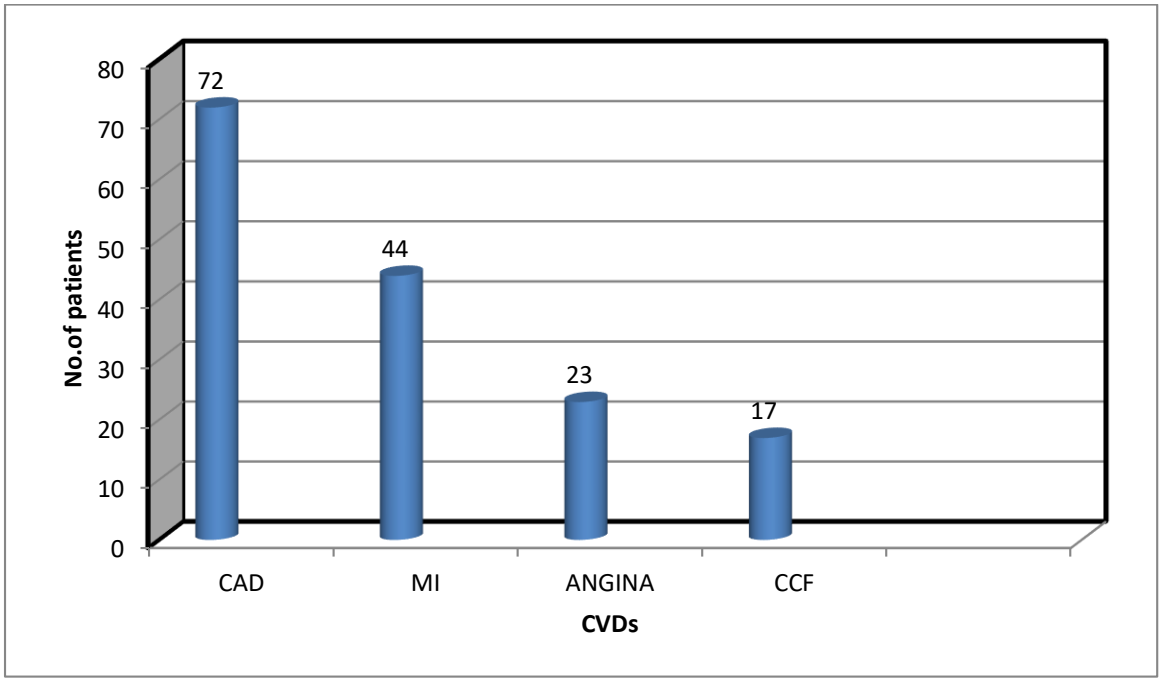


Fig.3:Common treated cardiovascular diseases

4.COMMON COMORBIDITIES ASSOCIATED WITH CARDIOVASCULAR DISEASE

COMORBIDITY	NO.OF PATIENTS
HTN	39
DM	31
HYPERLIPIDEMIA	6
CHRONIC KIDNEY DISEASE	6
ARF	5
COPD	4

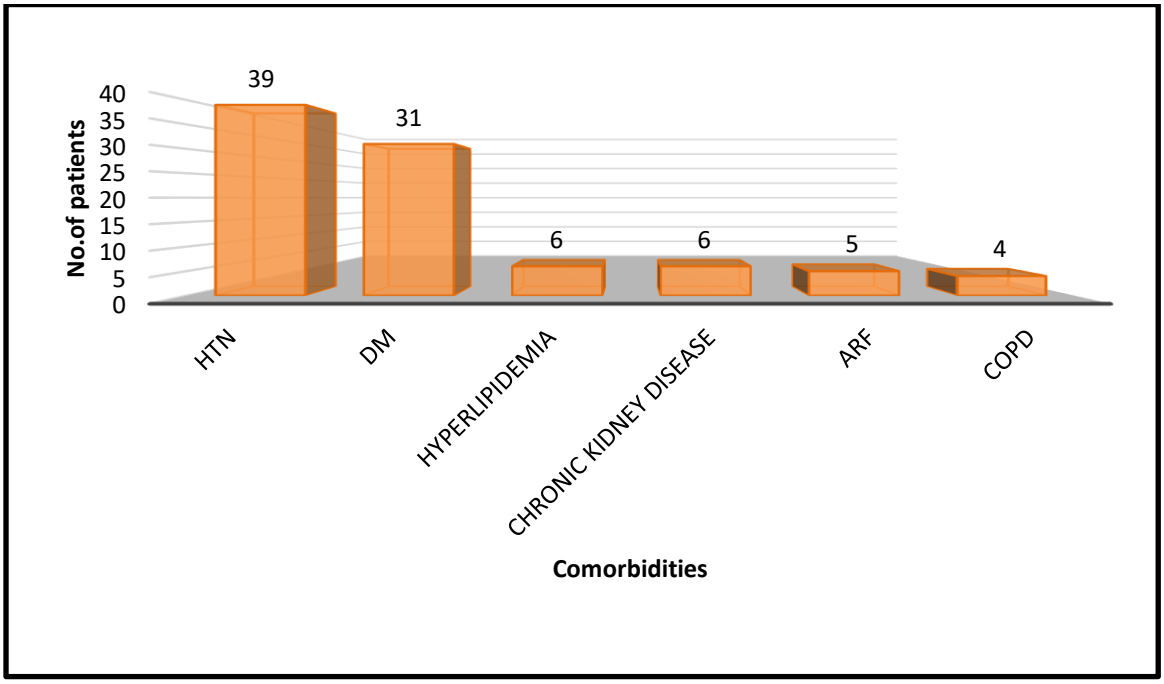


Fig 4:common comorbidities associated with cardiovascular diseases.

5.PERCENTAGE OF DRUG PRESCRIBED BY GENERIC NAME V/S BRAND NAME

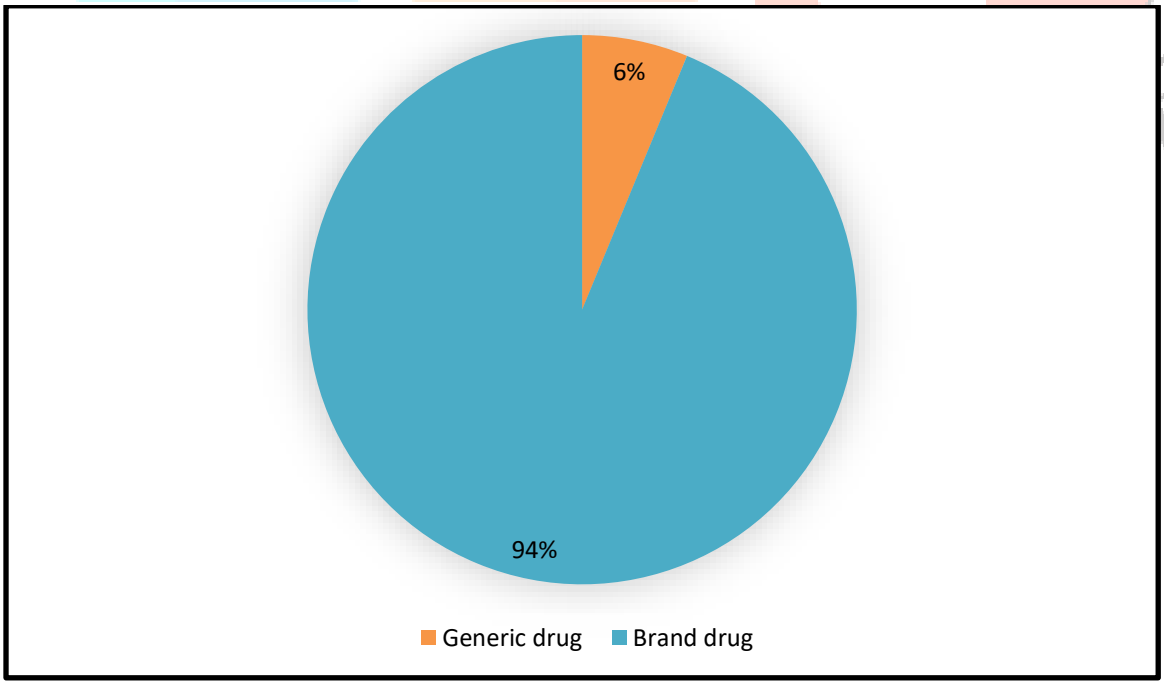


Fig 5: Percentage of drugs prescribed by generic name vs brand name.

6.PERCENTAGE OF DRUGS PRESCRIBED FROM NATIONAL LIST ESSENTIAL

MEDICINES (NLEM).

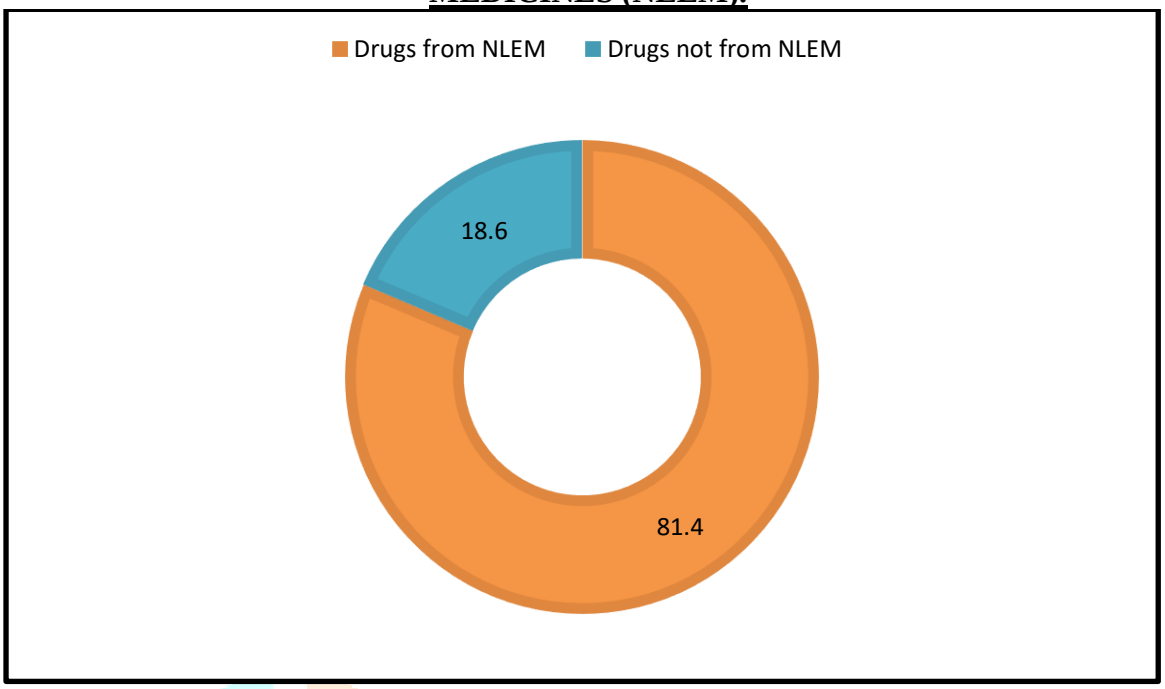


Fig 6:Drugs prescribed from NLEM

7.PERCENTAGE UTILISATION DIFFERENT CLASSES OF CARDIOVASCULAR DRUGS PRESCRIBED.

SL.NO	DRUG CLASS	FREQUENCY OF PRESCRIPTION	PERCENTAGE
1	Antiplatelets	154	35.98%
2	Anti-hyperlipidemics	70	16.35%
3	Anticoagulants	29	6.77%
4	Vasodialators	26	6.07%
5	Calcium channel blockers	28	6.54%
6	Diuretics	55	12.85%
7	Beta blockers	37	7.71%
8	ACE inhibitors/ARB Blockers	19	4.43%
9	Cardiac glycosides	10	1.63%
	TOTAL	428	100%

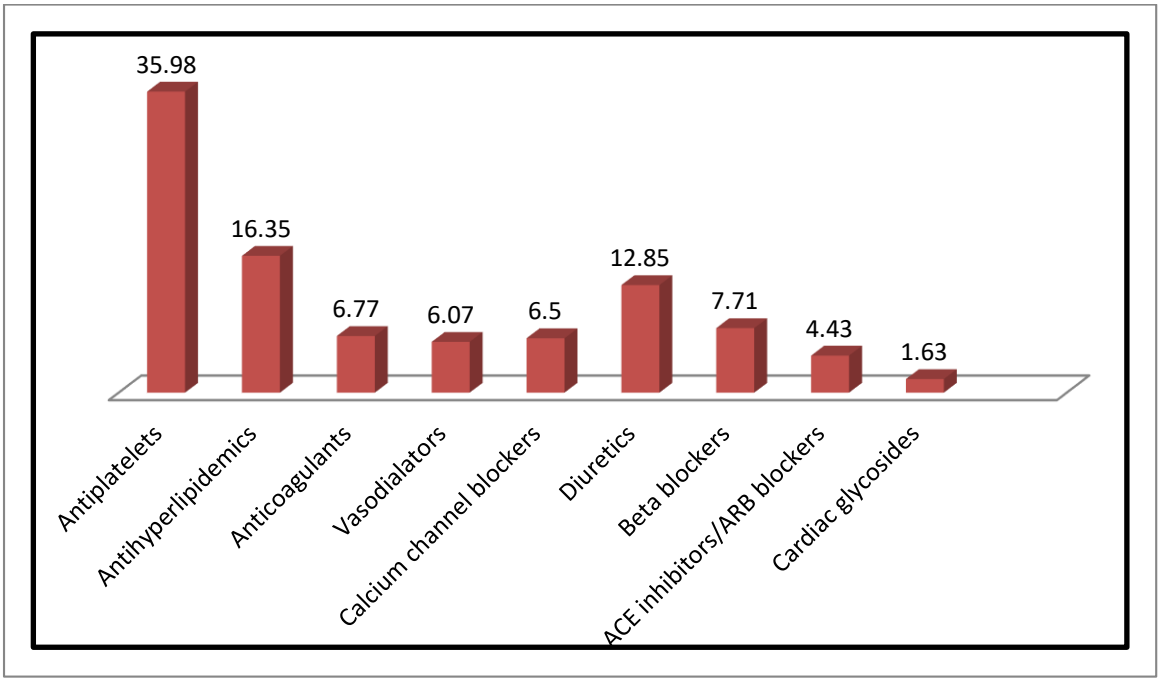


Fig 6:Prescribing trend of physician

8.PERCENTAGE OF UTILIZATION PATTERN OF CARDIOVASCULAR DRUGS

SL.NO	DRUG NAME	NO.OF PATIENTS PRESCRIBED	PERCENTAGE
1	Clopidogrel	48	11.11%
2	Atorvastatin	70	16.20%
3	Clonidine	3	0.69%
4	Furosemide	40	9.25%
5	Nicorandil	7	1.62%
6	Aspirin	56	12.96%
7	Warfarin	3	0.69%
8	Heparin	24	5.55%
9	Amlodipine	9	2.08%
10	Carvedilol	3	0.69%
11	Bisoprolol	22	5.09%
12	Ramipril	2	0.46%
13	Metoprolol	7	1.62%
14	Isosorbide dinitrate	3	0.69%
15	Telmisartan	17	3.93%
16	Atenolol	3	0.69%
17	Metalazone	2	0.46%
18	Prasugrel	28	6.48%
19	Clinidipine	4	0.92%
20	Ticagrelor	14	3.24%
21	Ivabradine	2	0.46%
22	Nitroglycerin	14	3.24%
23	Tamsulosin	1.38	0.46%
24	Amiodarone	6	1.38%
25	Tirofiban	8	1.85%
26	Spirinolactone	3	0.69%
27	Acenocoumarol	2	0.46%
28	Digoxin	4	0.92%
29	Isosorbide mononitrate	2	0.46%

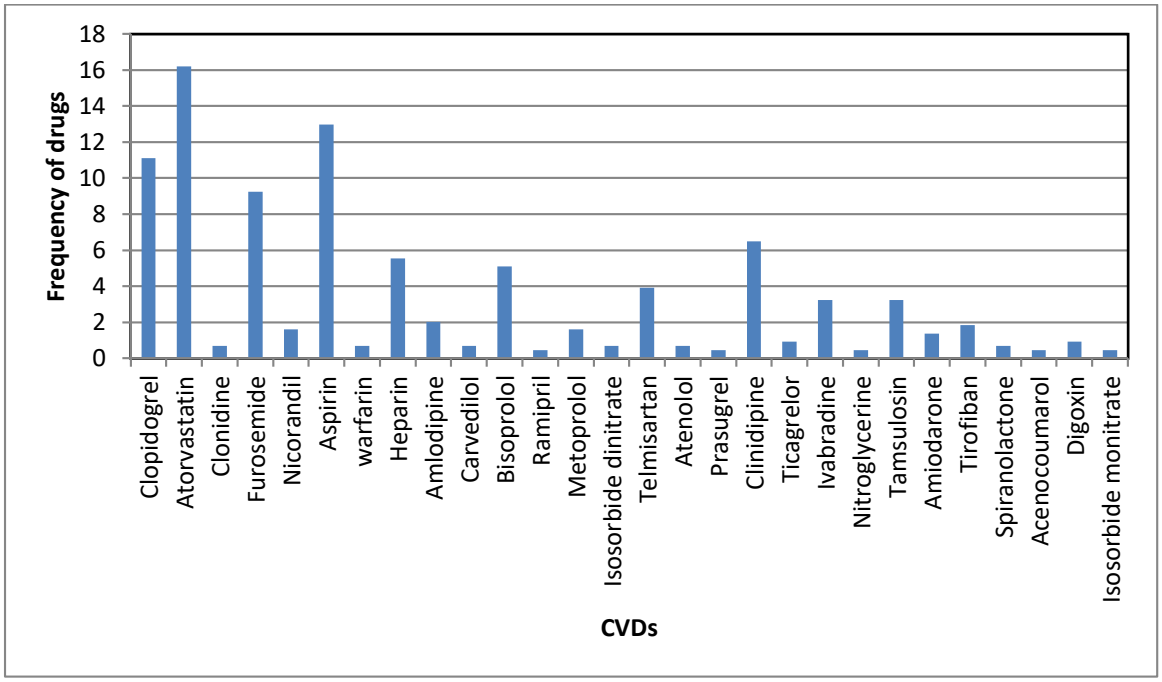
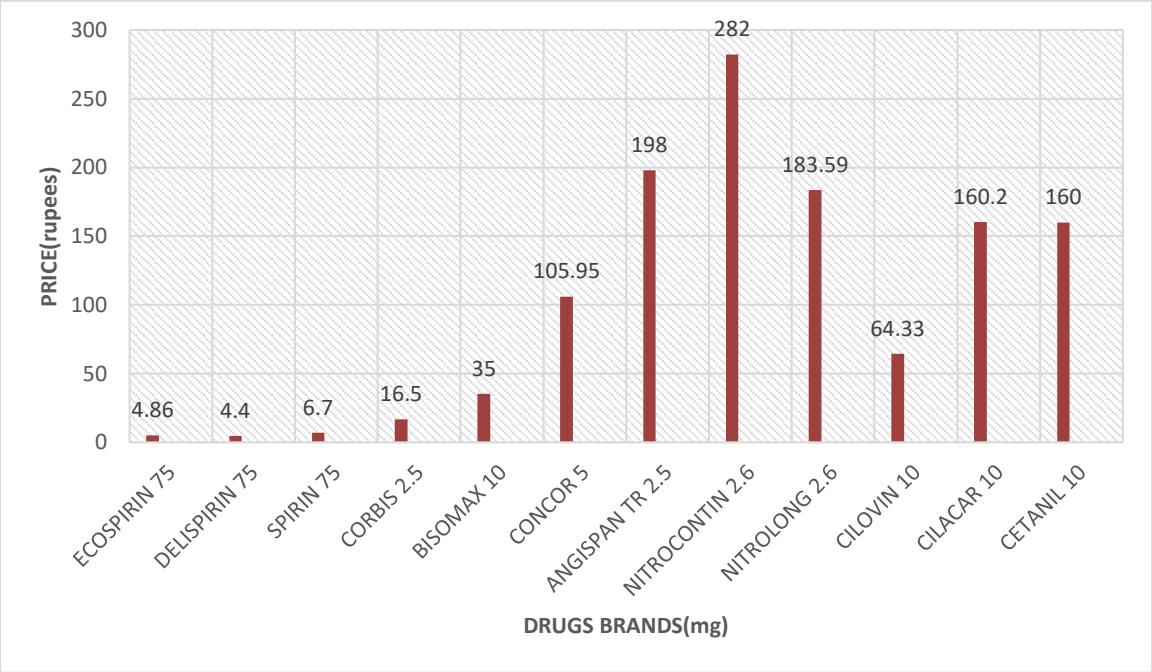


Fig 8:Percentage of utilization pattern of cardiovascular drugs

9.PRICE DISTRIBUTION OF CARDIOVASCULAR DRUGS

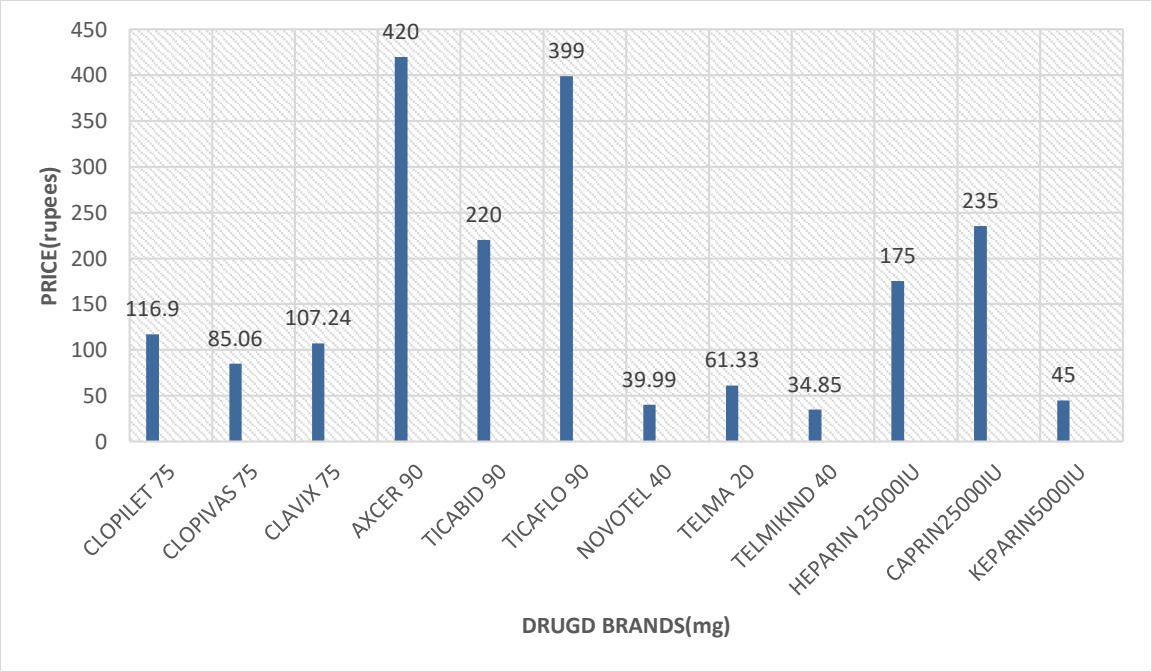
1.Coronary artery disease(CAD)

SL.NO	DRUGS	BRANDS(mg)	PRICE(rupees)
1	Aspirin	ECOSPIRIN 75	4.86
		DELISPIRIN 75	4.4
		SPIRIN 75	6.7
2	Bisoprolol	CORBIS 2.5	16.50
		BISOMAX 10	35
		CONCOR 5	105.95
3	Nitroglycerin	ANGISPAN TR 2.5	198
		NITROCONTIN 2.6	282
		NITROLONG 2.6	183.59
4	Clinidipine	CILOVIN 10	64.33
		CILACAR 10	160.2
		CETANIL 10	160


300
250
200
150
100
50
0
PRICE(rupees)
4.86
4.4
6.7
16.5
35
105.95
198
282
183.59
64.33
160.2
160
ECOSPIRIN 75
DELISPIRIN 75
SPIRIN 75
CORBIS 2.5
BISOMAX 10
CONCOR 5
ANGISPAN TR 2.5
NITROCONTIN 2.6
NITROLONG 2.6
CILOVIN 10
CILACAR 10
CETANIL 10
DRUGS BRANDS(mg)

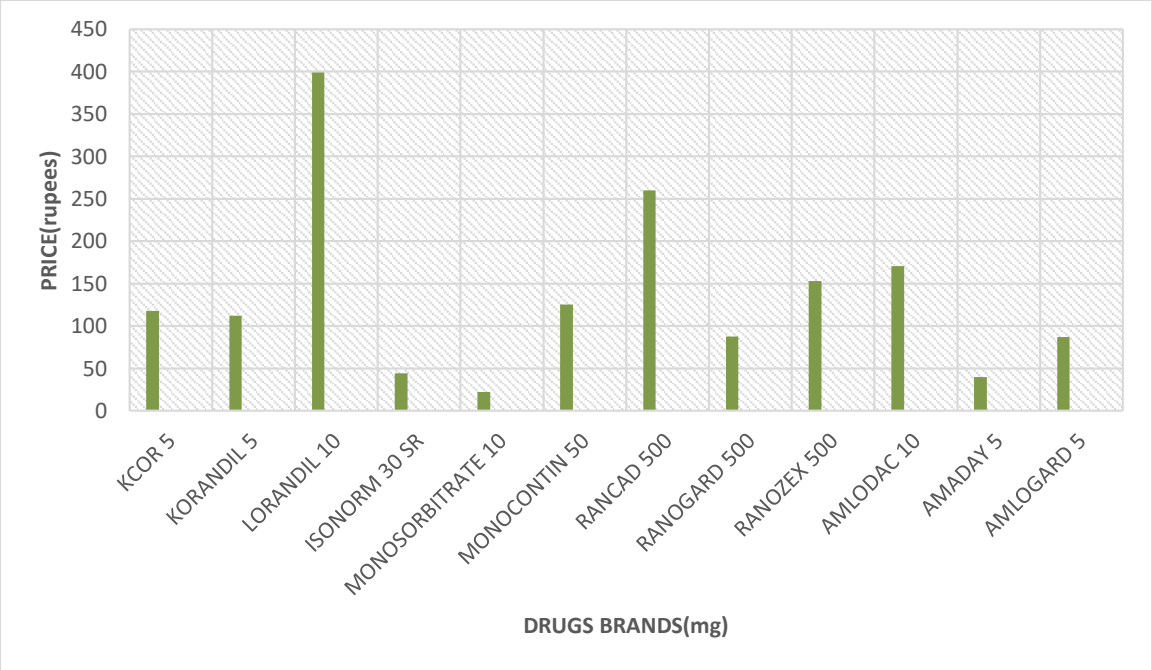
2. Myocardial infarction(MI)

SL.NO	DRUGS	BRANDS(mg)	PRICE(rupees)
1	Clopidogrel	CLOPILET 75	116.90
		CLOPIVAS 75	85.06
		CLAVIX 75	107.24
2	Ticagrelor	AXCER 90	420
		TICABID 90	220
		TICAFLO 90	399
3	Telmisartan	NOVOTEL 40	39.99
		TELMA 20	61.33
		TELMIKIND 40	34.85
4	Heparin	HEPARIN 25000IU	175
		CAPRIN 25000IU	235
		KEPARIN 5000IU	45



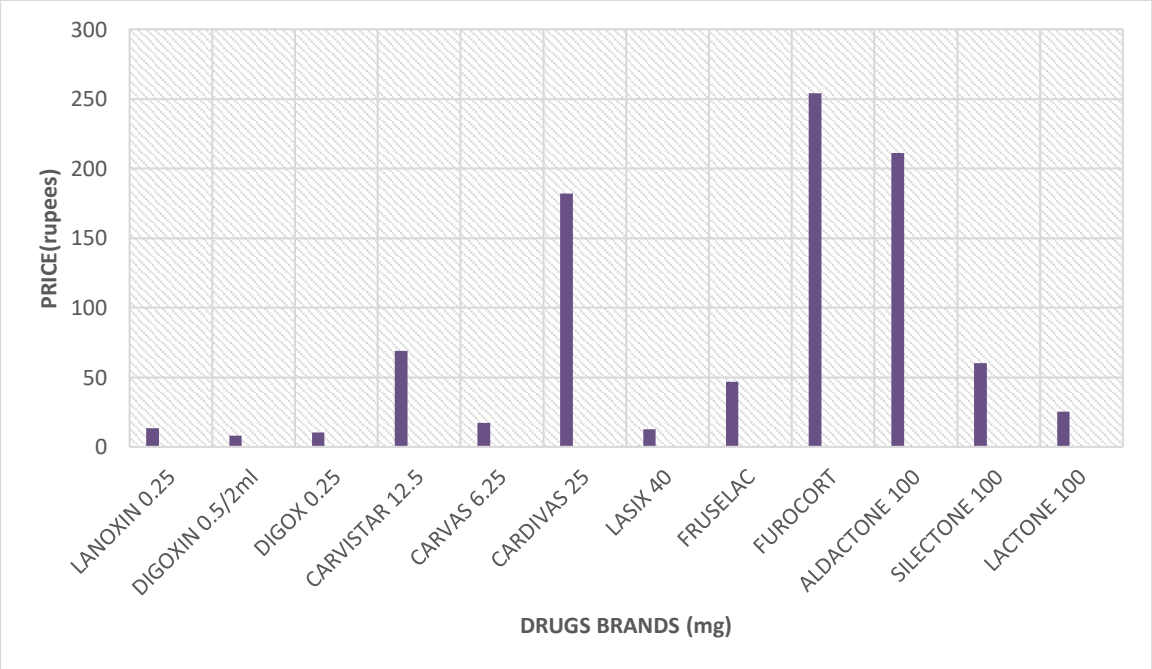
3.Anginapectoris

SL.NO	DRUGS	BRANDS(mg)	PRICE(rupees)
1	Nicorandil	KCOR 5	117.90
		KORANDIL 5	112
		LORANDIL 10	399
2	Isosorbide mononitrate	ISONORM 30 SR	44.31
		MONOSORBITRATE 10	21.78
		MONOCONTIN 50	125.50
3	Ranolazine	RANCAD 500	260.2
		RANOGARD 500	87.7
		RANOZEX 500	153
4	Amlodipine	AMLODAC 10	170.58
		AMADAY 5	39.41
		AMLOGARD 5	87.09



4.Congestive cardiac failure(CCF)

SL.NO	DRUGS	BRANDS(mg)	PRICE(rupees)
1	Digoxin	LANOXIN 0.25	13.35
		DIGOXIN 0.5/2ml	8.09
		DIGOX 0.25	10.42
2	Carvedilol	CARVISTAR 12.5	68.9
		CARVAS 6..25	17.21
		CARDIVAS 25	181.9
3	Furosemide	LASIX 40	12.60
		FRUSELAC	46.65
		FUROCORT	254
4	Spirinolactone	ALDACTONE 100	211.05
		SILECTONE 100	60.4
		LACTONE 100	25.20



10. DOSAGE FORM DISTRIBUTION OF CARDIOVASCULAR DRUGS

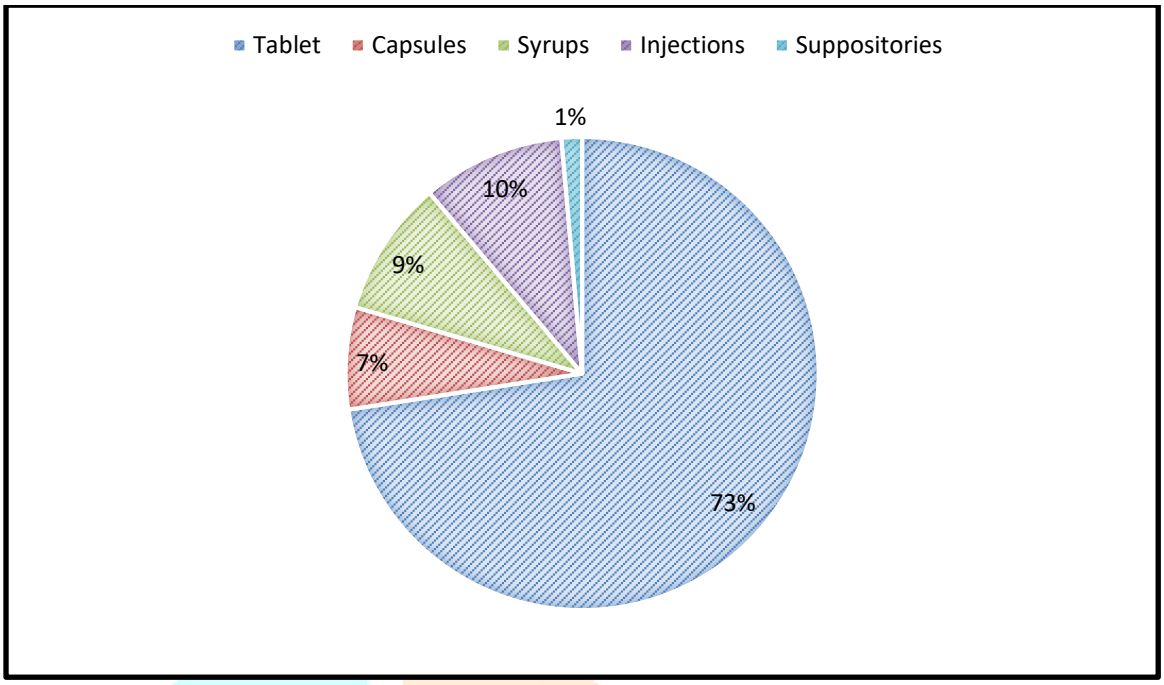


Fig 10: Dosage form distribution of cardiovascular drugs.

11.PERCENTAGE OF DIFFERENT CLASSES OF NON-CARDIOVASCULAR DRUGS PRESCRIBED

SL NO	CLASS OF DRUGS	% OF TOTAL PRESCRIPTION
1	Antiulcer	56.32
2	Antidiabetic	25.46
3	Laxatives	4.26
4	Antibiotics	3.86
5	Analgesics	6.28
6	Thyroid drugs	3.28

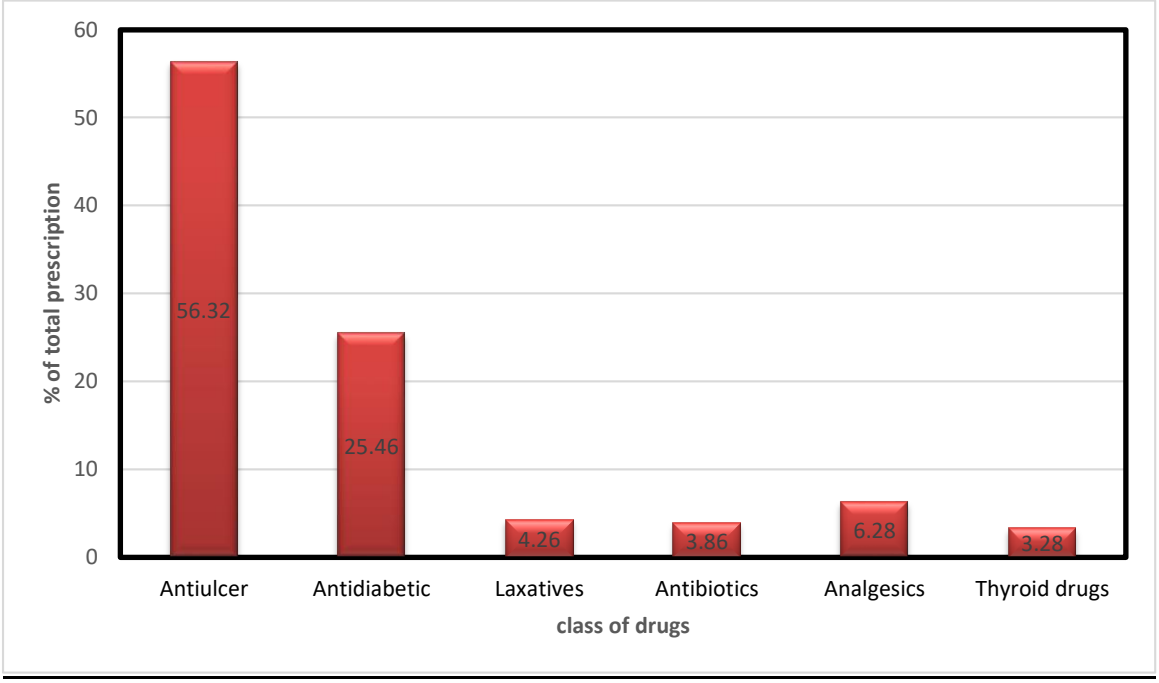


Fig 11: percentage of different classes of non cardiovascular drugs prescribed

DISCUSSION

The gender wise distribution study data shows that males (56%) patients had a high frequency of cardiovascular incidences as compared to females (44%) as shown in figure 1.

The age wise distribution analysis shows that , 24% of patients belongs to the age group (40-50 yrs),27% of patients belongs to the age groups (51-60 yrs),16% of patients belongs to the age groups (61-70yrs),14% of patients belongs to the age groups (71-80 yrs) only 5% of patients to age groups are greater than 80 as mentioned in fig 2.

Our study shows that , the most common diagnosis was CAD in 72 patients (72 %) followed by Myocardial infraction in 44 patients (44%),angina pectoris in 23 patients (23%) and Congestive cardiac failure in 17 patients (17 %) as mentioned in figure 3.

While analysing the common comorbidities associated with cardiovascular diseases , the Hypertension (39%) and type 2 DM(31%) are the frequently associated comorbid conditions and Doctors also diagnosed various other associated medical conditions in number of patients that is 6% of patients having chronic kidney disease ,While 5 % patients having acute renal failure ,also COPD was found in 4% patients. During the study different adjustable risk factors were also determined which are associated with cardiovascular diseases particularly inadequate diet, physical inactivity ,use of tobacco and abnormal blood lipid profile and obesity. Also other studies have indicated that high levels of insulin (frequently occurs in type 2 DM) is one of the independent factor related with cardiovascular disease.

Our study data shows, most of the drugs prescribed by cardiologists were by brand /trade names (94%) rather than generic which constitute only (6%). Thus the study documents preference for branded drugs or trade names instead of generic prescribing.It is prefeble to prescribe drugs by generic name as it avoids duplication of drug products and provides low cost which can translate into cost effective drug therapy .However , the issues of substandard manufacturing of generic drugs need to be accounted for,which generally lowers the therapeutic efficacy of drug.

The percentage of drugs prescribed from the NLEM in our study was 81.4% which was found to be fare when compared to the WHO prescribed ideal value 100%.This finding was more than other studies conducted in India; such as 45.71%,and it is found to be less when compared to the other countries such as; South Ethiopia and the percentage of drugs that not prescribed from NLEM in this study was found to be 18.6 %.Thus in this study the drugs that prescribed for cardiovascular diseases is more preferred from NLEM has mentioned in fig 6.

The most commonly prescribed class of drugs found to be antiplatelets(35.98%), anti Hyperlipidemics (16.35%),Anticoagulants (6.77%), Vasodilators (6.07%), calcium channel blockers (6.54%),diuretics(12.85%),beta blockers (7.71%), ACE inhibitors or ARB blockers (4.43%),Cardiac glycosides (1.63%).

In this study the fig 8 indicates that out of the 100 prescriptions 29 cardiovascular drugs were prescribed frequently among which the top three prescribed drugs were Atorvastatin(16.20%),Aspirin(12.96%), and Clopidogrel (11.11%).The most commonly prescribed anti hypertensive drugs are furosemide (9.25%),bisoprolol (5.09%), amlodipine (2.08%),metoprolol(1.62%).cardiac glycosides like digoxin was prescribed to only 0.92% patients.Most commonly prescribed vasodialators were nitroglycerin (3.24%) and isosorbidedinitrate (0.69%).Anticoagulants such as heparin (5.55%), and warfarin(0.69%).It is also found that apart from cardiovascular drugs most frequently prescribed non-cardiovascular class of drugs in CVD patients was antiulcer (56.32%),followed by antidiabetics (25.46%),laxatives (4.26%),antibiotics(3.86%),analgesics(6.28),and thyroid drugs (3.28%) as mentioned in fig11.

The fig 10 shows the prescription pattern , that is the cardiovascular drugs prescribed mainly in the form of tablets(73%) followed by capsules in 7%, injections were in 10% , 9% of syrups and only 1% of drugs were as in suppository dosage forms.

In our study ,we determine the price Distribution of cardiovascular drugs that used for various cardiovascular disease such as for CAD, MI, Angina, CCF. By analysing the price of most commonly used drugs and their brands ,we concluded that for the treatment of CAD Delispirin 75(4.4Rs) the brand of aspirin having the lowest price followed by AngispanTR 2.5(198Rs) the brand of Nitroglycerin having the highest price ; that for the treatment of MI Telmikind 40 (34.85 rs) the brand of Telmisartan having the lowest price and Axcer 90(420rs) the brand of Ticagrelor having the highest price.

The above study ,shows that for the treatment of angina Monosorbitrate 10(21.78rs) the brand of Isosorbide mononitrate having the lowest price followed by Lorandil 10(399rs) the brand of Nicorandil having the highest price.and for the treatment of CCF Digoxin 0.5 /2ml(8.09Rs) having the lowest price and the Furocort (254Rs)the brand of furosemiode having the highest price.

CONCLUSION

The study provides an insight on the various cardiovascular diseases and the spectrum of cardiovascular drug utilization in them. The overall prescription patterns encountered in our study is optimal,and it is found that majority of drugs were prescribed from the recent NLEM of India by the most of practitioners which indicates the implementation and adoption of national drug policy by the hospitals and cardiologists. But adherence to the generic prescription was found to be less as compared with the brand or trade names based on the standards recommended by the WHO; and this is the most important major short coming we found in our study.

The present study reveals the higher prevalence of CAD and MI among the patients of age group 51-60 years. The hypertension and DM were the most commonly associated comorbidities. The use of antiplatelets and anticoagulants help in the effective treatment and prevention of most CVDs; the antiplatelets drugs and statins dominated the prescribing pattern with high prescribing trend from national

list of essential drugs, but showed scope for improvement in encouraging the cardiologist to prescribe drugs by generic name. The important finding of this study is the anti-thrombotic market particularly antiplatelets drugs expected to overtake anticholesterol agents as the sales leader.

The study also reveals that both the practitioners and pharmacists should be aware of the updated knowledge about the banned drugs , deleted drugs , irrational FDCs, recent NLEM because it influences the prescribing pattern and its utilization.

The study conclude that the prescribing pattern and trend of cardiologist was knowledge ular disease. However, there is a need to sensitize the cardiologist and make them aware to adopt generic drugs so as to ensure cost effective and rational utilization of drugs.

Effective procedure, regular examination must be implemented to enhance the patient compliance and achieve a healthier outcome.

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