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An Observational Prospective Study on Drugs Utilization Pattern in Cardiovascular Diseases at a Tertiary Care Hospital

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ABSTRACT:
Background: Cardiovascular diseases (CVDs) are a leading cause of morbidity and mortality worldwide, necessitating effective management strategies. Drug Utilization Evaluation (DUE) studies are vital for understanding medication usage patterns and identifying potential issues in the treatment of these conditions.
Aim: This study aims to assess the drug utilization trends in patients with cardiovascular diseases.
Methods: A prospective observational study was conducted over six months at Venus Hospital, involving 120 patients diagnosed with cardiovascular diseases. Data were collected from medical case sheets, including demographic details, diagnoses, comorbidities, and medication usage. Ethical clearance was obtained from the SDPC Institutional Ethics Committee.
Results: Out of 120 patients, 56% were male and 44% female, with the largest age group being 46-65 years (47%). Myocardial infarction (31%) and congestive heart failure (24%) were the most common diagnoses. Hypertension (52%) and diabetes mellitus (37%) were prevalent comorbidities. The most commonly prescribed medications were aspirin (63%), metoprolol (21%), furosemide (21%), and atorvastatin (78%). Aspirin (49%) and clopidogrel (17%) were frequently used anti-atherogenic drugs, while nicorandil (27%) and ivabradine (23%) were common antianginals. Amiodarone (52%) and digoxin (48%) were the most prescribed antiarrhythmics.
Conclusion: The study highlights the significant prevalence of CVDs and associated comorbidities, emphasizing the need for optimizing medication use. The findings suggest that targeted interventions and enhanced prescribing practices are essential for improving patient outcomes. Further research involving diverse populations is necessary to ensure safer and more effective therapy.

KEYWORDS: Cardiovascular diseases (CVDs), Drug Utilization Evaluation (DUE) , coronary artery diseases (CAD),ischemic heart disease (IHD),Myocardial Infarction (MI),Heart Failure (HF),Peripheral Artery Disease (PAD).

I. INTRODUCTION

Cardiovascular Diseases (CVDs) are defined as a group of disorders of the heart and blood vessels commonly consist coronary artery diseases (CAD), ischemic heart disease (IHD), Myocardial Infarction (MI), Heart Failure (HF), hypertensive heart disease, Peripheral Artery Disease (PAD), Rheumatic Heart Disease (RHD), etc.[1]Cardiovascular diseases (CVDs) are the leading cause of mortality and morbidity worldwide, accounting for an estimated 18.6 million deaths globally in 2019.[2] In recent years, there has been a significant improvement in the management of CVDs, with the development of new diagnostic techniques and therapeutic strategies.[3] However, optimizing drug utilization patterns is crucial to ensure the effectiveness and safety of treatment for the patient population.[4]

Cardiovascular diseases (CVDs) remain a leading cause of morbidity and mortality globally, necessitating an in-depth understanding of drug utilization patterns to optimize therapeutic outcomes and resource allocation.[5]The effective management of CVDs largely hinges on the rational use of pharmacotherapy, which can significantly reduce the incidence of adverse events and improve patient prognosis.[6]Drug utilization studies are essential tools in this regard, offering critical insights into prescribing trends, adherence

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to clinical guidelines, and areas requiring intervention.[7]

OBJECTIVES:

- To evaluate the drugs utilized in cardiovascular disease patients.
- To study the cardiovascular disease prevalence in adult patients of diseases based on sex and among the various age groups.
- To assess the change in the prescribing trends in cardiovascular diseases.
- To assess the common drugs used in cardiovascular diseases patients.

II. MATERIALS & METHODS:

STUDY DESIGN:

A prospective observational study was conducted at Venus Hospital from October 2023 to March 2024. This study was approved by the SDPC ethics committee and all the required documents were submitted including Case Report Form.

STUDY DURATION:

The total duration of the study was six months from October 2023 to March 2024.

STUDY SUBJECTS:

The Total of 120 patients with Cardiovascular diseases enrolled in the study.

STUDY SITE:

The study was conducted in the Smt.Rasilaben Sevantilal Shah Venus Hospital.

INCLUSION CRITERIA:

(1) Data were collected of patients diagnosed with cardiovascular diseases.
(2) Data were collected of both male and female genders.
(3) Data of individuals above 18 years of age were included.
(4) Data of cardiovascular disease (CVD) patients with or without comorbidities were included.
(5) Data from the inpatient department were exclusively collected.

EXCLUSION CRITERIA:

(1) Incomplete data of the patients.
(2) Patients below 18 years of age.
(3) Pregnant and lactating women.
(4) Data from the outpatient department.

METHODOLOGY:

The research was conducted following the principles outlined in the ICH-GCP guidelines. Key documents, including the study protocol, data collection forms, and Case Report Forms (CRFs), were submitted for approval by the ethics committee. The study commenced after receiving the necessary authorization.

Designed as a prospective, observational study, it was conducted at a single site. The study focused on Drug utilization patterns in cardiovascular disease (CVD) patients in the inpatient department of Venus Hospital, Surat, spanning six months from October 2023 to March 2024.

The main aim was to assess the drug utilization patterns in cardiovascular disease (CVD) patients in a tertiary care hospital. The number of participants included in the study was 120.

III. RESULTS AND STATISTICS:

1. GENDER DISTRIBUTION:

In this study, a total of 120 prescriptions were included as per inclusion and exclusion criteria, out of which 67 (56%) were males and 53 (44%) females.

GENDER	NUMBER	PERCENTAGE
MALE	67	56%
FEMALE	53	44%

TABLE 1- GENDER DISTRIBUTION

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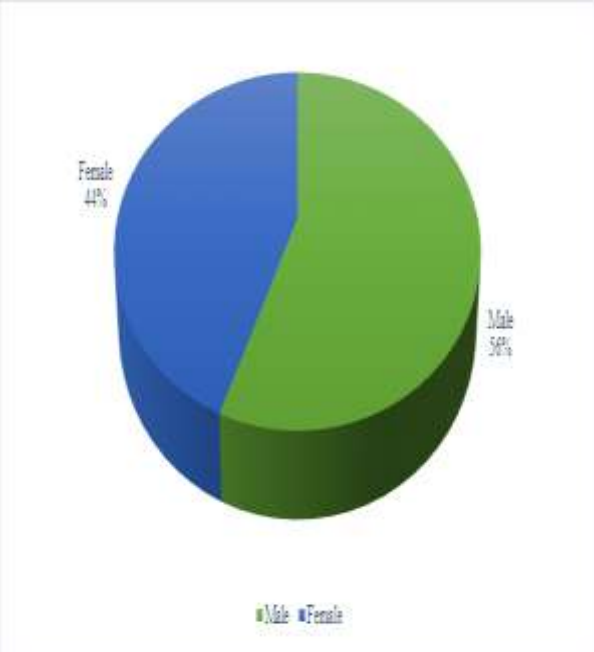

FIG 1 - GENDER DISTRIBUTION IN PERCENTAGE.

2. AGE CATEGORIZATION:

Age categorization of the study population was done. There were 57(47%) patients between the age group 41- 65, 38(32%) patients between the age group > 65, 20(17%) patients between the age group 31-45 and 5(4 %) patients between the age group 18-30. The maximum number of patients was from the age group 46-65(47%).

AGE-GROUP	NUMBER OF PATIENTS	PERCENTAGE
18-30	5	4 %
31-45	20	17 %
46-65	57	47 %
>65	38	32 %

TABLE 2- AGE CATEGORIZATION

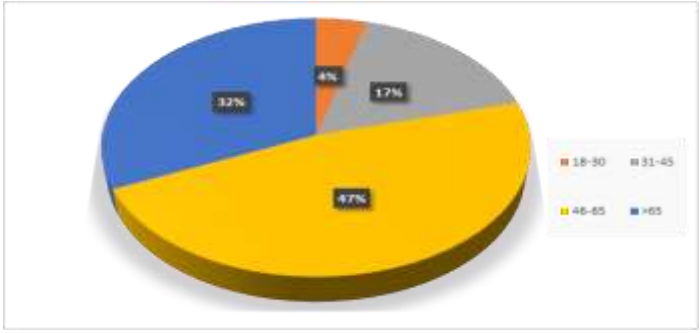

FIG 2 - AGE CATEGORIZATION IN PERCENTAGE

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3. DIAGNOSIS CATEGORIZATION:

All the study populations were categorized according to their diagnosis Myocardial infraction 37(32%), CHF 29(26 %), Angina 17(14%), CV stroke 10 (8%), HTN 9 (8%), Arrhythmia 9(7%), PAH 3(3%) and PAD 2(2%).

DISEASE	NO OF CASE	PERCENTAGE
Arrhythmia	9	7 %
MI	39	32%
CV Stroke	10	8 %
HTN	9	8 %
CHF	31	26%
PAD	2	2 %
PAH	3	3 %
Angina	17	14 %

TABLE 3- DIAGNOSIS CATEGORIZATION

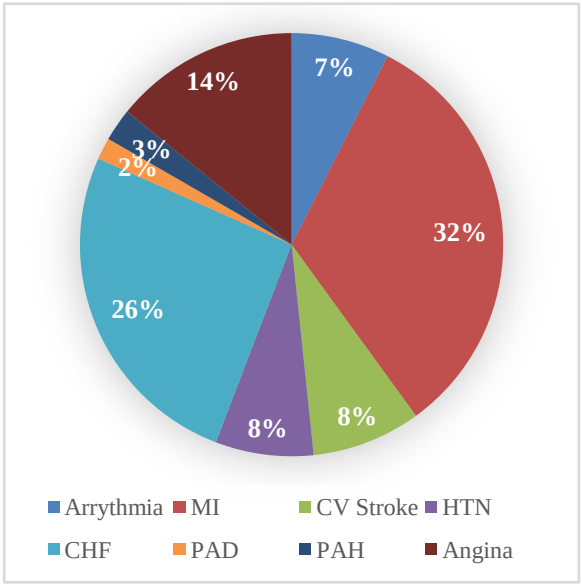

FIG 3 - DIAGNOSIS CATEGORIZATION IN PERCENTAGE

4. CO-MORBIDITIES:

According to the study, the most common comorbidities in CVD patients were HTN 52 (52%) followed by DM 37 (37%), CKD 6(6%), and COPD 5(5%).

CO-MORBIDITY	NO. OF CASE	PERCENTAGE
DM	37	37 %
HTN	52	52 %
CKD	6	6 %
COPD	5	5 %

TABLE 4- CO-MORBIDITY IN STUDY PATIENTS

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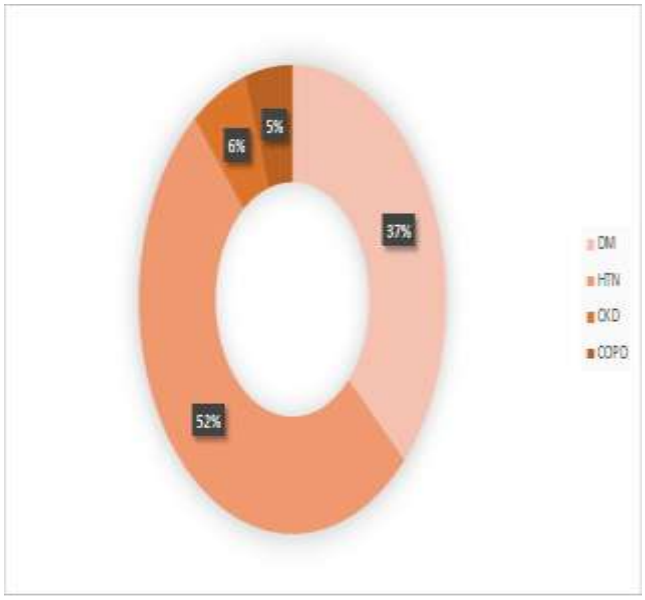

FIG 4: CO-MORBIDITIES IN CVD PATIENTS IN PERCENTAGE

5. PATTERN OF ANTIPLATELET USE IN THE STUDY POPULATION:

Out of 120 prescriptions included in the study, 50(51 %) prescriptions were used as monotherapy and 48(49%) as dual therapy.

DRUG PATTERN	NUMBER	PERCENTAGE
MONOTHERAPY	50	51 %
DUAL THERAPY	48	49 %

TABLE 5: PATTERN OF ANTIPLATELET USED IN THE STUDY POPULATION

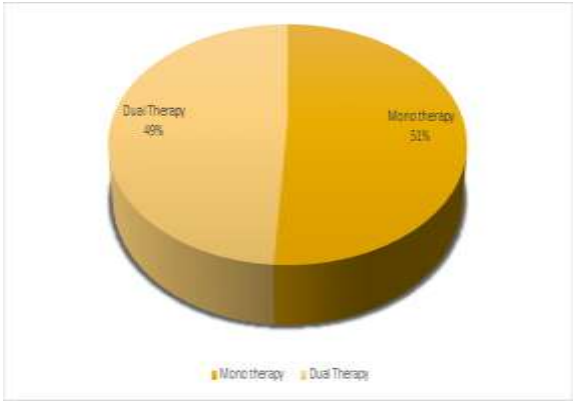

FIG 5: PATTERN OF DRUG USE IN THE STUDY POPULATION IN PERCENTAGE

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5. DIFFERENT CLASS OF CVD PRESCRIBED TO THE STUDY POPULATION:

A. ANTIPLATELETS:

Among the anti-platelets prescribed in the study, Aspirin 95 (63%) was the most prescribed anti-platelet, followed by Clopidogrel 34 (23%) and Ticagrelor 21 (14%).

DRUG	NO. OF PATIENTS	PERCENTAGE
ASPIRIN	95	63 %
CLOPIDOGREL	34	23 %
TICAGRELOR	21	14 %

TABLE 6- ANTI-PLATELET PRESCRIBED IN CVD PATIENTS.

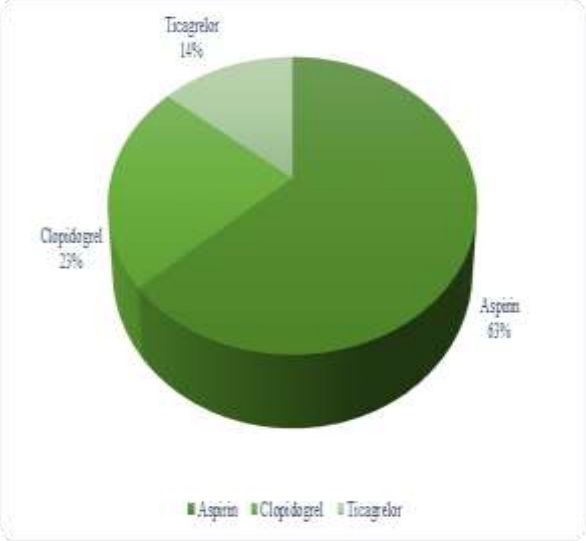

FIG 6: ANTI-PLATELET PRESCRIBED IN CVD PATIENTS IN PERCENTAGE.

B. ANTIHYPERTENSIVE DRUGS:

Among the anti-hypertensives prescribed in the study, Metoprolol 39 (21%) was the most prescribed anti-hypertensive, followed by Furosemide 38 (21%), Spironolactone 26 (14%), Bisoprolol 20 (11 %), Telmisartan 16 (9 %) and other as listed in below table.

DRUGS	NO. OF PRESCRIPTION	PERCENTAGE
METOPROLOL	39	21 %
FUROSEMIDE	38	21 %
SPIRONOLACTONE	26	14 %
TORSEMIDE	1	1 %
CARVEDILOL	8	4 %
ATENOLOL	1	1 %
AMLODIPINE	8	4 %

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CLINIDIPINE	2	1 %
NICARDIPINE	2	1 %
DILTIAZEM	5	3 %
RAMIPRIL	1	1 %
ENALAPRIL	1	1 %
BISOPROLOL	20	11 %
CLONIDINE	7	4 %
VERAPAMIL	1	1 %
TELMISARTAN	16	9 %
LABETALOL	1	1 %
NIFEDIPINE	3	2 %

TABLE7: ANTI HYPERTENSIVES PRESCRIBED IN CVD PATIENTS.

C. ANTIHYPERLIPIDEMIC DRUGS:

Among the antihyperlipidemics prescribed in the study, Atorvastatin 58 (78%) was the most prescribed antihyperlipidemic followed by Rosuvastatin 16 (22%).

DRUGS	NO. OF PRESCRIPTION	PERCENTAGE
ATORVASTATIN	58	78 %
ROSUVASTATIN	16	22 %

TABLE 8- ANTI ANTIHYPERLIPIDEMICS PRESCRIBED IN CVD PATIENTS.

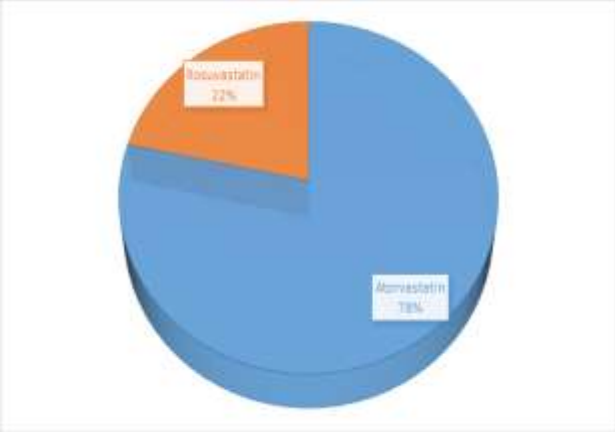

FIG 8: ANTI-HYPERLIPIDEMICS PRESCRIBED IN CVD PATIENTS IN PERCENTAGE.

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D. ANTI – ATHEROGENIC DRUGS:

Among the anti-atherogenic drugs Aspirin 95 (49 %) was the most prescribed drug, followed by Clopidogrel 34 (17 %), Ticagrelor 21 (11 %), Heparin 22 (11%), Rivaroxaban 5 (3 %), Enoxaparin 10 (5 %) and Warfarin 7 (4 %).

DRUG	NO. OF PRESCRIPTION	PERCENTAGE
ASPIRIN	95	49 %
CLOPIDOGREL	34	17 %
TICAGRELOR	21	11 %
HEPARIN	22	11 %
RIVAROXABAN	05	3 %
ENOXAPARIN	10	5 %
WARFARIN	07	4 %

TABLE 9: ANTI-ATHEROGENIC DRUG PRESCRIBED IN CVD PATIENTS

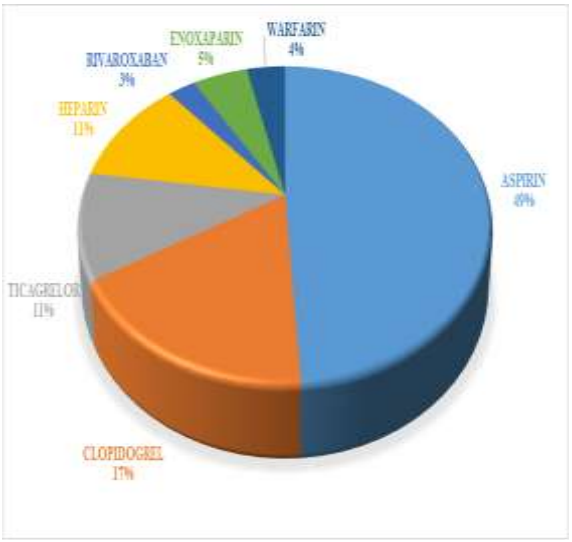

FIG 9 : ANTI-ATHEROGENIC DRUG PRESCRIBED IN CVD PATIENTS IN PERCENTAGE.

E. ANTIANGINAL DRUGS:

Among the anti-anginal drugs, Nicorandil 14 (27 %) was the most prescribed drug followed by Ivabradine 12 (23 %), Trimetazidine 10 (20 %), ISDN 10 (20%), and Glyceryl Trinitrate 5 (10%).

DRUG	NO. OF PRESCRIPTION	PERCENTAGE
ISOSORBIDE DINITRATE	10	20 %
GLYCERYL TRINITRATE	10	20 %
NICORANDIL	14	27 %
TRIMETAZIDINE	05	10 %
IVABRADINE	12	23 %

TABLE 10: ANTIANGINAL DRUGS PRESCRIBED IN CVD PATIENTS.

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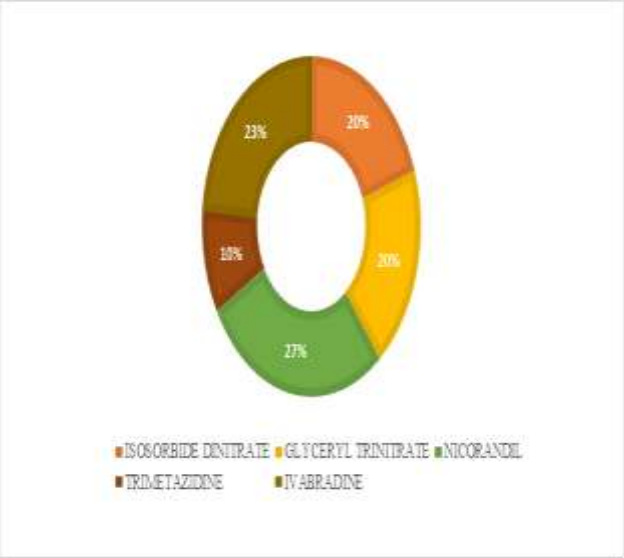

FIG 10: ANTI-ANGINAL DRUGS PRESCRIBED IN CVD PATIENTS IN PERCENTAGE.

F. . ANTIARRHYTHMIC DRUGS:

Amiodarone was the most prescribed anti-arrhythmic drug which is 11 (52 %), followed by Digoxin 10 (48 %).

DRUG	NO. OF PRESCRIPTION	PERCENTAGE
DIGOXIN	10	48 %
AMIODARONE	11	52 %

TABLE 11:ANTI-ARRHYTHMIC DRUGS PRESCRIBED IN CVD PATIENT.

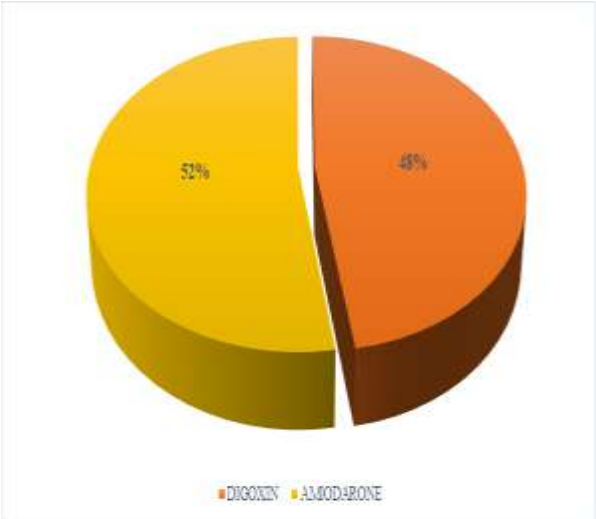

FIG 11: ANTI-ARRHYTHMIC DRUGS PRESCRIBED IN CVD PATIENT IN PERCENTAGE.

IV. DISCUSSION:

Drug utilization studies serve as a valuable tool in promoting the rational use of medications within healthcare delivery systems, offering insights into the state of healthcare provision. In conducting the DUE study, a prescription-based survey emerges as the most economical tool in terms of cost-effectiveness. Rational drug use entails effectiveness, safety, appropriate prescription for therapeutic indications, correct

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dosage, suitable formulation, accessibility, and affordability.

Over a six-month period spanning from October 2023 to March 2024, a total of 120 samples were gathered, adhering to specific inclusion and exclusion criteria, the cardiovascular diseases among males were higher 67 (56%) were males compared to 53 (44%) females' adult patients were suffering from cardiovascular diseases.These findings were corroborated by a study conducted by M. Rangapriya and Merlin K. Reji, where the prevalence among males stood at 65%, while among females it was 35%. Moreover, male patients exhibited a higher incidence of cardiovascular disease compared to their female counterparts.[8]

The study determined the most affected age groups for CVD patients were 45-65 years, with 47%, followed by the age group of more than 65 years, at 32%. As individuals age, they become more susceptible to cardiovascular disease (CVD). Age is an independent risk factor for CVD in adults, but it is exacerbated by factors such as frailty, obesity, and diabetes. These factors can complicate and exacerbate cardiac risk factors associated with advanced age. Gender is also a potential risk factor in aging adults, with older women having a higher risk of CVD compared to age-matched men. However, in both genders, the risk of CVD increases with age.[9]

In the study, among a total of 120sample sizes, the commonly diagnosed diseases in CVD patients based on the categorization were Myocardial Infarction (MI), with 31%, followed by Congestive Heart Failure (CHF), with 24 %. The comorbidities associated with cardiovascular disease in this study were Diabetes, Hypertension, Chronic Kidney disease, and Chronic Obstructive Pulmonary Disease of which the most frequent comorbid condition was hypertension (HTN), with 52 % followed by Diabetes Mellitus (DM), with 37 %.

Recent studies show that hypertension is a well-established risk factor for a multitude of cardiovascular diseases (CVDs) acting as a significant co-morbidity. Hypertension is estimated to contribute to roughly one-quarter of heart failure cases, with an even stronger association in elderly populations where up to 68% of HF is attributed to it. Studies suggest a two to three-fold increased risk of heart failure in hypertensive patients compared to those with normal blood pressure. Moreover, hypertension is a key player in the development of coronary artery disease, nearly doubling the risk of MI. The mechanisms are multifactorial, with increased afterload due to hypertension leading to compromised coronary blood flow and myocardial ischemia, even in the absence of epicardial coronary artery disease. Effective blood pressure control remains paramount in reducing the burden of CVDs.[10]One study also shows that Cardiovascular comorbidities have been reported to be four times higher among diabetics in comparison to nondiabetics, leading to an adverse effect on QOL and increased expenditure on treatment.[11]Total number of CVD drugs prescribed is 534.

Among 120 sample size, it was found that the most commonly prescribed CVD drugs were anti-hypertensive drugs, Metoprolol 39 (21%) was the most prescribed anti-hypertensive, followed by Furosemide 38 (21%), Spironolactone 26 (14%) and Bisoprolol 20 (11 %). Among the anti-atherogenic drugs Aspirin 95 (49 %) was the most prescribed drug, followed by Clopidogrel 34 (17 %), Ticagrelor 21 (11 %), Heparin 22 (11%), Rivaroxaban 5 (3 %), Enoxaparin 10 (5 %) and Warfarin 7 (4 %).

Among anti-platelet drugs, the patient was receiving monotherapy and dual anti-platelet therapy, 50(51%) prescriptions were used as monotherapy and 48(49%) as dual therapy. One of the studies suggests that dual anti-platelet therapy is effective in reducing the risk of recurrent MI, stroke, and cardiovascular death compared to aspirin alone. For instance, the CURE trial demonstrated that combining clopidogrel with aspirin for 3-12 months in patients with acute coronary syndrome (ACS) presenting with non-ST-segment elevation MI (NSTEMI) significantly decreased these events.[12]

After analyzing the data, it was observed that the mostprescribed drugs in the Beta Blocker (BB) class of drugs in cardiovascular diseases, out which metoprolol 39 (21%), Bisoprolol 20 (11%), Carvedilol 8 (4%), Atenolol 1 (1%) and labetalol 1 (1%). Recent research highlights their effectiveness varies depending on the condition. They remain a powerful tool for heart failure, reducing mortality and symptoms (Ruilope et al., 2023).

They are crucial for managing angina in coronary artery disease and potentially improve outcomes after a heart attack.[13]Most prescriptions were prescribed with knowing drug indication andtherefore drugs were prescribed relevant to the symptoms anddiagnosis of patients. The average duration of hospital stay is 3 to 4 days.

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V. CONCLUSIONS:

Based on the findings from our study, it is evident that there is a growing concern regarding the increased prevalence of cardiovascular diseases (CVDs). It was also observed from the study that a crowning phenomenon of increased health risks. There is a similar growth in the case of cardiovascular-related diseases. Increasing age, random changes in lifestyle, lack of physical activities, increased stress, workload, and smoking-like habits have been providing a path to more morbidity and mortality due to cardiovascular disorders. It was observed that co-morbidities were the main cause of cardiovascular diseases and their complications. By controlling the co-morbid conditions there could be a substantial decline in cardiovascular diseases and their complications in the present study, the prescribing pattern of drugs in the cardiovascular system was assessed.

The present study explores the common risk factors involved in CVD's and the prevalence of CVD's with age and sex. The study reveals the prescribing pattern (dual therapy) of drugs and the common class of drugs prescribed for the management of CVD.

In conclusion, our study provides insight into the various cardiovascular disorders encountered in a cardiac in-patient setting and the spectrum of cardiovascular drug utilization in the patients. However, it has identified areas to further rationalize and optimize patterns of polypharmacy and evidence-based use of medications like beta-blockers, newer anticoagulants as well as anti-platelet agents, and newer anti-anginal agents. Further, drug utilization studies with different population groups will generate more comparative data to ensure more rational and safer therapy.

Effective strategies and regular monitoring needed to be implemented to improve patient compliance and achieve a better outcome. Therefore, an effective intervention program, like training, for the promotion of rational drug use practice was recommended to improve the prescribing pattern of drugs and the quality of prescriptions in the hospital.

ABBREVIATION:
ACS: Acute Coronary Syndrome
BB: Beta Blocker
CAD: Coronary Artery Diseases
CVDs: Cardiovascular Diseases
CRF: Case Report Form
CHF: Congestive Heart Failure
CV Stroke: Cerebrovascular Stroke
DM: Diabetes Mellitus
DUE: Drugs Utilization Evaluation
HTN: Hypertension
HF: Heart Failure
IHD: Ischemic Heart Disease
MI: Myocardial Infarction
NSTEMI: non-ST segment elevation Myocardial Infarction
PAD: Peripheral Artery Disease
QOL: Quality Of Life
RHD: Rheumatic Heart Disease

AUTHOR'S CONTRIBUTION:

Shaikh Mohmed Adnan Mohmed Javid, Vishaj Bidja, Fenal Desai and Bhavya Rathod ,for designing and conducting thestudy, analyzing data, interpreting the results anddrafting the manuscript. Dr. Zeel Naik and Dr. Surbhi Chitania supervised the study and its critical review. All theauthors gave the final approval of the version to bepublished.

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