EVALUATION OF DRUG UTILIZATION IN CORONARY ARTERY DISEASE IN TERTIARY CARE CENTRE: A CROSS SECTIONAL STUDY

ABSTRACT

Aim: In this study, the goal was to asses Drug utilization evaluation, WHO core indicators, monitoring the patient's response to therapy of coronary artery disease.
Study design: Sapthagiri institute of medical sciences, Bangalore.
Place and Duration of Study: Sample: Department of Cardiology Sapthagiri Institute of Medical Sciences (SIMS), From (June 2024- Nov 2024) Chikkasandra, Hesaraghatta Road Bangalore.
Methodology: We conducted prospective cross-sectional study for 6 months which includes patients who were diagnosed with coronary artery disease diagnosed of different types.
Results: Among 311 patients, 30.2% were in the age group between 58-67 years of age. By 68.8%, male patients outnumbered female patients. Ischemic heart disease in coronary artery disease were the most common diagnosis. Out of 311 patients, 197 patients had comorbidities and the most common comorbidity was Hypertension (66), Diabetes melitus (47). Most commonly used combination therapy was Coronary angiography (CAG) with drug therapy (233). Majority of drugs prescribed under generic name with Aspirin (244). Category of drugs used is antiplatelet (471). Oral route (1423) of drug administration was the preferred route. Drug interactions are moderate which can be avoided at dose adjustments and limiting to single drug use of antiplatelets. WHO reports 45% of prescriptions include 5.4 drugs, 2.3% prescribe antibiotics, 10.6% use injections, 73.2% use generic names, and 98% are from the essential medicines list.
Conclusion: The study evaluated drug utilization in coronary artery disease patients in a tertiary care hospital. The most common treatment approach was Coronary Angiography with drug therapy, with antiplatelet, antihypertensive, and antidiabetic drugs being the most commonly prescribed.

KEYWORDS: Ecosprin (aspirin), Statins (atorvastatin) Combination Therapy, Monotherapy, drug interactions.

1.INTRODUCTION

Coronary artery disease is characterized by an insufficient flow of blood and oxygen to the heart muscle. Oxygen demand and supply are out of balance as a result of coronary artery blockage. Usually, it is caused by plaques that obstruct blood flow in the coronary artery lumen. In the US and around the world, it is the leading cause of death. It was an unusual cause of death during the start of the 20th century. Though the number of deaths from CAD declined after reaching a peak in the middle of the 1960s, it remains the biggest cause of death globally.[1]

The formation of atherosclerotic plaque is a defining feature of the pathophysiology of CAD. A buildup of fatty material called plaque causes the vessel lumen to constrict and obstruct blood flow. The process begins with the development of a "fatty streak." The formation of a fatty streak is caused by the sub-endothelial deposition of foam cells, or lipid-loaded macrophages. The intima layer ruptures in response to a vascular insult, causing monocytes to go into the sub-endothelial region and develop into macrophages. Foam cells are created when these macrophages absorb oxidized low-density lipoprotein (LDL) particles. Activated T cells exclusively release cytokines to support the pathogenic process. Smooth muscles are stimulated by growth hormones produced, which also cause them to absorb collagen and oxidized LDL particles, deposit them alongside active macrophages, and produce more foam cells. The result of this process is the development of sub-endothelial plaque.

This plaque may enlarge or stabilize over time provided the endothelium sustains no more damage. A fibrous cap will grow and the lesion will eventually become calcified if it becomes stable. Over time, the lesion may become hemodynamically substantial enough to cause angina symptoms when there is insufficient blood flow to the cardiac tissue during times of peak demand. At rest, though, symptoms would lessen as the need for oxygen decreases. A lesion needs to be at least 90% stenosed in order to elicit angina while at rest. Certain plaques have the potential to burst, exposing tissue factor and ultimately thrombosis. Depending on the extent of the injury, this thrombosis may result in subtotal or total blockage of the lumen and the development of acute coronary syndrome (ACS) as unstable angina, NSTEMI, or STEMI.[2]

There are several modalities to evaluate for coronary artery disease including EKG, Echo, CXR, Stress test, cardiac catheterization, and blood work to name the main ones. These tests are done depending on the context in which patients are presenting. The following are details on different diagnostic modalities we have available for the evaluation of coronary artery disease:

Electrocardiogram (ECG): An extremely simple yet very useful test for assessing coronary artery disease is the electrocardiogram (ECG). Ten leads that are affixed to the skin at predetermined sites are used to assess the electrical activity in the cardiac conduction system. It offers details on the anatomy and physiology of the heart. Once the test is completed, the paper that is printed usually has 12 leads, each of which corresponds to a particular place on the heart. The heart's axis, beat, and rate are all significant details to note on an ECG, following that, details about both acute and chronic pathologic processes can be found. Acute coronary syndrome is characterized by T wave and ST-segment abnormalities. It is also visible if an ACS has developed into arrhythmias. An ECG in a chronic condition can reveal details such as bundle branch blockages, ventricular hypertrophy, and axis deviation. ECG is another easily accessible, affordable, and user-independent diagnostic technique.

Echocardiography: Echocardiography is a type of cardiac ultrasonography. It is a practical, non-invasive testing method used in both inpatient and outpatient acute and chronic conditions. It could provide information regarding chamber diameters, autoimmune or infectious diseases, valvular regurgitation and stenosis, and wall motion in acute situations. Additionally, it helps in the detection of acute pulmonary diseases like as pulmonary embolism. It assesses the pericardial cavity as well. It can be used in chronic circumstances to observe both a response to the therapy and the previously indicated data. It is also utilized as a component of stress testing in an outpatient environment. It plays a part in

treatments as well as diagnostics. For instance, echocardiogram can be used to guide the needle during pericardiocentesis.[3]

Stress Test: This is relatively non-invasive method for checking for coronary artery disease is the stress test. When evaluated appropriately, it can assist rule out or confirm cardiac disease in cases of suspected angina or angina similar. The test involves artificially stressing the heart; if the patient experiences abnormal changes in ST segments of their EKG or experiences angina symptoms, the procedure is stopped and coronary artery disease is confirmed. Before, during, and after the procedure, EKGs are taken, and the patient is closely watched for any symptoms. Exercise stress testing and pharmacologic stress tests are the two basic categories of stress assessments. The patient is required to run on a treadmill until he reaches 85% of the age-predicted maximum heart rate during exercise stress tests. Should a patient experience ventricular or supraventricular arrhythmia, exertional hypotension, hypertension (>200/110 mmHg), or ST-segment elevations or depression.[4]

Chest X-ray: An essential part of the initial assessment of heart illness is a chest X-ray. The standing posteroanterior (PA) and left lateral decubitus imaging films are among the standard imaging films. Anteroposterior (AP) projection can occasionally be achieved with the patient lying down, particularly in inpatient settings. Nevertheless, there are substantial limitations to the interpretation of AP films. An accurate and economical way to obtain information about the heart, lungs, and vasculature is to properly analyze the PA and AP images. It is best to interpret in a step-by-step manner to avoid missing any crucial information.[5]

Extensive epidemiological research has identified the risk factors for the development of CAD, which include hypertension, diabetes, and hyperlipidemia. According to estimates, CAD causes between 30 and 40 percent of deaths each year, most of which are linked to smoking. It has been discovered that psychosocial stress related to job strain is a risk factor for CAD.Obesity.[6]

Overall, globally the cardiovascular disease it is rapidly spreading and leading cause of health concern with more deaths in Coronary artery disease emerges as the predominant form of CVD . According to the data of global burden of disease, coronary artery disease was responsible for 16.2% of all-cause deaths and 7.19% of disability-adjusted life years (DALY) worldwide in 2019.[7]

Thus, Coronary artery disease affects mortality and morbidity and affects a considerable population in the society. However, the secondary prevention practice utilizing aspirin, beta-blockers, angiotensin converting enzyme (ACE) inhibitors and statins still can be sub-optimal.[8]

TREATMENT OF CORONARY ARTERY DISEASE: REPERFUSION STRATEGIES

NSTEMI (Non-ST-Elevation Myocardial Infarction)

A large portion of the preliminary data appeared to suggest that, in terms of outcomes like death or recurrent non-ST-elevation myocardial infarction (NSTEMI, or MI), an early invasive technique was less advantageous in women than in men—in fact, there appeared to be a trend toward higher harm in women. An early invasive versus non invasive method for reducing death and MI in patients with unstable CAD was examined in the FRISC II trial (The Fragmin and rapid Revascularization during In-Stability in Coronary artery disease). A meta-analysis comparing the outcomes of early invasive versus conservative strategies in NSTEMI found that an invasive strategy can be equally helpful in lowering the odds of death, MI, or rehospitalization in men and high-risk women, who are defined as those who present with elevated biomarkers, for both unstable angina (UA) and NSTEMI.

The meta-analysis also showed a significant 33% reduction in death, MI, or rehospitalization for ACS in women undergoing invasive therapy. For this reason, the most recent NSTEMI guidelines recommend an early invasive procedure as a Class I, Level of Evidence A recommendation in women with high-risk features.

STEMI (ST-elevation myocardial infarction)

When it comes to ST-elevation MI (STEMI), women are more likely than men to experience consequences like shock, heart failure, reinfarction, recurrent ischemia, haemorrhage, and stroke. However, there is no gender difference in 1-year mortality. In the context of STEMI, PCI treatment yields better results in women than thrombolytic therapy. The increased morbidity and mortality rates among women treated with thrombolytics compared to men can be largely attributed to less favourable baseline characteristics such as age and rates of heart failure, diabetes, and hypertension. The use of primary angioplasty was an independent predictor of survival in women and almost completely eliminates the danger of cerebral bleeding.20 The GUSTO II-B angioplasty sub study validated the beneficial mortality benefit of primary PCI in women when compared with thrombolytic treatment; per 1000 treated patients, primary PCI prevented 56 fatalities in women compared to 42 deaths in men.

STENT SELECTION

Despite the fact that a large number of randomized controlled trials have evaluated the safety and effectiveness of drug-eluting stents (DES) for the treatment of coronary artery disease (CAD), none of these trials had sufficient sample sizes to evaluate the safety and efficacy of DES in female patients. On the other hand, a major pooled review revealed that, over long-term follow-up, the use of DES in women is safer and more effective than bare metal stents. Women receiving DES treatment had much improved safety profiles, with fewer stent thromboses and lower rates of target lesion revascularization, in addition to significantly lower risks of mortality or MI.

Regardless of gender, coronary artery bypass grafting (CABG) is typically the standard of care for multivessel or complicated CAD. Women appear to experience higher rates of postoperative morbidity and mortality after CABG than do males.[9]

DRUG UTILIZATION EVALUATION

The development of drug utilization research was sparked by initiatives taken in Northern Europe and the United Kingdom in the mid-1960s the ultimate goal of drug utilization research must be to assess whether drug therapy is rational or not.

Drug utilization research was defined by WHO in marketing, distribution, prescription, and use of drugs in a society, with special emphasis on the resulting medical, social and economic consequences. Description of drug use pattern; early signals of irrational use of drugs; interventions to improve drug use; quality control cycle; continuous quality improvement.

Types of drug utilization study:

Drug utilization studies can be targeted towards any of the following links in the drug-use chain:

The systems and structures surrounding of the drug use (e.g. how drugs are ordered, delivered and administered in a hospital or health care facility). The processes of drug use (e.g. what drugs are used and how they are used and does their use comply with the relevant criteria, guidelines or restrictions).The outcomes of drug use (e.g. efficacy, adverse drug reactions and the use of resources such as drugs, laboratory tests, hospital beds or procedures).

Quality control of drug use:

Drug use should be controlled according to a quality control cycle that offers a systematic framework for continuous quality improvement. The components of below mentioned cycle.

Step 1: Plan. Analyze current situation to establish a plan for improvement (e.g. analyze current prescription patterns of individual prescribers, groups of prescribers, or health facilities).

Step 2: Implement the plan on a small scale (e.g. provide feedback on possible overuse, underuse or drug misuse of individual drugs or therapeutic groups).

Step 3: Check to see if expected results are obtained (e.g. evaluate whether prescription patterns really improve).

Step 4: Act Revise plan or implement plan on large scale (e.g. guide national implementation of plan Drugs and therapeutic committee; prospective evaluation; retrospective evaluation; criteria setting.[10]

World health organization (WHO) initiated better prescribing indicators to assess the prescribing in health care. Commonly used are, the number of drugs per encounter, the percentage of drugs prescribed by brand name, the percentage of antibiotics and injectable drugs per encounter, and the percentage of drugs prescribed from an essential drug list (EDL). All these indicators are used to indicate effectiveness of proper drug utilization pattern and to compare health facilities and prescribers.[11]

Drug utilization ensures the benefits and justifiable to drug therapy by aiding data in health care systems. This Evaluation is used to enhance better outcomes of drug usage, prevention from misuse of drugs and guidelines compliance towards medical standards and to avoid drug interactions.[12]

Drug utilization plays an important role in health centre, as it creates policies with concerning drug utilizing pattern both locally and nationwide. It ensures rational drug use and appropriate use of resources, minimizing patients suffering and builds-up confidence in the health care system. The suitable method for assessing this to check prescription of health care practitioners, when analysing studies based on prescription patterns helps the health policymakers to establish the urgencies in encouraging the appropriate use of medicines in health care practice. Proper utilization of drug indicators was developed by the WHO to study prescription pattern and to improve rational drug use in out-patient practice. It includes the prescribing indicators, the patient care indicators, and the facility indicators.[13]

2. MATERIALS AND METHODS

2.1 Study Design

A Cross sectional study, was carried out in the Department of Cardiology, Sapthagiri Institute of medical sciences, Bangalore, Karnataka for a period of six months (From June 2024- Nov 2024). This study was conducted after obtaining approval from institutional ethics committee of Sapathagiri Institute of medical Sciences, Bangalore (Ref.no: SIMS & RC/EC-10/RR-04/2024-2025).

2.2 : Study Sample Size: The sample size was 311.

2.3 Study Criteria: The study was carried out by considering the following inclusion and exclusion criteria.

Inclusion Criteria:

Patients aged above 18 years.

Patients having coronary artery disease.

Exclusion Criteria:

Pregnant and lactating women.

History of intestinal acute and chronic disease.

2.4 Sources of Data and Materials

1. Patient case sheet.

2. Drug-drug interaction forms.

3. Adverse drug reaction forms.

4. Patient counseling forms.

5. Prescribing indicator form.

2.5 Method of Collecting Data

This is a cross-sectional study in which patients who met the inclusion criteria were enrolled using a patient consent form. Every patient admitted to the ward was evaluated on a daily basis. Patients with known symptoms were interviewed and enrolled if they matched the research requirements, which included open-ended questions about their past medical history. Name, age, gender, education level, lifestyle, economic position, occupation, date of admission, reasons for admission, history of previous illness, and social history were collected from patients.

Vital signs (blood pressure, temperature, pulse rate, and respiratory rate),laboratory data (hematological tests, blood sugar tests, liver function tests, urine analysis, renal function tests such as serum creatinine, blood urea, and so on), final diagnosis, current treatment drug regimen, and other relevant data were also collected from patient case sheets. The patient data collecting form will be filled out with the information stated above. Interviews with patients or those who are responsible for their care will be conducted to get demographic information. The outcomes of the data collection will be examined using descriptive inferential statistics, and frequencies, percentages, and mean values will be computed.

2.6 Statistical Analysis

The data was collected and entered in Microsoft Excel software 2019 and interpreted by descriptive statistics that were presented to analyze and express the report as counts and percentages in the form of tables, charts, and graphs.

The statistical analysis of the collected data was performed using IBM SPSS version 26 statistical software.

2.7 Ethical Consideration

Confidentiality was maintained throughout the study with Written informed consent was obtained from all the participants. And There is no physical harm to the participants, as there is no intervention.

2.8 Ethical Clearance

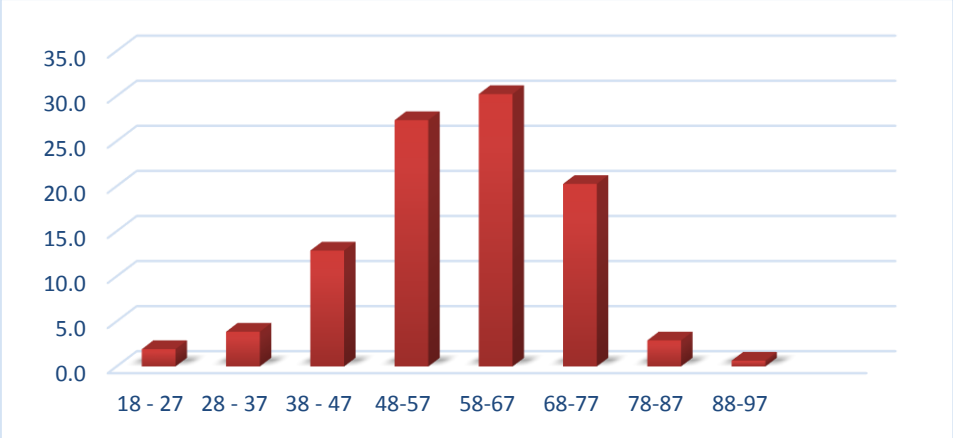
The study was submitted for ethical clearance to the ethical committee of the Sapthagiri Institute of Medical Sciences and Research Center. This study was based on the analysis of approved surveillance data.

3. RESULTS

3.1 Patient Age Categorization

In the given age distribution data, the majority of patients fall within the 58-67 age group, representing 30.2% (94 cases), followed by the 48-57 age group at 27.3% (85 cases). The 68-77 age group makes up 20.3% (63 cases), while younger age groups such as 38-47 account for 12.9% (40 cases). The least represented groups are those under 18 and above 88, with 0.6%, respectively.

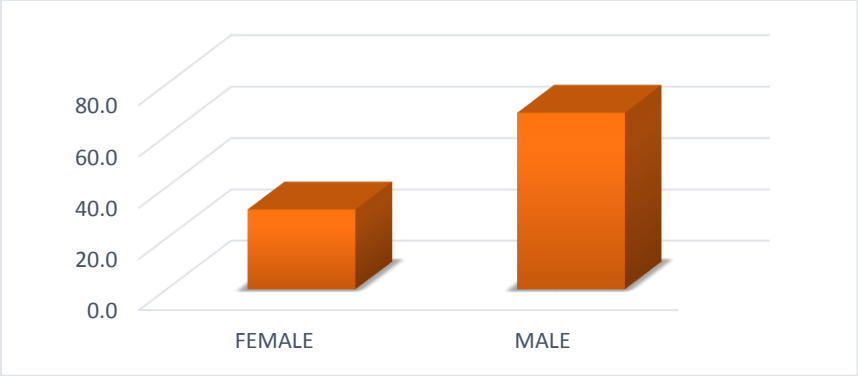
Fig.1. Distribution of patient age according to gender.



3.2 Gender Enumeration

In this gender distribution data, the majority of the patients are male, accounting for 68.8% (214 cases), while females make up 31.2% (97 cases) of the total. The data includes 311 patients in total.

Fig .2. Patient Gender Enumeration.



3.3 Final Diagnosis

In this diagnosis distribution, ischemic heart disease (IHD) is the most prevalent, representing 23.47% (73 cases) of the total diagnoses. Effort Angina follows with 6.43% (20 cases), and Unstable Angina accounts for 4.82% (15 cases). Acute Anterior Wall Myocardial Infarction (AWMI), Acute Coronary Syndrome (ACS), and Inferior Wall Myocardial Infarction (IWMI) make up the remaining percentages, with 2.89%, 2.57%, and 2.25%, respectively. The data includes 311 diagnoses overall.

Table. 1.Distribution of Final Diagnosis of patient.

TYPE OF DIAGNOSIS	COUNT OF DIAGNOSIS	PERCENTAGE
AWMI	9	2.89
ACS	8	2.57

EFFORT ANGINA	20	6.43
IHD	73	23.47
IWMI	7	2.25
UNSTABLE ANGINA	15	4.82
OTHERS	179	57.55
GRAND TOTAL	311	100

3.4 Co Morbidities

In patients with Coronary Artery Disease (CAD) and comorbidities, the most common co-existing condition is Hypertension (HTN), which appears in 66 cases. Type 2 Diabetes Mellitus (T2DM) follows with 47 cases. Hypertension combined with T2DM is also prevalent, occurring in 64 cases. Other notable comorbidities include HTN with COPD (5 cases), HTN with hypothyroidism (5 cases), and IHD with T2DM (3 cases) and others without co-morbidities(114 cases). Overall, there are 311 instances of CAD with various comorbidities.

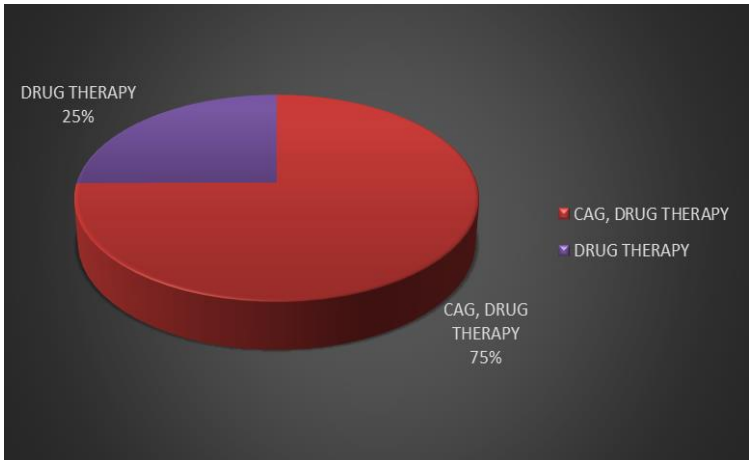
Table. 2.Count of Patients with Co Morbidities.

TYPE OF COMORBIDITIES	CAD WITH CO MORBIDITIES	PERCENTAGE
T2DM	47	15.11
COPD	4	1.28
HTN	66	21.22
HTN, COPD	5	1.60
HTN, DM	3	0.96
HTN, HYPOTHYROIDISM	5	1.60
HTN, T2DM	64	20.57
IHD, T2DM	3	0.96
Total with co-morbidities	197	63.34
Others without co-morbidities	114	36.65
Grand Total	311	100

3.5 Combination Therapy

In patients undergoing treatment, the most common approach was Coronary Angiography (CAG) with drug therapy, which was provided to 233 patients. Drug therapy alone was administered to 78 patients. Overall, the total number of treatments administered was 311.

Fig. 3. Patients undergoing Combination Therapy



3.6 Drugs Prescribed Under Generic Name

Out of 311 patients, the analysis of drugs prescribed, the most commonly used generic name drugs include Aspirin (244) and least drugs include Dapagliflozin, Soluble Insulin Telmisartan each (21) respectively. This indicates a usage of drugs in treatment, with 441 drugs prescribed by brand names and 1,207 drugs prescribed by generic names, highlighting a slight preference for generics.

Table. 3. Distribution of Drugs Prescribed Under Generic Name

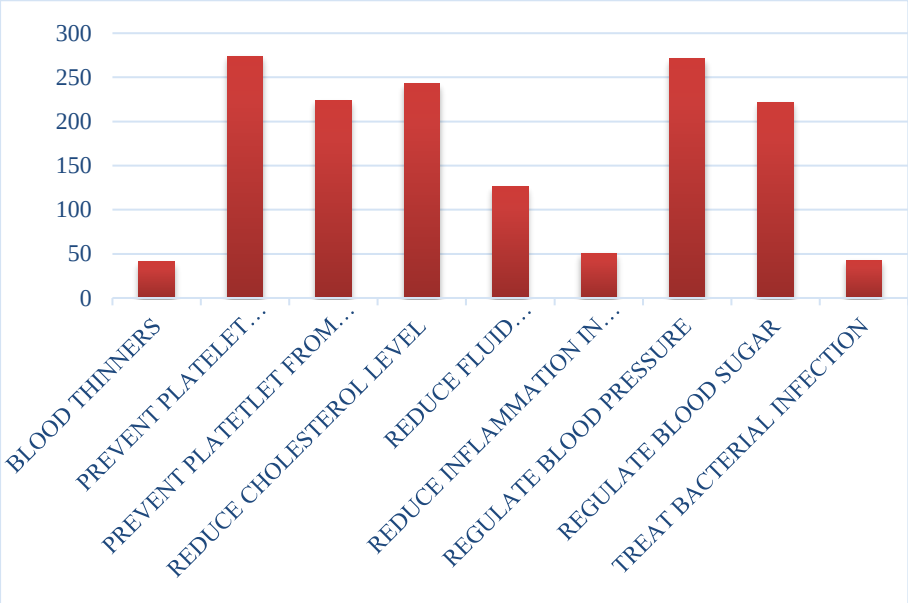
MOST DRUGS PRESCRIBED IN GENERIC NAME	GENERIC	PERCENTAGE
ASPIRIN	244	14.8
ATORVASTATIN	222	13.4
BUDESONIDE	26	1.5
CARVEDILOL	27	1.6
CEFTRIAXONE	33	2
CLOPIDOGREL	45	2.7
DAPAGLIFLOZIN	21	1.2
FRUSEMIDE	32	1.9
GLIMEPIRIDE + METFORMIN HCL	30	1.8
GLIMEPIRIDE+METFORMIN HCL+VOGLIBOSE	22	1.3
HEPARIN	34	2
IPRATROPIUM BROMIDE + LEVOSALBUTAMOL	22	1.3
METFORMIN HCL	27	1.6
METOPROLOL SUCCINATE	98	5.9
RANOLAZINE	31	1.8
SOLUBLE INSULIN	21	1.2
TELMISARTAN	21	1.2
TICAGRELOR	183	11.1
TORSEMIDE+SPIRONOLACTONE	68	4.1
TOTAL GENERIC DRUGS	1207	73.2
TOTAL BRAND DRUGS	441	26.7
GRAND TOTAL DRUGS	1648	100

3.7 Count of Drug Indication

In the analysis of drug indication, The most common indications were for preventing platelet aggregation (274), followed by regulating blood pressure (271) and reducing cholesterol levels (243). Drugs

prescribed to prevent platelet clot formation accounted for 224 prescriptions, while regulating blood sugar was indicated in 222 cases. Additionally, reducing fluid accumulation was a common indication (126), and 51 prescriptions were aimed at reducing inflammation in arteries. Treatments for bacterial infections (43) and blood thinning (41) were less frequently prescribed.

Fig. 4. Drug Indication Count



3.8 Category of Drug Used In CAD

The drug analysis of 311 patients reveals of that the most commonly prescribed categories are antiplatelet (471), antihypertensive (267), and antidiabetic (164). Within these categories, aspirin (244) and atorvastatin (222) were frequently used. Other key drugs include heparin (34) as an anticoagulant, ranolazine (26) for anti-anginal therapy, and torsemide + spironolactone (95) as a diuretic. Notable antidiabetic drugs include glimepiride + metformin HCL (60) and soluble insulin (30). Overall, 1,381 drugs were prescribed, with a diverse range of therapeutic class.

Table. 4. Category of Drug Used in CAD

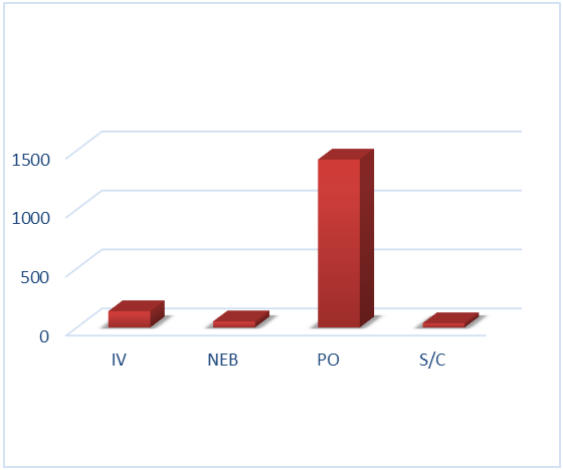
CATEGORY OF DRUG	TYPE OF DRUG	COUNT OF DRUGS	TOTAL
ANTI ANGINAL	RANOLAZINE	26	26
ANTICOAGULANT	HEPARIN	34	34
ANTIDIABETIC	DAPAGLIFLOZIN	21	164
	GLIMEPIRIDE + METFORMIN HCL	60	
	METFORMIN HCL + GLIMEPIRIDE	40	
	SOLUBLE INSULIN	30	
	VILDAGLYPTIN+METFORMIN HCL	13	
ANTIHYPERTENSIVE	AMLODIPINE	52	267
	CARVEDILOL	38	
	METOPROLOL SUCCINATE	97	
	TELMISARTAN	60	
	CILNIDIPINE	20	
ANTIPLATELET	ASPIRIN	244	471
	CLOPIDOGREL	45	
	TICAGRELOR	182	

ANTIPLATELET+STATIN	ASPIRIN+ATORVASTATIN	20	29
	ATORVASTATIN+CLOPIDOGREL+ASPIRIN	9	
BRONCHODILATOR	IPRATROPIUM BROMIDE + LEVOSALBUTAMOL	24	24
CEPHALOSPORIN ANTIBIOTIC	CEFTRIAXONE	32	32
DIURETICS	TORSEMIDE+SPIRONOLACTONE	95	95
HMG CoA REDUCTASE INHIBITOR	ATORVASTATIN	222	222
NITRATES	NITROGLYCERIN	17	17
Total		1381	

3.9 Count of Route of Administration

The route of administration data indicates that oral (PO) was the most commonly used method, comprising in 311 prescriptions, in which the total count of drugs prescribed, in the oral route of drugs was prescribed 1423 instances prescribing different drugs. Intravenous (IV) administration followed with 8.4% of prescriptions, totalling 138 cases. Nebulization (NEB) accounted for 3.1% with 51 instances, and subcutaneous (S/C) administration was the least common, making up 2.2% with 36 cases. Overall, these routes reflect a total of 1,648 prescriptions.

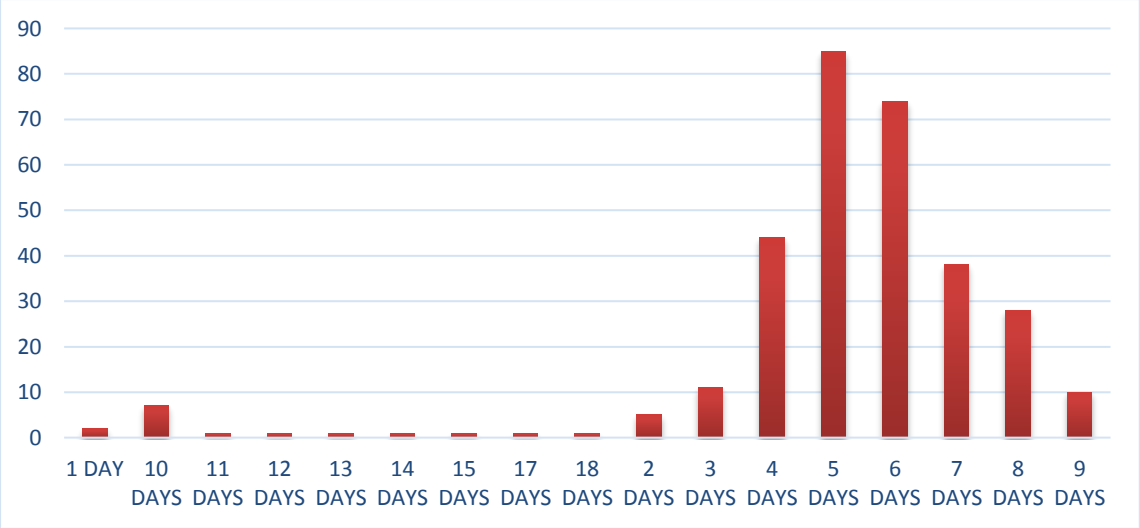
Fig .5. Distribution of Count of Route of Administration



3.10 Duration of Hospital Stay

The duration of hospital stays varies significantly, with the majority of patients staying for 5 days (84 instances), followed by 6 days (74 instances) and 4 days (43 instances). Shorter stays include 1 day (1 instance) and 2 days (5 instances). Longer stays include 10 days (7 instances) and 20 days (2 instances). Overall, there are a total of 311 recorded hospital stays.

Fig. 6. Count of Duration of Hospital Stay



3.11 WHO indicators

The WHO indicators reveal that 45% of prescriptions included an average of 5.4 drugs. Antibiotics were prescribed in 2.3% of patient encounters, while injections were utilized in 10.6% of cases. Generic names were used for 73.2% of the drugs prescribed, and an impressive 98% of the medications were from the essential medicines list.

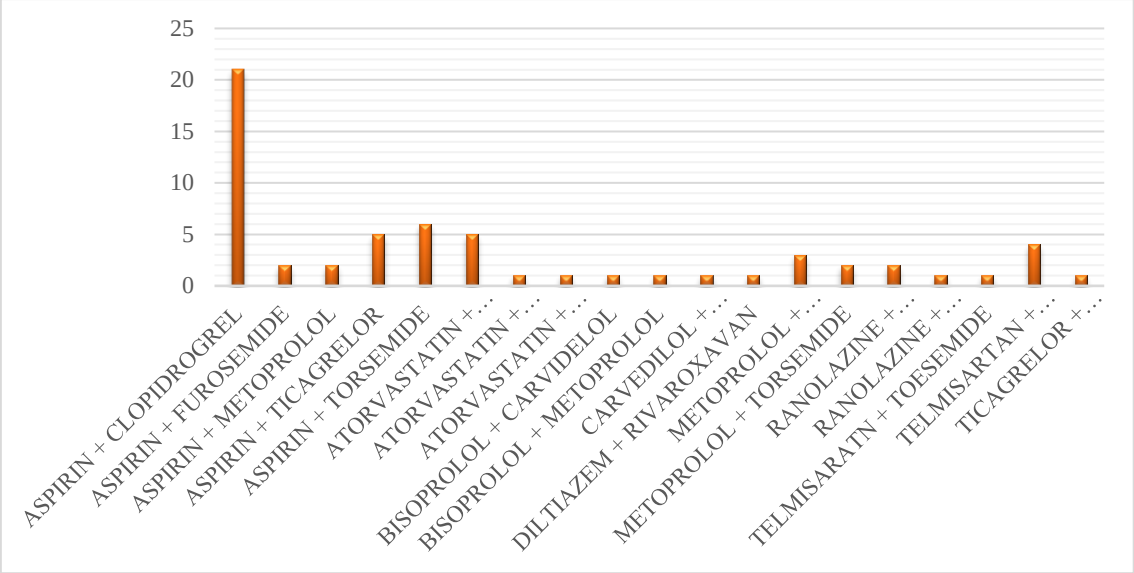
Table.5. WHO Indicators

WHO INDICATOR	PERCENTAGE
Average number of drugs per prescription	45.00%
Percentage encounters with antibiotics prescribed	2.3%
Percentage encounters with injections prescribed	10.6%
Percentage drugs prescribed by generic name	73.2%
Percentage of drugs prescribed from essential medicines	98%

3.12 Drug – Drug Interactions

The data provides information on drug combinations and their associated drug interactions. Among a total of 61 interactions, the combination of Aspirin and Clopidrogrel has 21 intractions, Atorvastatin + Telmisartan, Atorvastatin + Valsartan, Bisoprolol + Carvidelol, Bisoprolol + Metoprolol, Bisoprolol + Metoprolol, Bisoprolol + Metoprolol, Carvedilol + Torsemide – Spironolactone, Diltiazem + Rivaroxavan, Ranolazine + Rosuvastatin, Telmisaratn + Toesemide , Ranolazine + Rosuvastatin, Telmisaratn + Toesemide has 1 interaction respectively followed by Aspirin + Furosemide, Aspirin + Metoprolol, Aspirin + Metoprolol has 2 interactions, Metoprolol + Telmisartan Has 4 Interactions, Atorvastatin + Ranolazine has 5 interactions, Aspirin + Torsemide has 6 interactions and they are categorized as having a "moderate" level of drug interactions.

Table 6. Drug – Drug Interactions



4. DISCUSSION

Coronary Artery Disease (CAD), also known as ischemic heart disease, occurs when coronary arteries become narrowed or blocked due to atherosclerosis, inflammation, and damage to arterial walls . Types of CAD like Stable Angina: predictable chest pain during physical activity, Unstable Angina unpredictable chest pain, even at rest, Acute Coronary Syndrome (ACS): sudden blockage, leading to heart attack. Early detection and treatment of coronary artery disease (CAD) can prevent complications like heart attacks, heart failure, arrhythmias, and cardiac arrest through various diagnostic tests and appropriate treatments. The study reveals that Drug Utilization Evaluation (DUE) is a systematic review of drug use patterns, aiming to improve care quality, optimize therapy outcomes, reduce adverse reactions, promote rational drug use, and enhance patient safety. WHO's objectives include reducing healthcare costs, promoting evidence-based medicine, and supporting national drug policy development .In our study , among 311 patients the highest age group in terms of patient count is found to be 30.2% of patients in the age group of 58-67 years ,The majority of patients are male, accounting for 68.8% of the total population (214 cases), while females make up 31.2% (97 cases) .Ischemic Heart Disease is the most prevalent diagnosis, accounting for 55.3% of total diagnoses, followed by Effort Angina and Unstable Angina. Other prevalent diagnoses include Acute Anterior Wall Myocardial Infarction, Coronary Artery Disease, and IWMI. Hypertension is the most common co-existing condition in 197 instances of CAD, followed by Type 2 Diabetes Mellitus and hypertension combined with T_2DM, among other notable comorbidities. In patients undergoing treatment, the most common approach was Coronary Angiography (CAG) with drug therapy, which was provided to 233 patients. Drug therapy alone was administered to 78 patients. Majority of drugs prescribed under generic name with aspirin 244. The analysis of 1,495 prescriptions revealed that the most common indications were for preventing platelet aggregation, regulating blood pressure, and reducing cholesterol levels, while less frequently were prescribed for bacterial infections and blood thinning. The drug analysis reveals that the most commonly prescribed categories are antiplatelet (471), antihypertensive (267), and antidiabetic (164). Within these categories, aspirin (244) and atorvastatin (222) were frequently used drugs. The majority of cases are treated with oral administration 86.3%, followed by intravenous administration (8.4%), nebulization (3.1%), and subcutaneous administration (2.2%). Drug interactions are moderate with aspirin and clopidogrel interacting in 21 cases. In which can be avoided at dose adjustments and limiting to single drug use of antiplatelet. WHO reports, with antibiotics prescribed in 2.3%, injections in 10.6%, and 73.2% using generic names, with 98% from essential medicines list. The drug analysis reveals that the most commonly prescribed categories are antiplatelet (471), antihypertensive (267), and antidiabetic (164). The drug analysis shows that antiplatelet, antihypertensive, and antidiabetic categories are the most commonly prescribed drugs.

According to the study done by Riya Sharma indicated that the medication regimens used by patients declared with coronary artery disease vary greatly. This study assesses the clinical trial and usage

trends in CAD and the factors that influence the occurrence of CAD which ultimately affect the administration of medication in people who have CAD. The median age ranged from 58 to 69 years. 62.5% of the patients came from rural areas. Only 2% of patients received one medication, while 68.4% received polypharmacy. The most frequent comorbidity is diabetes and hypertension. The population under study was determined to be males, to live in rural area, as well as between the age of 58 and 69.[14]

In the research done by Md Yousuf Hussain. A prospective observational study conducted at a tertiary care hospital's inpatient cardiology department found that cardiovascular illnesses are a leading cause of morbidity and death worldwide. The study involved 114 patients aged 51-60, with diabetes and hypertension being the most prevalent co-morbid conditions. The study found that 32.64% of patients received antibiotic prescriptions, while 76.39% received injections. The most commonly prescribed categories of cardiovascular drugs were antihypertensives (24.06%) and antiplatelets (23.31%), indicating high prevalence of hypertension and coronary artery disease. Extensive polypharmacy was observed in prescriptions.[15]

The study conducted by Fehmi M. Mukadam. conducted a study on Prescription patterns of Drugs Used in Patients with Coronary Artery Disease in Tertiary Care Hospital". In this study the current studies were done according to recommendations of American College of Cardiology Federation/American Heart Association (ACC/AHA) . the study discovered majority of the medications were prescribed sensibly, according to the overall study of the prescription pattern. As advised by the WHO, the incidence of polypharmacy was within normal bounds. The majority of prescriptions were for generic medications, which encourages provider awareness and supports WHO guidelines.[16]

The research done by Anuradha on Drug Utilization Study in Intensive in the Cardiac Care Unit of a Tertiary Care Hospital. This study was conducted a intensive cardiac care unit (ICCU) to assess patients' drug use patterns. The study revealed that 63% of patients were men, with an average age of 61.25 years. Total Ninety percent of the patients were diagnosed with acute myocardial infarction. On average, three days were spent in the ICCU, and each patient received an average of ten prescription medications. Co-morbidities were diabetes mellitus and hypertension. Commonly prescribed drug classes included dual platelet inhibitors, statins, thrombolytics, opioid analgesics, anticoagulants, ACE-inhibitors, angiotensin receptor blockers, antianginal medications, and antibiotics. The study aimed to evaluate the economic, social, and medical effects of drug use and assess the ICCU's drug consumption quality and efficacy.[17]

5. CONCLUSION

Rational use of drugs is a significant factor that must be addressed to maximize the benefit of drug therapy in patient care. WHO core indicators of drug utilization and monitoring the patient's response to therapy, including safety and effectiveness and to prevent medication related problems. This is cross sectional study sheds light on the socio-demographic profile, patient history, drug utilization pattern, and dietary habits of CAD patients. The study reveals that CAD patients in India are mostly elderly, male, and have comorbidities such as hypertension and diabetes mellitus. The study found that medications, and medical interventions such as angioplasty are the mainstay of CAD management. The drug utilization pattern reveals that anti-platelets, statins, anti-coagulants, nitrates, and anti-hypertensives are commonly prescribed drugs for CAD patients. The study highlights the importance of public health efforts to raise awareness of CAD and its associated risk factors, particularly in countries where the incidence of CAD is increasing.

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DISCLAIMER (ARTIFICIAL INTELLIGENCE) : Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc.) and text-to-image generators have been used during the writing or editing of this manuscript.

CONSENT AND ETHICAL APPROVAL: The protocol was verified by Institutional Ethics Committee(IEC) of Sapthagiri Institute of Medical Sciences, informed consent form was obtained from the guardians of the study subjects.

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