

## Study on the utilization pattern of anticoagulant and antiplatelet drugs used in patients admitted to the cardiology department in a tertiary care hospital

### ABSTRACT

**Background:** Cardiovascular diseases encompass a group of conditions affecting the heart and blood vessels. Anticoagulant and antiplatelet medications are commonly prescribed for patients with cardiovascular conditions, including myocardial infarction, angina pectoris, heart attack, coronary heart disease, and stroke. The study aims to evaluate the utilization pattern of anticoagulant and antiplatelet drugs in patients admitted to the cardiology department of a tertiary care hospital.

**Objective:** To evaluate the utilization pattern of anticoagulant and antiplatelet drugs used in the cardiology department and to assess the safety profile of various anticoagulant and antiplatelet drugs administered to cardiac patients.

**Methodology:** We conducted a 6-month prospective cross-sectional study at Siddaganga Hospital, which included patients prescribed anticoagulants and antiplatelet drugs for the management of cardiovascular diseases.

**Results:** Out of 115 cases, a higher incidence of cardiovascular disease was observed in males (63%) compared to females (37%). Most patients affected by cardiovascular disease belong to the 60-69 age group (36.5%). Most patients experienced CAD-ACS-AWMI (31.3%). Among the 115 patients, 40% were prescribed antiplatelet medications, 4.34% were prescribed anticoagulant drugs, and 55.65% received a combination of antiplatelet and anticoagulant medication therapies. The most commonly prescribed antiplatelet medication was aspirin (82.60%), while the most widely used anticoagulant was heparin (52.17%). Among the 115 patients, 110 underwent laboratory investigations, and the majority had a platelet count investigation done.

**Conclusion:** Our study concludes that anticoagulants and antiplatelet drugs are crucial in preventing complications and managing cardiovascular diseases. A combination of both therapies was preferred, with antiplatelet drugs being more commonly prescribed than anticoagulants.

**Keywords:** Utilization, Anticoagulants, Antiplatelet, Cardiovascular Disease.

### Abbreviation:

CAD-ACS-AWMI : Coronary Artery Disease-Acute Coronary Syndrome-Anterior Wall Myocardial Infarction

CVA-HTN: Cerebrovascular Accident-Hypertension

CAD-ACS-IWMI: Coronary Artery Disease-Acute Coronary Syndrome-Inferior Wall Myocardial Infarction

HTN-CCF: Hypertension-Congestive Cardiac Failure

CAD-ACS: Coronary Artery Disease-Acute Coronary Syndrome

IHD-CHD-APO: Ischemic Heart Disease-Coronary Heart Disease-Acute Pulmonary Oedema

IHD-CCF: Ischemic Heart Disease- Congestive Cardiac Failure

## 1. INTRODUCTION

WHO defines cardiovascular disease (CVD) as “a group of disorders that affects the heart and blood vessels and include coronary heart disease, myocardial infarction, angina, stroke, and congenital heart disease” (Jack Stewart et al., 2017).

Cardiovascular disease is the predominant cause of death globally. The global burden of CVD has gradually increased over the years. Since 1990, the number of deaths from cardiovascular diseases has increased from 14.4 million to 17.5 million globally. Annual deaths from cardiovascular diseases in India have risen from 2.20 million in 1990 to 4.77 million in 2020 (Sonal Vyas et al., 2022).

Drug utilization is defined by WHO as “the marketing, distribution, prescription, and use of drugs in a society and it emphasizes the various medical, social, and economic aspects of drug use. It helps to understand, interpret, and improve the prescription, administration, and use of medicines which improves patient therapeutic outcomes (Shirin et al., 2019).

Anticoagulants are the drugs used to prevent or reduce the formation of blood clots in the blood vessels. They do not directly dissolve the existing blood clot but prevent the blood clot from forming or preventing existing clots from growing (Vijay et al., 2015).

Anticoagulants are mainly used for serious conditions like myocardial infarction, angina, stroke, pulmonary embolism, and rheumatic heart diseases. Low molecular weight heparin, unfractionated heparin, fondaparinux, and warfarin are generally used as parental anticoagulants. In recent years several oral anticoagulants have been developed such as direct thrombin inhibitors (dabigatran) and Anti-Xa inhibitors (apixaban, edoxaban, and rivaroxaban) (Shahzad et al., 2021).

Antiplatelet drugs are used to prevent blood clots by inhibiting platelet function and are widely used to prevent cardiac events. Aspirin, clopidogrel, ticagrelor, and prasugrel are the most commonly used antiplatelet drugs. Aspirin works by irreversible inhibition of cyclooxygenase (COX) activity and prevents platelet activation. Clopidogrel selectively inhibits the binding of adenosine diphosphate to its platelet P2Y<sub>12</sub> receptor and also stops ADP-mediated activation of glycoprotein GP IIa/IIIb complex (Suney et al., 2022).

The combination of antiplatelet and anticoagulant therapy is more effective than monotherapy in the management of cardiac events. Anticoagulants and antiplatelet drugs have the potential to increase the risk of bleeding (Eikelboom et al., 2007). INR (International normalized Ratio), PT (Prothrombin Time), and aPTT (Activated Partial Prothrombin Time) are laboratory tests used primarily to monitor the risk of bleeding (Akbar et al., 2020).

Hence, this study was conducted to assess the utilization pattern of anticoagulant and antiplatelet drugs in the treatment of cardiovascular diseases which in turn helpful in preventing the risk of bleeding.

### Need of the study:

- Evaluating the use of anticoagulant and antiplatelet drugs in the management of cardiovascular diseases.
- Improves patient care and reduces the risk of complications.
- Assess the safety profile of various anticoagulant and antiplatelet drugs administered to cardiac patients.

## 2. MATERIALS AND METHODS

### 2.1. Study design:

A prospective cross-sectional study was carried out in the Department of Cardiology, SMCRI, Tumakuru District, Karnataka for six months (21st March 2024-28th September 2024). The study was conducted

after approval was obtained from the Institutional Ethics Committee of Sree Siddaganga Medical College and Research Institute. (Reference no. – SMCRI/IEC/2024-25/85)

**2.2. Sample size:**  $n = Z^2_{(1-\alpha)} \times P(1-P)/d^2$

Where,

n = Sample size.

Z = 1.96, associated with 95% CI.

d = 5%, absolute precision value.

p = 7.6% = 0.076, population proportion.

Now, substituting these values in a given equation

We derive,

$$\begin{aligned} n &= [(1.96)^2 \times 0.076(1-0.076)] / (0.05)^2 \\ &= 107.909 \\ &= 108 \end{aligned}$$

The sample size was calculated by considering the percentage of double anticoagulant therapy parameter 7.6% “1” and for margin of error 5% and 95% of the confidence interval. The minimum number of subjects required for the study was 108.

**2.3. Source of data:** Data was collected from patient case sheets.

**2.4. Study criteria:**

Inclusion criteria	Exclusion criteria
<ul style="list-style-type: none"> <li>Male and female patients aged over 18 years.</li> <li>Patients who were prescribed anticoagulant and antiplatelet drugs in the cardiology department.</li> </ul>	<ul style="list-style-type: none"> <li>Patients who were suffering from diseases other than cardiovascular diseases.</li> <li>Patients who were not willing to provide informed consent.</li> </ul>

**2.5. Sampling method:** Convenient sampling method.

**2.6. Material used:** It involves a patient informed consent form, participant information sheet, patient case sheet, and data collection form.

**2.7. Statistical method used:** Descriptive statistical method

Data was analysed using IBM SPSS 16 software. The descriptive statistics, including proportions/percentages and frequencies, were calculated. An appropriate statistical test of significance will be applied when necessary. A p-value < 0.05 will be considered statistically significant.

**2.8. Study procedure:**

A study protocol was developed by reviewing various articles, and ethical approval was obtained before the initiation of data collection from the study participants. Patient enrolment was conducted based on predefined inclusion and exclusion criteria. Details of anticoagulants and antiplatelets prescribed in the management of cardiovascular disease were obtained from inpatient case sheets. The collected information was assessed for the utilization of anticoagulant and antiplatelet drugs in cardiac patients.

The collected data were systematically organized and presented through graphs and tables using Microsoft Excel, and the final report was submitted.

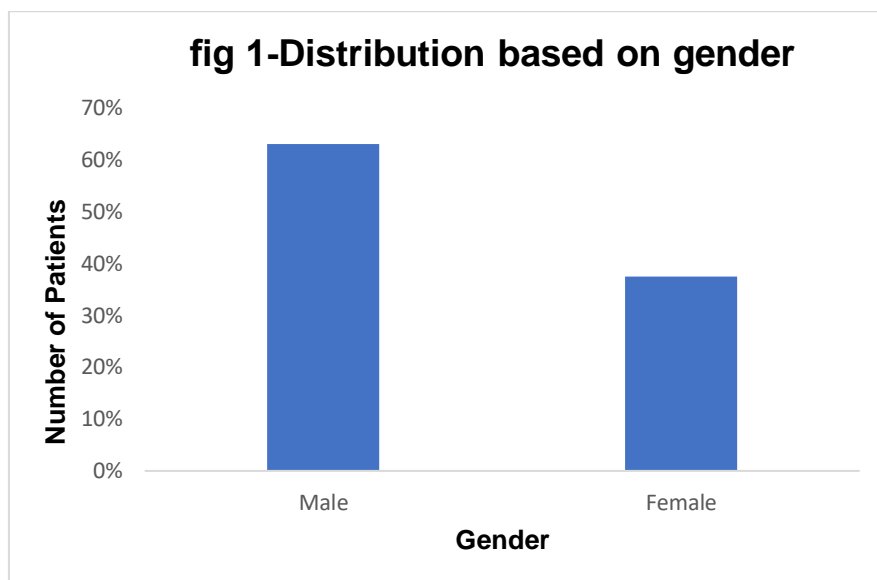
### 3. RESULTS

#### 3.1 Distribution based on gender

A total of 115 patients were included during the study period. Table 1 shows the distribution of the patients based on gender. The number of male patients, 72(63%), was higher than that of female patients, 43(37.39%).

Gender	Number of Patients (n=115)
Male	72(63%)
Female	43(37.39%)

Table 1: Distribution based on gender

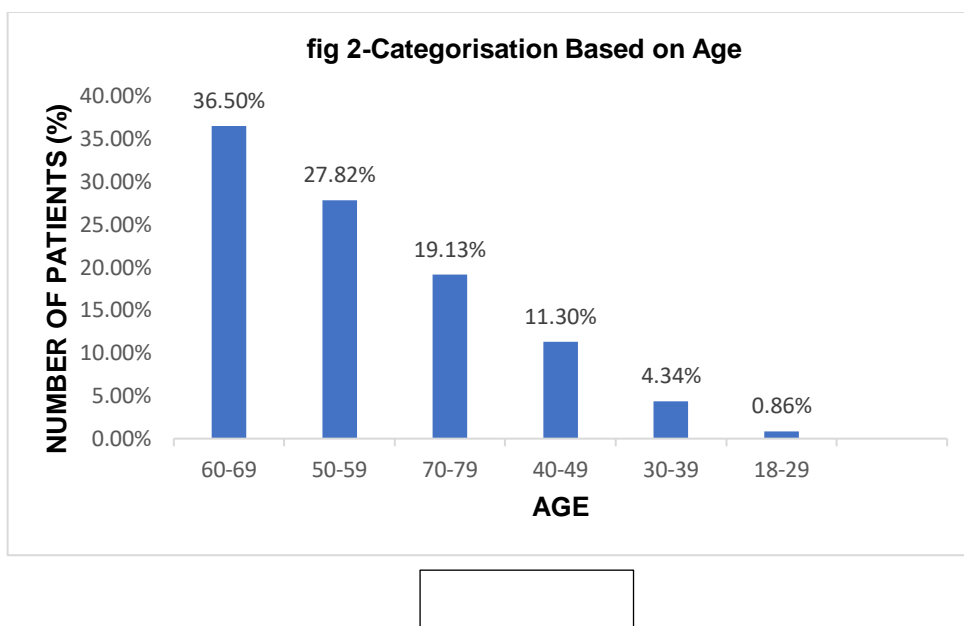


#### 3.2 Categorisation Based on Age

In our study, the maximum number of patients was found in the age group of 60 to 69(36.50%), followed by 50 to 59(27.82%), 70 to 79(19.13%), and 40 to 49(11.30%), 30 to 39(4.34%) and the minimum number of patients in the age group of 18 to 29(0.86%).

Age in Years	Number of Patients (n=115)
60-69	42(36.50%)
50-59	32(27.82%)
70-79	22(19.13%)
40-49	13(11.3%)
30-39	5(4.34%)
18-29	1(0.86%)

Table 2: Categorisation Based on Age

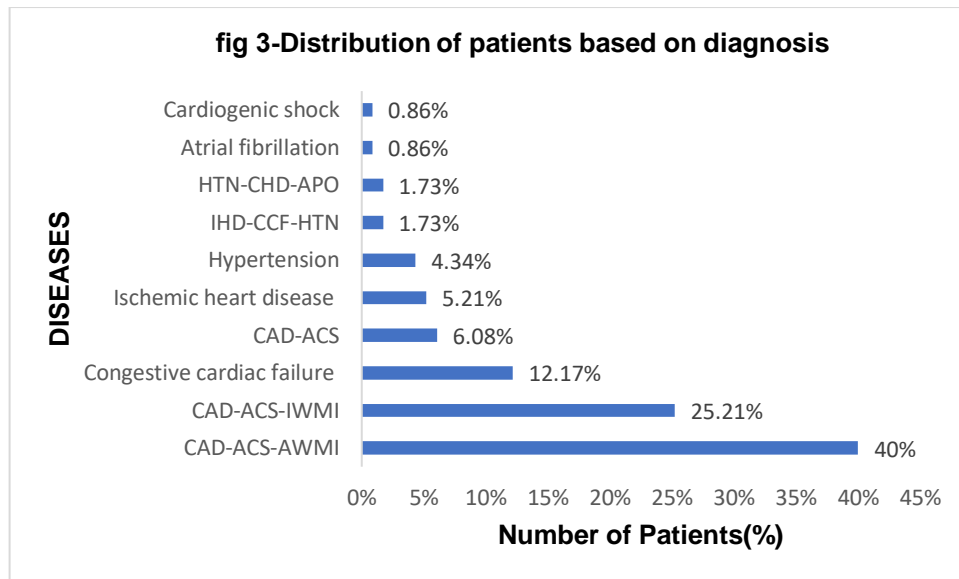


### 3.3 Distribution of patients based on diagnosis

Different types of CVD were observed during the study most common cases reported were coronary artery disease-acute coronary syndrome-anterior wall myocardial infraction 46(40%) followed by coronary artery disease-acute coronary syndrome–inferior wall myocardial infraction 29(25.21%), congestive cardiac failure 14(12.17%), coronary artery disease–acute coronary syndrome 7(6.08%), ischemic heart disease 6(5.21%), hypertension 5(4.34%), ischemic heart disease - cerebral vascular accident–hypertension 2(1.73%), hypertension–congenital heart disease–acute pulmonary oedema 2(1.73%) list common is atrial fibrillation 1(0.86%) and cardiogenic shock 1(0.86%).

Disease	Number of Patients
CAD-ACS-AWMI	46(40%)
CAD-ACS-IWMI	29(25.21%)
Congestive cardiac failure	14(12.17%)
CAD-ACS	7(6.08%)
Ischemic heart disease	6(5.21%)
Hypertension	5(4.34%)
IHD-CCF-HTN	2(1.73%)
HTN-CHD-APO	2(1.73%)
Atrial fibrillation	1(0.86%).
Cardiogenic shock	1(0.86%).

**TABLE NO 3: Distribution of patients based on diagnosis**

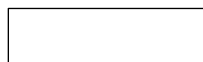
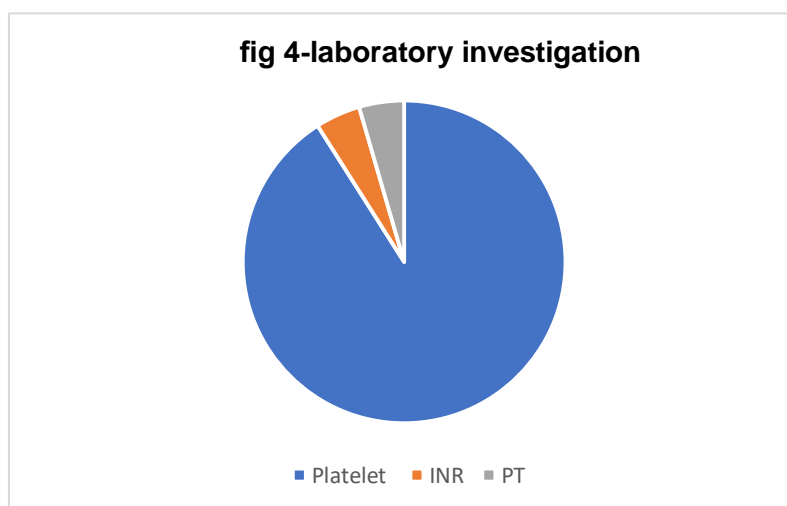


**3.4 Assessment of laboratory investigation**

Among 115 patients, 110 patients had undergone laboratory investigation. In the laboratory investigation, 90.90% had platelet count done, while 4.5% of patients had their International Normalised Ratio and prothrombin time levels tested each.

Laboratory investigation.	Number of Patients
Platelet	100(90.90%)
International Normalised Ratio	5(4.5%)
Prothrombin Time	5(4.5%)

**TABLE NO 4: Assessment of laboratory investigation**

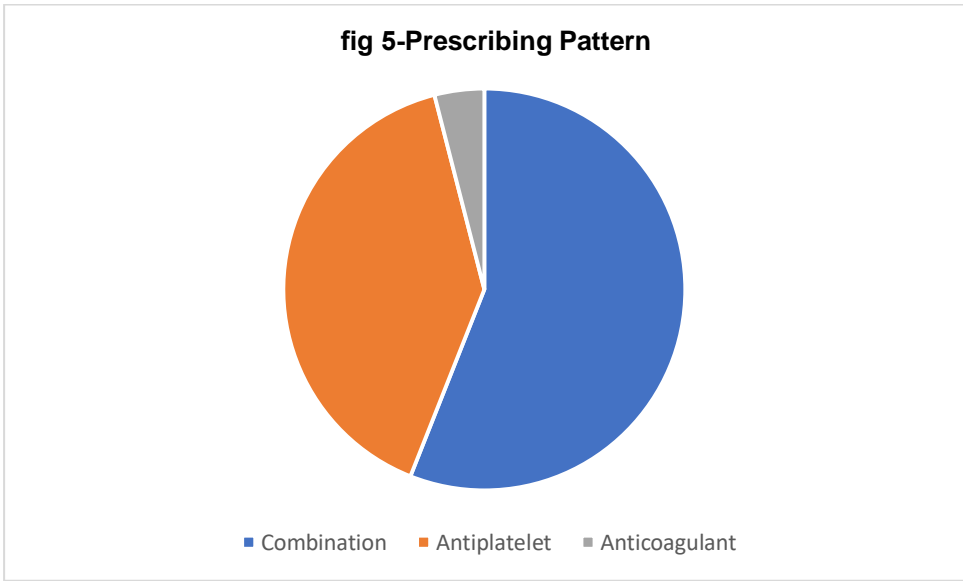


### 3.5 Prescribing Pattern

Out of 115 patients in our study, 46 (40%) patients were prescribed antiplatelet, 5(4%) patients were prescribed anticoagulants, and 64(56%) patients were prescribed with combination of antiplatelets and anticoagulants.

Class	Number of patients
Combination	64(56%)
Antiplatelet	46(40%)
Anticoagulant	5(4%)

**TABLE NO.5 Prescribing Pattern**



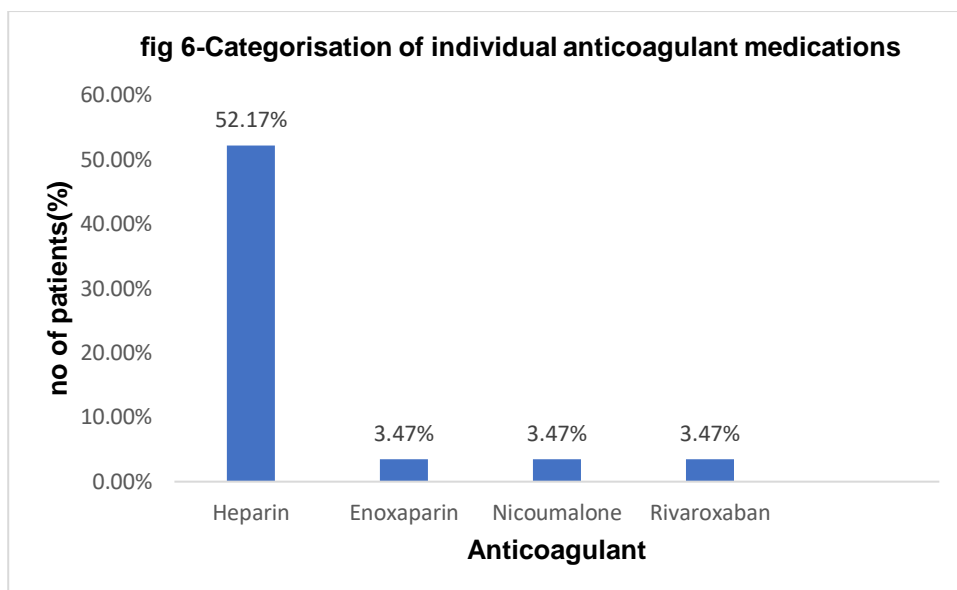
**TABLE NO.5 Prescribing Pattern**

### 3.6 Categorisation of individual anticoagulant medications

The most commonly prescribed individual anticoagulant drugs were heparin 60 (52.17%), followed by enoxaparin 4 (3.47%), and the least prescribed individual anticoagulant drugs were nicoumalone 1(0.86%) and rivaroxaban 1 (0.86%).

Anticoagulant	Number of Patients
Heparin	60(52.17%)
Enoxaparin	4(3.47%)
Nicoumalone	1(0.86%)
Rivaroxaban	1(0.86%)

**TABLE NO 6: Categorisation of individual anticoagulant medications**

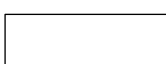
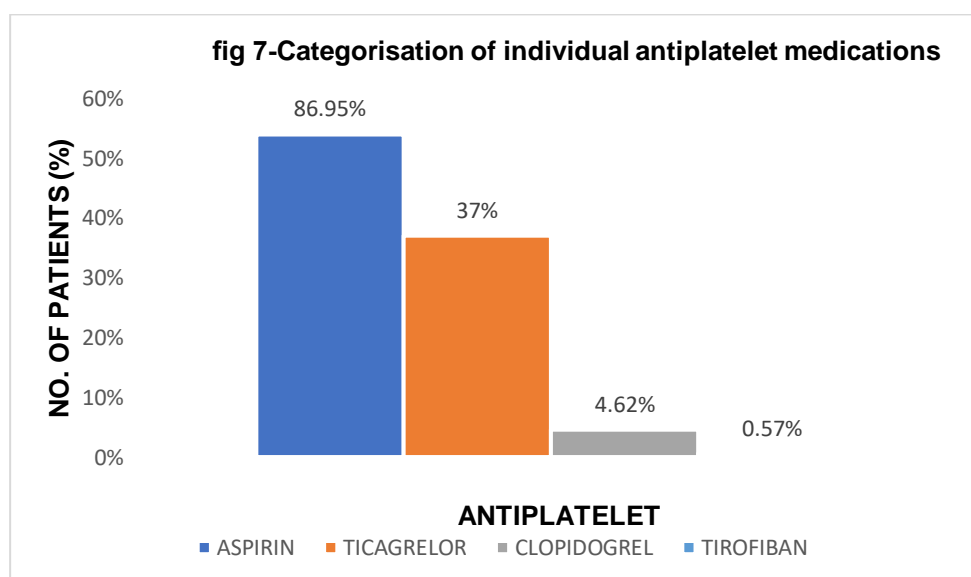


### 3.7 Categorisation of individual antiplatelet medications

The most commonly prescribed individual antiplatelet drugs were found to be aspirin 100(82.6%), followed by ticagrelor 65(37%), clopidogrel 8(4.62%), and the least prescribed individual antiplatelet drug was tirofiban 1(0.57%).

Antiplatelet	Number of Patients
Aspirin	100(86.95%)
Ticagrelor	65(37%)
Clopidogrel	8(4.62%)
Tirofiban	1(0.57%).

**TABLE NO 7: Categorisation of individual antiplatelet medications**

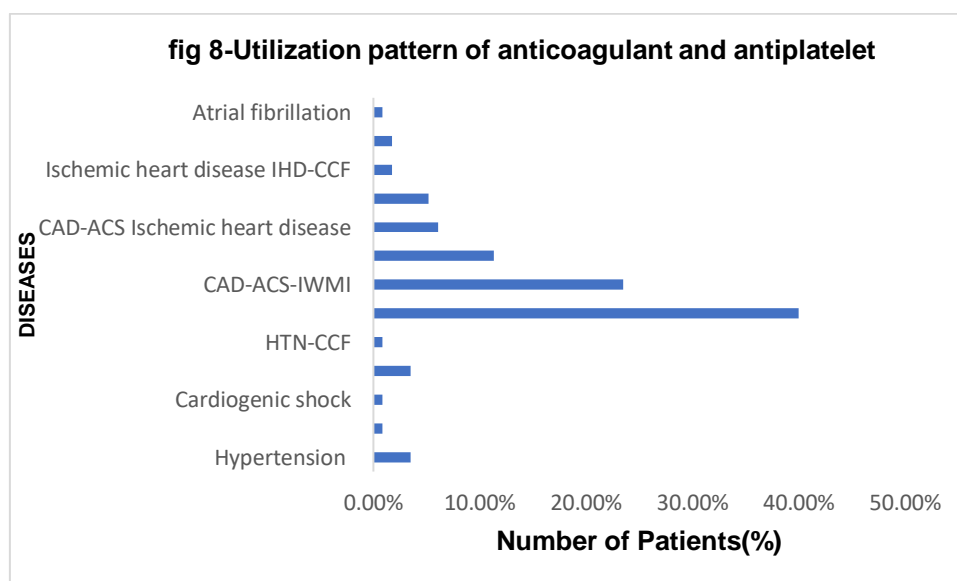


### 3.8 Utilization pattern of anticoagulants and antiplatelets

The Utilization of antiplatelets was found to be highest in hypertension (4, 3.47%) and lowest in cerebrovascular accident-hypertension (1, 0.86%) and cardiogenic shock (1, 0.86%). Anticoagulant drugs were most commonly prescribed in coronary artery disease-acute coronary syndrome-inferior wall myocardial infarction 4(3.48%). Least in hypertension-congestive cardiac failure 1(0.86%). Combination of anticoagulant and antiplatelet was most commonly prescribed in coronary artery disease-acute coronary syndrome -anterior wall myocardial infarction 46(40%) followed by coronary artery disease-acute coronary syndrome-inferior wall myocardial infarction 27(23.47%), congestive cardiac failure 13(11.30%), coronary artery disease-acute coronary syndrome 7(6.08%), ischemic heart disease 6(5.21%), ischemic heart disease-coronary heart disease-acute pulmonary oedema 2(1.73%), ischemic heart disease- congestive cardiac failure and least commonly prescribed in atrial fibrillation 1(0.86%).

Drugs	Diagnosis	Number of Patients
Antiplatelet	Hypertension	4(3.47%)
	CVA-HTN	1(0.86%)
	Cardiogenic shock	1(0.86%)
Anticoagulant	CAD-ACS-IWMI	4(3.48%)
	HTN-CCF	1(0.86%)
Combination	CAD-ACS-AWMI	46(40%)
	CAD-ACS-IWMI	27(23.47%)
	Congestive cardiac failure	13(11.30%)
	CAD-ACS	7(6.08%)
	Ischemic heart disease	6(5.21%)
	IHD-CHD-APO	2(1.73%)
	IHD-CCF	2(1.73%)
	Atrial fibrillation	1(0.86%)

**TABLE NO 8: Utilization pattern of anticoagulant and antiplatelet**



#### 4. Discussion

A prospective observational study was conducted over six months among participants aged 18 years and older who were prescribed anticoagulant and antiplatelet drugs to manage cardiovascular diseases and were admitted to Siddaganga Hospital. Relevant articles related to the study were systematically collected and reviewed. A comprehensive study protocol, informed consent form, and data collection form were developed and submitted to the Institutional Review Board (IRB) at SMCRI. Following their guidance, necessary corrections were made. Subsequently, the protocol was presented to the Institutional Ethics Committee, and ethical approval was granted. Participants were selected according to the defined inclusion and exclusion criteria. Before the initiation of the study, informed consent was obtained from all participants. Once participants' consent was secured, data were gathered using a pre-designed data collection form, which included:

- i. Socio-demographic details: name, age, sex, and IP number.
- ii. Clinical evaluation:
  - Patients prescribed anticoagulants and antiplatelet drugs for cardiovascular diseases were observed for utilization patterns.
  - Laboratory tests (PT, INR, and platelet count) were collected to assess the community's
  - The primary outcome of the study was to evaluate the utilization pattern of anticoagulant and antiplatelet drugs in the cardiology department.
  - The collected data were presented in graphs and tables using MS Excel, and a report was submitted.

Among 115 cases in our study, a higher prevalence of cardiovascular disease was observed in males (63%) compared to females (37%). Similarly, a study conducted by Muneeshwar Reddy T et al. (2018), involved a sample of 200 subjects, comprising 113 males (65.5%) and 69 females (34.5%). Individuals aged 18 years or older were included in the study, with the majority belonging to the 60–69-year age group. These results align with the study conducted by Sonal Vyas et al. (2022), which also found that the majority of patients were aged between 60 and 69 years.

In our study, out of the 115 patients observed, the majority were suffering from CAD-ACS-AWMI (40%), followed in prevalence by CAD-ACS-IWMI (25.21%), CCF (12%), CAD-ACS (6.08%), IHD (5.21%), HTN (4.34%), IHD-CVA-HTN (1.73%), HTN-CHD-APO (1.73%), and the least observed were atrial fibrillation (0.86%) and cardiogenic shock (0.86%). However, these findings do not align with the prospective observational study conducted by Muneeshwar Reddy T et al. (2018), where Hypertension (33.4%) was the most prevalent condition observed, followed by coronary artery disease (21%), congestive cardiac failure (9.6%), dilated cardiomyopathy and myocardial infarction (7.4% each), atrial fibrillation and cor pulmonale (6.17%), ischemic cardiomyopathy (4.9%), and other conditions, which were the least common at 3.7%

Among the 115 patients, the platelet count was the most frequently performed laboratory investigation, conducted for 90.9% of the patients, while INR and PT testing were the least performed, with only 4.5% respectively of patients undergoing these tests. This differs from the prospective observational study conducted by Shivashankar V et al. (2002), where PT, APTT, and INR were performed; PT (67.16%) was more commonly tested than APTT and INR.

In our study of 115 patients, we observed that a combination of both anticoagulant and antiplatelet therapy was the most commonly prescribed treatment, accounting for 56% of cases. This was followed by 40% of patients receiving only antiplatelet therapy, and 4% being prescribed anticoagulants alone, indicating that combination therapy was preferred over either treatment alone. Our results align with the findings reported by Sonal Vyas et al. (2022), who reported that 52.30% of

patients were prescribed combination therapy. In contrast, single therapy with anticoagulants was more commonly prescribed (47.60%) compared to antiplatelet therapy (54%, 25.70%).

Aspirin (86.95%) was the most commonly prescribed antiplatelet medication, used by 54% of patients, followed by ticagrelor, which was prescribed to 37%. Among the less commonly used antiplatelet agents were clopidogrel (4.62%), and tirofiban (0.57%). This pattern of medication use was also noted in a study conducted by Sonal Vyas et al. (2022), where the highest prescribed antiplatelets were aspirin (75.71%), followed by ticagrelor (59.52%), clopidogrel (27.14%), and tirofiban (32.90%). Regarding anticoagulants, heparin was the most widely prescribed, that is 99.90% of patients, while enoxaparin was prescribed to 6.06%. Rivaroxaban and nicoumalone were prescribed to a small number of patients, each at 1.51%. This medication usage pattern was similarly reflected in a study by Shahrzad Raouf et al. (2021), where heparin (34.28%) and enoxaparin (29%) were the most commonly prescribed anticoagulant therapies.

Our study has provided additional results highlighting the utilization patterns of anticoagulants and antiplatelets in cardiovascular diseases. Antiplatelet use was observed most frequently among patients with hypertension, while it was least common in cases involving cerebrovascular events with hypertension and cardiogenic shock. Anticoagulants were predominantly used in coronary artery disease with acute coronary syndrome, particularly inferior wall myocardial infarction, and were less common in hypertension with heart failure. The combined use of both was especially prevalent in anterior and inferior wall myocardial infarctions, with lower usage in heart failure, acute coronary syndromes, and ischemic heart disease, and the least in atrial fibrillation.

## 5. CONCLUSION

A prospective cross-sectional study was conducted to evaluate the utilization patterns of anticoagulant and antiplatelet drugs in the cardiology department. A total of 115 cases were included in the study, meeting the specified inclusion criteria. Demographic details such as age, sex, and treatment specifics were recorded in a pre-designed patient profile form. Overall, we primarily observed that coronary artery disease- acute coronary syndrome- anterior wall myocardial infarction is the most common cardiovascular condition, affecting 40% of patients. Drug utilization patterns show that a combination of antiplatelet and anticoagulant therapies (56%) was widely prescribed for cardiovascular diseases. Aspirin (86.95%) is the most frequently prescribed antiplatelet, while heparin (52.17%) is the most commonly used anticoagulant for treating cardiovascular disease. Laboratory investigations showed that most patients had their platelet counts checked, but fewer had their International Normalized Ratio and Prothrombin Time levels tested.

A clinical pharmacist plays a vital role in ensuring the appropriate selection and dosing of anticoagulant and antiplatelet therapies based on individual patient needs and clinical guidelines. The pharmacist is responsible for maintaining therapeutic effectiveness through continuous patient assessment. They also collaborate with the healthcare team to recommend adjustments in treatment regimens, contributing to optimal therapeutic outcomes. Additionally, the clinical pharmacist reviews laboratory test results, including platelet count and INR.

## 6. RECOMMENDATIONS/ CLARIFICATIONS/ SUGGESTIONS

- A) A study should be conducted in various healthcare centres instead of conducted in one tertiary care hospital.
- B) Can be conducted in geriatric patients.
- C) The study may further include the comparison between newly prescribed patients and old patients.
- D) The study may be carried out focusing on a particular drug.

## 7. STRENGTHS AND LIMITATIONS

**Strength:**

- A) The study includes a comparison between drugs according to disease-specific.
- B) Study evaluates the utilization pattern of anticoagulant and antiplatelet agents used in the cardiology department.
- C) The study assessed the common cardiovascular disease.
- D) Study conducted on a specific age group and department.

**Limitations:**

- A) Prothrombin time, International Normalized Ratio are not performed for all the patients.
- B) Study conducted in only one health care centre.
- C) A study was not conducted on geriatric patients.
- D) A specific single drug was not focused in our study.

**DISCLAIMER (ARTIFICIAL INTELLIGENCE)**

Author(s) affirm that they did not utilize any generative AI tools such as Large Language Models like (ChatGPT, Deep seek, Perplexity) at any stages of writing or preparing the manuscript.

**CONSENT AND ETHICAL APPROVAL**

The study was reviewed and approved by the Institutional Ethics Committee (IEM) of Sree Siddaganga Medical College and Research Institute (SMCRI), and all the participants gave their study protocol and informed consent to take part in the research.

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