Utilization Patterns of Anticoagulant and Antiplatelet Drugs in Cardiovascular Patients at 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 (heart attack), angina pectoris, coronary heart disease, and stroke. Optimizing the use of these medications is crucial for improving patient outcomes and reducing associated risks. This study was conducted to evaluate the prescribing patterns and safety profiles of these agents in patients admitted to the cardiology department of a tertiary care hospital.

Objective: To evaluate the utilization patterns and safety profiles of anticoagulant and antiplatelet drugs administered to cardiac patients in the cardiology department.

Methodology: A prospective cross-sectional study was conducted over six months at Siddaganga Hospital, involving 115 patients admitted to the cardiology department and prescribed anticoagulants and antiplatelet for cardiovascular diseases.

Results: Of the 115 cases, cardiovascular disease was more prevalent in males (63%) than in females (37%). Most patients affected by cardiovascular disease belonged to the 60–69 age group (36.5%). The most common diagnosis among patients was CAD-ACS-AWMI (31.3%). Of the 115 patients, 40% received antiplatelet medications, 4.34% received anticoagulants, and 55.65% were treated with a combination of both. Aspirin (86.25%) was the most commonly prescribed antiplatelet, while heparin (52.17%) was the most frequently used anticoagulant. Of the 115 patients, 110 underwent laboratory investigations, with most undergoing platelet count testing.

Conclusion: Our study concludes that anticoagulants and antiplatelet drugs are crucial in preventing complications and managing cardiovascular diseases. Combination therapy was preferred, with antiplatelet drugs prescribed more frequently 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

The World Health Organization (WHO) defines cardiovascular disease (CVD) as a group of disorders affecting the heart and blood vessels, including coronary heart disease, myocardial infarction, angina, stroke, and congenital heart disease (Jack Stewart et al., 2017).

Cardiovascular disease remains the leading cause of death worldwide, with its global burden steadily increasing over the years. Since 1990, global deaths due to cardiovascular diseases have risen from 14.4 million to 17.5 million. In India, annual cardiovascular-related deaths increased from 2.20 million in 1990 to 4.77 million in 2020 (Sonal Vyas et al., 2022).

According to WHO, drug utilization refers to the marketing, distribution, prescription, and use of drugs within a society, highlighting the medical, social, and economic aspects that influence medication 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 drugs used to prevent or reduce the formation of blood clots within the circulatory system. Although they do not dissolve existing clots, they help prevent new clots from forming and inhibit the growth of existing ones (Vijay et al., 2015).

Anticoagulants are primarily used to manage serious conditions such as myocardial infarction, angina, stroke, pulmonary embolism, and rheumatic heart disease. Low molecular weight heparin, unfractionated heparin, fondaparinux, and warfarin are generally used as parenteral anticoagulants. Recently, several oral anticoagulants have been introduced, including direct thrombin inhibitors (e.g., dabigatran) and factor Xa inhibitors such as apixaban, edoxaban, and rivaroxaban (Shahrzad et al., 2021).

Antiplatelet drugs inhibit platelet function to prevent blood clot formation and are commonly used to reduce the risk of cardiac events. Aspirin, clopidogrel, ticagrelor, and prasugrel are the most commonly used antiplatelet drugs. Aspirin irreversibly inhibits cyclooxygenase (COX) activity, thereby preventing platelet activation. Clopidogrel blocks the binding of adenosine diphosphate (ADP) to the P2Y12 receptor on platelets, thereby inhibiting ADP-mediated activation of the GP IIb/IIIa complex (Suney et al., 2022).

Combining antiplatelet and anticoagulant therapy is more effective than monotherapy in managing cardiac events. Both anticoagulants and antiplatelet agents carry a risk of increased 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).

Therefore, this study was conducted to assess the utilization patterns of anticoagulant and antiplatelet drugs in the treatment of cardiovascular diseases, to optimize their use and minimize bleeding risks.

Need of the study:

- To evaluate the use of anticoagulant and antiplatelet drugs in the management of cardiovascular diseases.
- To enhance patient care and reduce the risk of complications.
- To assess the safety profiles of various anticoagulant and antiplatelet drugs administered to cardiac patients.

2. MATERIALS AND METHODS

2.1. Study design:

A prospective cross-sectional study was conducted in the Department of Cardiology at Sree Siddaganga Medical College and Research Institute (SMCRI), Tumakuru District, Karnataka, over six months from 21st March 2024 to 28th September 2024. The study commenced after obtaining approval from the Institutional Ethics Committee of SMCRI (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 a 95% CI.

d = 5%, absolute precision value.

p = 7.6% = 0.076, population proportion.

Now, substituting these values in a given equation

We derive,

n = [(1.96)2×0.076(1-0.076)]/ (0.05)2

= 107.909

= 108

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:

Chart 1: Study criteria

Inclusion criteria	Exclusion criteria
• Male and female patients aged above 18 years. • Patients who were prescribed anticoagulant or antiplatelet medications in the Department of Cardiology	• Patients with non-cardiovascular comorbidities. • Patients who did not provide informed consent.

2.5. Sampling method: Convenient sampling method.

2.6. Material used: The study utilized a patient informed consent form, participant information sheet, patient case sheet, and a 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 based on a review of relevant literature, and ethical approval was obtained prior to the commencement of data collection. Patients were enrolled according to predefined inclusion and exclusion criteria. Information regarding anticoagulant and antiplatelet prescriptions for the management of cardiovascular disease was extracted from inpatient case sheets. The collected data were assessed to evaluate the utilization patterns of anticoagulant and antiplatelet drugs in cardiac patients. Data were systematically organized and presented using graphs and tables in Microsoft Excel, and a final report was compiled and submitted.

3. RESULTS

3.1 Distribution based on gender

A total of 115 patients were included during the study period. Table 1 presents the gender-wise distribution of the patients. The number of male patients was higher, with 72 (63%), compared to 43 female patients (37.39%).

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

Table 1: Distribution based on gender

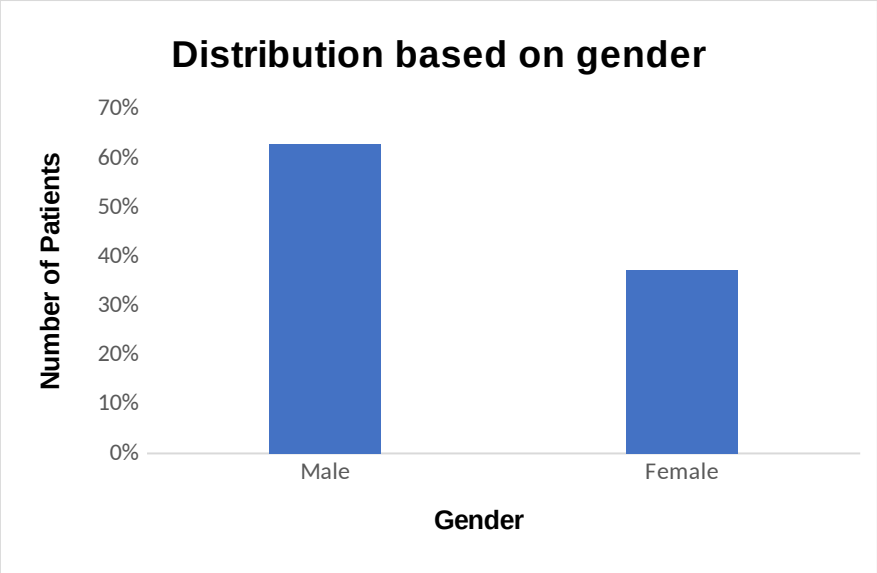

Figure 1

3.2 Categorisation Based on Age

In our study, the highest number of patients belonged to the 60–69 age group (36.50%), followed by 50–59 (27.82%), 70–79 (19.13%), 40–49 (11.30%), and 30–39 (4.34%). The lowest number of patients was observed in the 18–29 age group (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

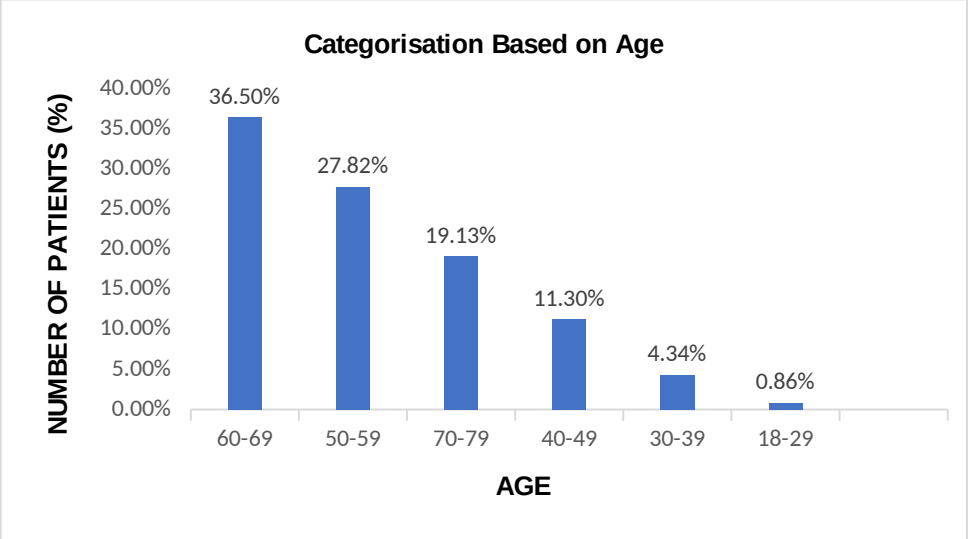

Figure 2

3.3 Distribution of patients based on diagnosis

Various types of cardiovascular diseases (CVDs) were observed during the study. The most commonly reported condition was coronary artery disease–acute coronary syndrome–anterior wall myocardial infarction (46, 40%), followed by coronary artery disease–acute coronary syndrome–inferior wall myocardial infarction (29, 25.21%). Other diagnoses included congestive cardiac failure (14, 12.17%), coronary artery disease–acute coronary syndrome (7, 6.08%), ischemic heart disease (6, 5.21%), and hypertension (5, 4.34%). Less frequent conditions included ischemic heart disease with cerebrovascular accident and hypertension (2, 1.73%) and hypertension with congenital heart disease and acute pulmonary oedema (2, 1.73%). The least common diagnoses were 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

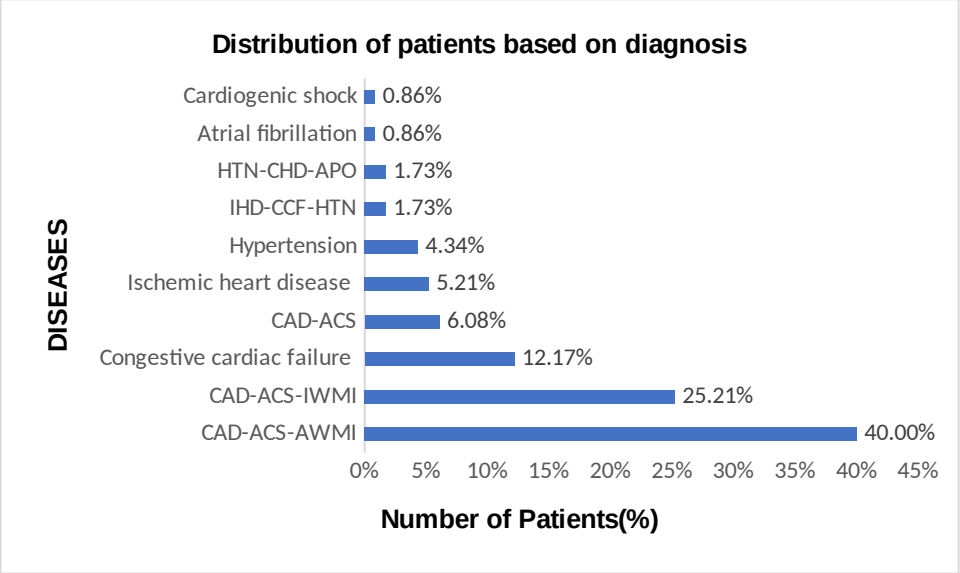

Figure 3

3.4 Assessment of laboratory investigation

Out of 115 patients, 110 underwent laboratory investigations. Among them, 90.9% had a platelet count performed, while 4.5% had their International Normalised Ratio (INR) and prothrombin time levels tested.

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

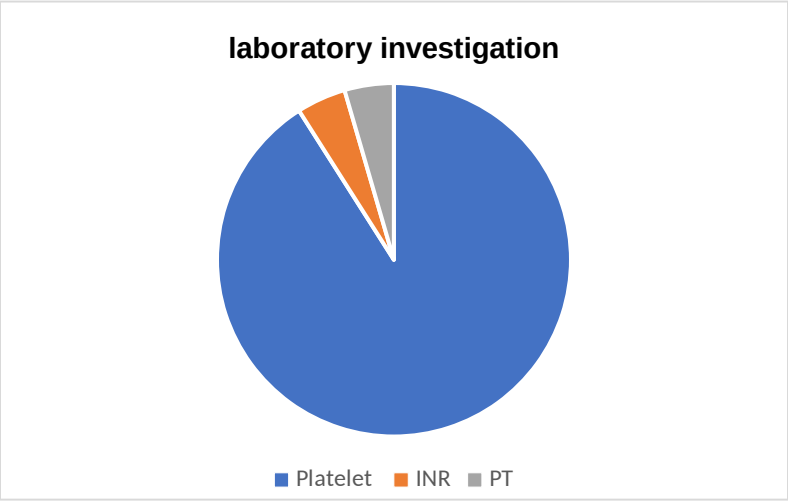

Figure 4

3.5 Prescribing Pattern

Out of 115 patients in our study, 46 (40%) were prescribed antiplatelets, 5 (4%) were

prescribed anticoagulants, and 64 (56%) received a combination of both antiplatelets and anticoagulants.

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

TABLE NO.5 Prescribing Pattern

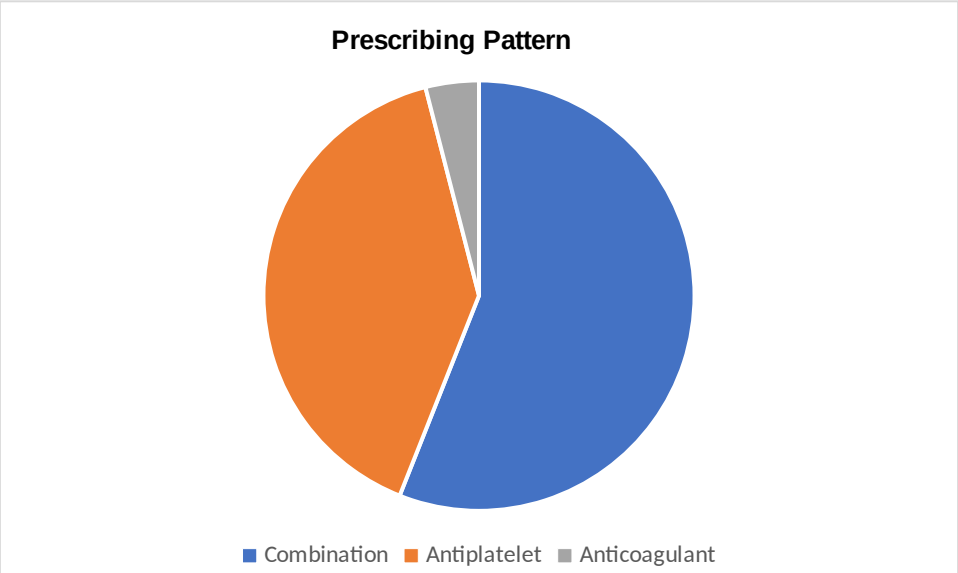

Figure 5

3.6 Categorisation of individual anticoagulant medications

The most commonly prescribed individual anticoagulant was heparin (60, 52.17%), followed by enoxaparin (4, 3.47%). The least prescribed anticoagulants 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

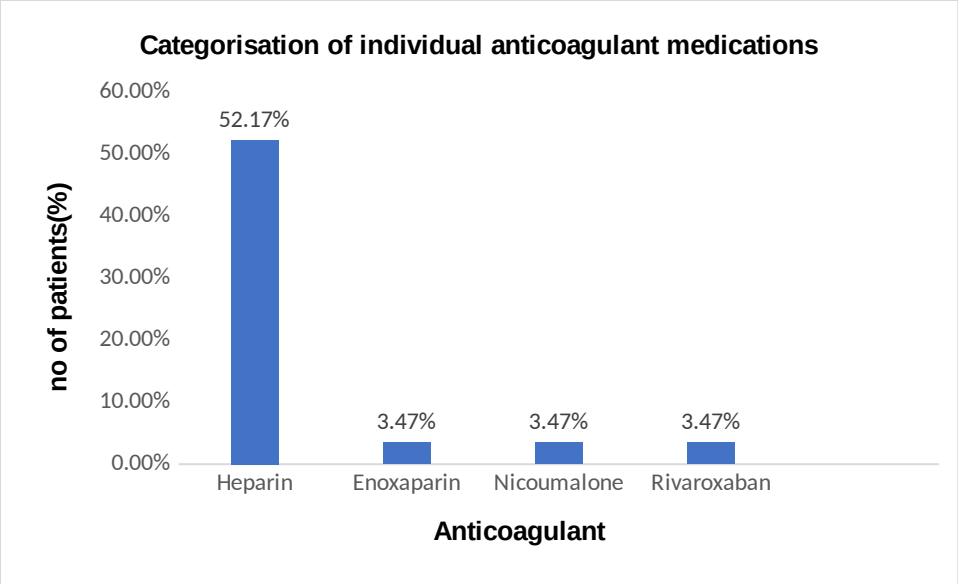

Figure 6

3.7 Categorisation of individual antiplatelet medications

The most commonly prescribed individual antiplatelet drug was aspirin (100, 86.95%), followed by ticagrelor (65, 37%) and clopidogrel (8, 4.62%). The least prescribed antiplatelet 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

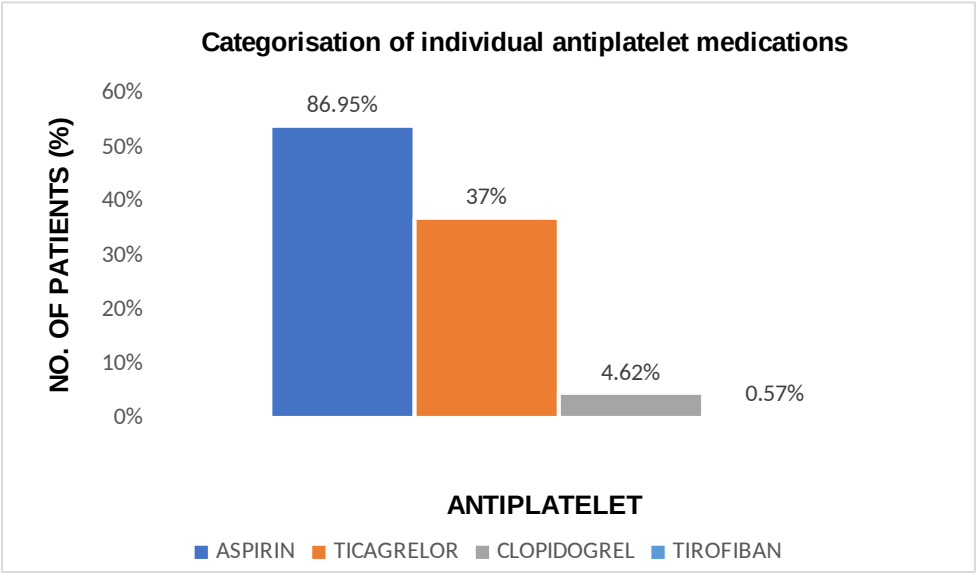

Figure 7

3.8 Utilization pattern of anticoagulants and antiplatelets

The utilization of antiplatelets was highest in patients with hypertension (4, 3.47%) and lowest in those with cerebrovascular accident combined with hypertension (1, 0.86%) and cardiogenic shock (1, 0.86%). Anticoagulants were most frequently prescribed for patients with coronary artery disease–acute coronary syndrome–inferior wall myocardial infarction (4, 3.48%) and least for those with hypertension and congestive cardiac failure (1, 0.86%).

The combination of anticoagulants and antiplatelets was most commonly prescribed for coronary artery disease–acute coronary syndrome–anterior wall myocardial infarction (46, 40%), followed by inferior wall myocardial infarction (27, 23.47%), congestive cardiac failure (13, 11.30%), acute coronary syndrome (7, 6.08%), ischemic heart disease (6, 5.21%), and ischemic heart disease with congenital heart disease and acute pulmonary oedema (2, 1.73%). This combination was also prescribed for patients with ischemic heart disease and congestive cardiac failure, and least commonly for those with 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

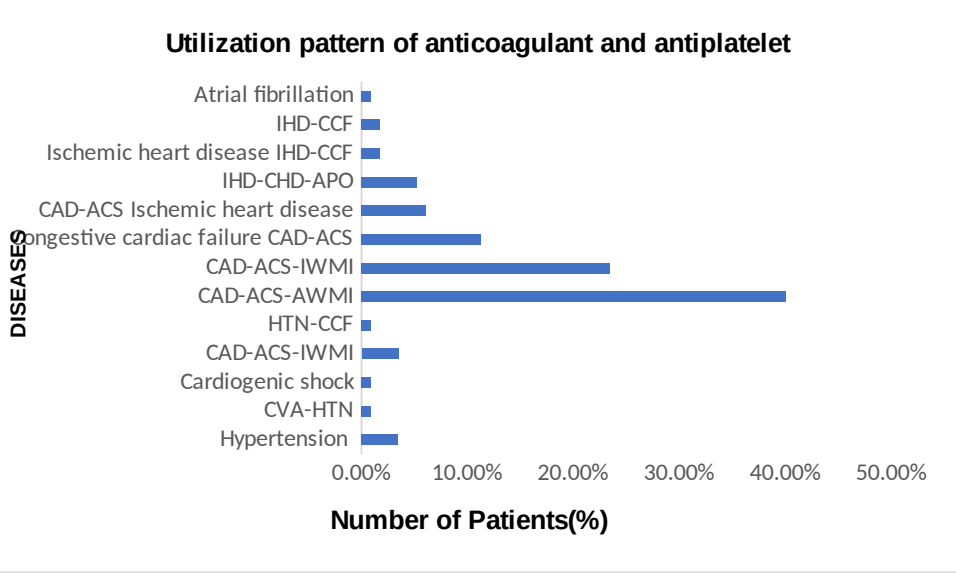

Figure 8

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 for managing 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 feedback, necessary corrections were made. The protocol was then presented to the Institutional Ethics Committee, and ethical approval was granted. Participants were selected according to the defined inclusion and exclusion criteria. Before the study began, informed consent was obtained from all participants. Once participants' consent was secured, data were collected 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 conducted to assess the community's health.
- 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 the 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 findings align with the study conducted by Sonal Vyas et al. (2022), which also reported 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 Coronary Artery Disease - Acute Coronary Syndrome - Anterior Wall Myocardial Infarction (40%), followed in prevalence by Coronary Artery Disease - Acute Coronary Syndrome - Inferior Wall Myocardial Infarction (25.21%), Congestive Cardiac Failure (12%), Coronary Artery Disease - Acute Coronary Syndrome (6.08%), Ischemic Heart Disease (5.21%), Hypertension (4.34%), Ischemic Heart Disease - Cerebrovascular Accident - Hypertension (1.73%), Hypertension - Congenital Heart Disease - Acute Pulmonary Oedema (1.73%), with the least observed being 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), in which 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 test, conducted on 90.9% of the patients, while INR and PT testing were performed the least, with only 4.5% of patients undergoing each of these tests. This contrasts with the prospective observational study conducted by Shivashankar V et al. (2002), in which PT, APTT, and INR were tested; PT (67.16%) was tested more commonly than APTT and INR.

In our study of 115 patients, we observed that combination therapy with both anticoagulants and antiplatelets was the most commonly prescribed treatment, accounting for 56% of cases. Next, 40% of patients received only antiplatelet therapy, and 4% were prescribed anticoagulants alone, suggesting a preference for combination therapy over monotherapy. Our results align with the findings of Sonal Vyas et al. (2022), who found that 52.30% of patients were prescribed combination therapy. In contrast, monotherapy with anticoagulants (47.60%) was more commonly prescribed than antiplatelet therapy (25.70%).

Aspirin was the most commonly prescribed antiplatelet medication, used by 86.25% of patients, followed by ticagrelor, prescribed to 37% of patients. The less commonly used antiplatelet agents included clopidogrel (4.62%) and tirofiban (0.57%). This pattern of medication use was similarly observed in a study conducted by Sonal Vyas et al. (2022), where the most commonly prescribed antiplatelets were aspirin (75.71%), followed by ticagrelor (59.52%), clopidogrel (27.14%), and tirofiban (32.90%).

In a single antiplatelet therapy strategy, ticagrelor is preferred as the second most commonly prescribed antiplatelet after Cardioaspirin (aspirin), rather than clopidogrel, as it offers superior efficacy in certain clinical contexts, particularly in patients with acute coronary syndrome (ACS). This preference is supported by results from major clinical trials, such as the PLATO study, which demonstrated that ticagrelor significantly reduces cardiovascular events compared to clopidogrel in ACS patients, without a significant increase in the risk of major bleeding, conducted by Wallentin et al., (2009). The study found that ticagrelor therapy was associated with a greater reduction in the rate of cardiovascular death, myocardial infarction, and stroke, making it a more effective choice for high-risk ACS patients.

Regarding anticoagulants, heparin was the most widely prescribed, accounting for 99.90% of patients, while enoxaparin was prescribed to 6.06%. Rivaroxaban and nicoumalone were prescribed to fewer patients, each at 1.51%. This medication usage pattern was similarly observed 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 highlighted additional insights into 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 patients with cerebrovascular events complicated by hypertension and cardiogenic shock. Anticoagulants were predominantly used in patients with coronary artery disease and acute coronary syndrome, particularly in inferior wall myocardial infarction, and were less common in hypertension complicated by heart failure. The combined use of both medications was particularly prevalent in anterior and inferior wall myocardial infarctions, while it was less common in heart failure, acute coronary syndromes, and ischemic heart disease, and least common in atrial fibrillation.

We primarily observed that coronary artery disease, particularly acute coronary syndrome (ACS) and anterior wall myocardial infarction, was the most prevalent cardiovascular condition in our cohort. Aspirin (86.95%) was the most frequently prescribed antiplatelet agent, while heparin (52.17%) was the most commonly used anticoagulant. This treatment pattern may indicate undertreatment, as current clinical guidelines recommend the use of dual antiplatelet therapy (DAPT) in combination with anticoagulation for patients with ACS-STEMI. This approach is supported by recent findings from Patail et al. (2023), who emphasize that combining DAPT with anticoagulants enhances clinical outcomes in ACS patients, particularly those undergoing percutaneous coronary intervention (PCI), by reducing thrombotic events while managing bleeding risk.

Antiplatelet use was most frequently observed among patients with hypertension, which may indicate overtreatment, as only well-stratified high-risk individuals with hypertension are likely to benefit from single antiplatelet therapy. This observation is supported by a study conducted by Del Pinto et al. (2022), which reported that aspirin was frequently over-prescribed to hypertensive patients without

adequate cardiovascular risk assessment. The inappropriate use of aspirin in low-risk cases may increase the likelihood of adverse effects, such as bleeding, underscoring the need for more personalized and evidence-based prescribing practices.

5. CONCLUSION

A prospective cross-sectional study evaluated the utilization patterns of anticoagulant and antiplatelet drugs in the cardiology department. A total of 115 cases were included based on predefined inclusion criteria. Demographic details such as age, sex, and treatment specifics were recorded using a standardized patient profile form.

The most common cardiovascular condition observed was coronary artery disease, specifically acute coronary syndrome with anterior wall myocardial infarction, affecting 40% of patients. Drug utilization patterns revealed that combination therapy with antiplatelet and anticoagulant agents was commonly prescribed, accounting for 56% of cases. Among antiplatelet drugs, aspirin was the most frequently used (86.95%), while heparin was the most commonly prescribed anticoagulant (52.17%).

Laboratory investigations showed that platelet counts were routinely measured in most patients. However, fewer patients had their International Normalized Ratio (INR) and Prothrombin Time (PT) levels assessed.

While medical doctors are primarily responsible for diagnosing conditions and initiating overall treatment plans, pharmacists play a crucial role in selecting and dosing anticoagulant and antiplatelet therapies due to their specialized expertise in pharmacology, drug interactions, and patient-specific factors. These medications have narrow therapeutic windows, complex dosing requirements, and carry significant risks of bleeding or clotting if not managed properly.

Pharmacists are specifically trained to assess kidney and liver function, evaluate drug interactions, consider body weight, and interpret other clinical parameters that affect safe and effective dosing. Additionally, they are responsible for ensuring adherence to current clinical guidelines, adjusting doses based on laboratory values (such as INR or renal clearance), and providing patient counselling to help prevent adverse events.

In many healthcare settings—especially hospitals and anticoagulation clinics—pharmacists work closely with physicians in a collaborative model to optimize therapy. This partnership allows physicians to concentrate on diagnosis and overall patient management while pharmacists ensure the safe and effective use of high-risk medications like anticoagulants and antiplatelets.

6. RECOMMENDATIONS/ CLARIFICATIONS/ SUGGESTIONS

A) The study should be conducted across multiple healthcare centers rather than being limited to a single tertiary care hospital.
B) It can also be conducted specifically in geriatric patients.
C) The study may include a comparison between newly prescribed patients and those already undergoing treatment.
D) Alternatively, the study could focus on a specific drug for more detailed analysis.

7. STRENGTHS AND LIMITATIONS

Strengths:

A) The study includes a drug comparison based on specific cardiovascular conditions.

B) It evaluates the utilization patterns of anticoagulant and antiplatelet agents in the cardiology department.

C) The study assesses the prevalence and treatment of common cardiovascular diseases.

D) It was conducted on a defined age group within a specific department, allowing focused analysis.

Limitations:

A) Prothrombin Time (PT) and International Normalized Ratio (INR) were not performed for all patients.

B) The study was limited to a single healthcare center.

C) Geriatric patients were not included in the study population.

D) The study did not focus on any single specific drug.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

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

CONSENT AND ETHICAL APPROVAL

The study was reviewed and approved by the Institutional Ethics Committee (IEC) of Sree Siddaganga Medical College and Research Institute (SMCRI), and all participants provided informed consent to participate in the research in accordance with the approved study protocol.

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The authors declare that they have no competing interests related to this research.

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