International Journal of Pharmaceutical Research and Applications
Volume 9, Issue 6 Nov - Dec 2024, pp: 767-775 www.ijprajournal.com ISSN: 2456-4494

Comparative Study between Clopidogrel and Prasugrel in Acute Coronary Syndrome for Patients Undergoing Ptca

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Date of Submission: 01-12-2024 Date of Acceptance: 10-12-2024

ABSTRACT:
Antiplatelet agents are the cornerstone of treatment for patients with acute coronary syndrome (ACS) undergoing Percutaneous transluminal coronary angioplasty (PTCA)

AIM: To study comprehensively by conducting an observational comparative study between clopidogrel and prasugrel in ACS patients with scheduled Percutaneous transluminal coronary angioplasty.

OBJECTIVE: The objective of this study was to compare the effectiveness of Prasugrel & Clopidogrel in the patients with acute coronary syndromes undergoing PCI by measuring bleeding risk (major and minor) ischemic events and other outcomes after loading and maintenance dose of both the drugs. The patients were also assessed for safety and efficacy.

METHODOLOGY: A cross-sectional study was conducted which comprised of 120 participants who are undergoing PTCA procedure with Acute coronary syndrome patients were assessed for the primary safety and efficacy endpoint that is major bleeding events, ischemic events and in secondary endpoint patients were observed for the incident of nonfatal MI, nonfatal stroke, re hospitalization, revascularization due to cardiac ischemic events at days 30 and 90 during the study.

RESULTS: The study included 120 ACS patients undergoing PTCA, divided into two groups: Group 1 (prasugrel) and Group 2 (clopidogrel). Key demographic factors assessed were age, weight, gender, and clinical presentation of ACS. Among prasugrel recipients (58 patients), outcomes showed effective prevention of ischemic and bleeding events. In contrast, 20 of the 62 patients on clopidogrel experienced complications such as ischemic events, minor bleeds, chest discomfort, and required hospital revisits for symptom evaluation.

CONCLUSION: In conclusion, this study highlights the superior clinical outcomes associated with prasugrel compared to clopidogrel in ACS patients undergoing PTCA, particularly in reducing ischemic and bleeding events. The Use of prasugrel to better approximate a patient's ischemic risk may yield a more appreciable therapeutic benefit, a hypothesis that needs further study.

KEYWORDS: Acute coronary syndrome, PTCA, Effectiveness, Safety, Tolerability, ischemic events, bleeding risk, stent thrombosis.

I. INTRODUCTION

Acute coronary syndrome (ACS) represents a spectrum of conditions associated with sudden, reduced blood flow to the heart, typically caused by atherosclerotic plaque rupture or erosion, leading to partial or complete occlusion of the coronary arteries. As a significant contributor to morbidity and mortality worldwide, encompassing unstable angina (UA), non-ST-segment elevation myocardial infarction (NSTEMI), and ST-segment elevation myocardial infarction (STEMI), represents a spectrum of life-threatening cardiovascular conditions that necessitate urgent medical intervention. Percutaneous transluminal coronary angioplasty (PTCA) is a widely employed revascularization technique for ACS patients, aiming to restore coronary blood flow and minimize myocardial damage. Despite the procedural success of PTCA, patients remain at risk for adverse thrombotic events such as stent thrombosis, myocardial infarction (MI), and cardiovascular death. Therefore, antiplatelet therapy plays a pivotal role in reducing these risks and improving patient outcomes post-PTCA.

Dual antiplatelet therapy (DAPT), consisting of aspirin and a P2Y12 receptor inhibitor, is the cornerstone of medical management in ACS patients undergoing PTCA. The inhibition of platelet activation and aggregation is crucial for preventing thrombotic complications, particularly in the context of stent

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placement. Historically, clopidogrel, a thienopyridine P2Y12 inhibitor, has been the most widely used agent in this setting. However, despite its established efficacy, clopidogrel's variable pharmacodynamic response has raised concerns regarding its reliability in certain patient populations.

Clopidogrel is a prodrug, a second-generation thienopyridine, has long been the mainstay in antiplatelet therapy for ACS patients due to its proven efficacy in reducing adverse cardiovascular events. However, clopidogrel requires hepatic bioactivation through the cytochrome P450 enzyme system, resulting in variable drug response and potential resistance in certain individuals. The variability in platelet inhibition and delayed onset of action have raised concerns regarding its effectiveness in high-risk populations undergoing PCI.

In contrast, prasugrel, a third-generation thienopyridine, was developed to overcome many of the limitations associated with clopidogrel. Prasugrel is also a prodrug but undergoes more efficient and consistent bioactivation, resulting in rapid and potent inhibition of the P2Y12 receptor. This leads to more predictable pharmacodynamics and greater platelet inhibition, reducing the risk of thrombotic events compared to clopidogrel. Clinical trials, such as the TRITON-TIMI 38 study, demonstrated that prasugrel significantly reduces the incidence of major adverse cardiac events (MACE), including MI, stent thrombosis, and cardiovascular death, in ACS patients undergoing PCI.

However, the enhanced potency of prasugrel comes with an increased risk of bleeding, especially in certain high-risk populations. Elderly patients (≥75 years), those with low body weight (<60 kg), and individuals with a history of stroke or transient ischemic attack (TIA) are particularly susceptible to prasugrel-associated bleeding complications. Therefore, careful patient selection is essential when considering prasugrel as part of DAPT, balancing the benefits of potent antiplatelet therapy against the potential for bleeding events.

Given the differences in pharmacokinetics, pharmacodynamics, and clinical outcomes between prasugrel and clopidogrel, there is a need for a comparative evaluation of these agents in ACS patients undergoing PTCA. This study aims to provide a comprehensive analysis of the efficacy and safety of prasugrel versus clopidogrel in this patient population, with a focus on major adverse cardiac events (MACE), including cardiovascular death, myocardial infarction, and stent thrombosis, as well as the incidence of bleeding complications. By understanding the relative advantages and risks of each drug, clinicians can make informed decisions regarding antiplatelet therapy, optimizing patient outcomes and minimizing complications post-PTCA.

II. MATERIAL AND METHOD

SOURCE OF DATA:

1. Case report form
2. Prescription of patients
3. Patient case sheet/medication chart.
4. Lab reports

STUDY DESING:

This is a prospective observational cross- sectional study.

STUDY DURATION:

6 Months.

STUDY CENTER:

Out-patient clinic and Inpatient wards of the Department of Cardiology in Kamineni Academy of Medical Sciences and Research Centreand Hospitals, L.B Nagar, Hyderabad.

INCLUSION CRITERIA:

- STEMI [Patients undergoing PTCA]
- NSTEMI [Patients undergoing PTCA]
- Unstable Angina [Patients undergoing PTCA)

EXCLUSIVE CRITERIA:

- Patients with increased risk of bleeding [Calculated by using HAS-BLED Score), SevereAnemia, thrombocytopenia.
- Elderly patients who are at risk of stroke, Past history of Stroke, Past history of head injury or trauma.
- Patients with Brain Tumors Intracranial changes.
- Patients with Age >75 and Weight less than 60kgs are Excluded.

METHOD OF COLLECTION OF DATA

STUDY TOOLS:

Self-designed case report form: A data collection form will be designed to collect subject's demographic and disease specific aspects.

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STUDY OF PROCEDURE:

Subjects meeting the inclusion and exclusion criteria would be identified during OP and IP by the Investigator. The investigator would obtain demographics and disease information on a self- designed case report form. The subjects would be briefed about the study and willingness to participate would be ascertained. The patients who are undergoing **PTCA** will be followed up for a duration of 6months, this information would help in obtaining information regarding tolerability, effectiveness and safety of given drugs those are clopidogrel and prasugrel, In Indian patients. The patient data collected, would be entered in an Excel sheet and relevant statistical analysis would be carried out.

STATISTICAL ANALYSIS:

Descriptive statistics was done by using SPSS Software to determine mean and standard deviation of collected data.

The statistical tool independent T-test performed to determine P-value between the different collected data.

SAMPLE SIZE:

All the patients of Acute coronary syndrome undergoing PTCA in the department of Cardiology during the study period of six months. (Sample Size = 120)

ETHICS AND CONSENT:

Institutional Ethical Committee of Kamineni Academy of Medical Sciences, Research Centre and Hospital approved the survey; Chairperson of Institutional Ethics Committee gave permission to conduct the study. The study participants received an overview of the research, and their willingness to participate was confirmed.

III. RESULTS:

A total of 120 patients with acute coronary syndrome (ACS) scheduled for percutaneous transluminal coronary angioplasty (PTCA) were included in the study based on the predefined inclusion criteria. **TABLE 1** outlines the prescribed antiplatelet therapies and their distribution within the study population. Of the total patients, 58 (48%) were prescribed prasugrel, while 62 (52%) received clopidogrel, as illustrated in **Figure 1.**

Table 2 presents the gender distribution of the participants, which included 68 males and 52 females. Gender-based analysis by treatment groups revealed that Group 1 (clopidogrel) consisted of 34 males and 28 females, whereas Group 2 (prasugrel) included 34 males and 24 females, as depicted in **Figure 3**.

Table 4 provides the age-wise distribution of patients across the treatment groups. The study excluded patients aged 75 years or older and those weighing less than 60 kg from receiving prasugrel due to contraindications associated with increased bleeding risk. Additionally, bothdrugs were evaluated for their association with major bleeding riskassessed using the HAS-BLED score. Patients aged 51–60 years demonstrated the highest representation, as shown in **Figure 4.**

The study population included patients with ACS subtypes such as non-ST-elevation myocardial infarction (NSTEMI), ST-elevation myocardial infarction (STEMI), and unstable angina, as outlined in the inclusion criteria. **Figure 5** highlights the clinical presentation of ACS within the study cohort, revealing that STEMI accounted for the majority of cases (45%), followed by NSTEMI (33%) and unstable angina (22%). The figure also illustrates the drug distribution based on ACS presentations.

The baseline characteristics of the population included the presence of comorbid conditions such as chronic kidney disease (CKD) and diabetes mellitus (DM).

1SOCIO DEMOGRAPHICS DETAILS OF PATIENTS:

1. DRUG DISTRIBUTION IN PATIENTS:

TABLE 1. indicates total number (sample size) of population involved in the study

DRUG	PATIENTS
PRASUGREL	58
CLOPIDOGREL	62

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2. GENDER DISTRIBUTION

TABLE 2 indicates total no of patients with respect to Gender, 68 males and 52 females in study as mentioned in figure 2

Gender wise Distribution of study population.

GENDER	NUMBER OF PATIENTS	PERCENTAGE
MALE	68	57%
FEMALE	52	43%
TOTAL	120	100%

3. REPRESENTATION OF GENDER DISTRIBUTION OF PATIENTS W.R.T GROUPS

TABLE 3 Indicates gender distribution of patients w.r.t group

GENDER	GROUP1 CLOPIDOGREL	GROUP2 PRASUGREL	TOTAL PATIENTS
MALES	34	34	68
FEMALES	28	24	52

FIGURE: 1 Drug distribution in patients

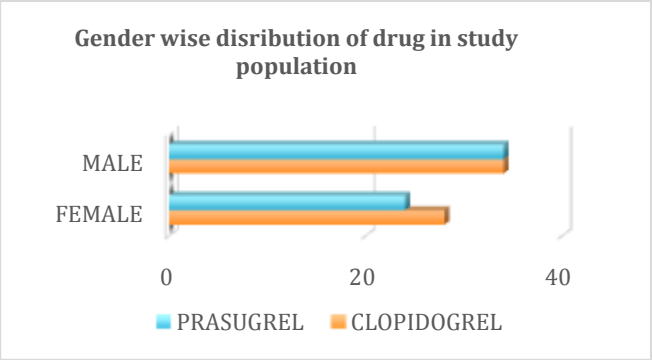

FIGURE: 2 Gender wise Graph

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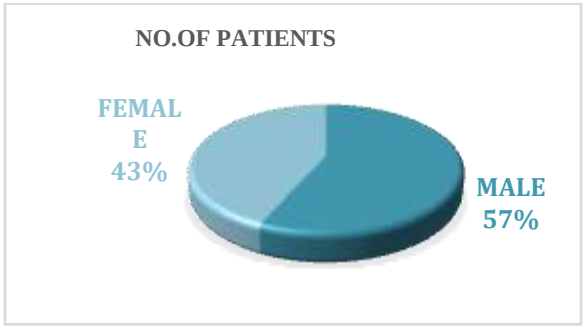

FIGURE: 3 Indicates gender wise distribution of drugs in study population

4. AGE DISTRIBUTION OF VARIOUS GROUPS

TABLE 4 Indicates age wise distribution of patients among various groups

Age	Frequency
31-40	6
41-50	13
51-60	19
61-70	15
71-80	4
81-90	3

5. REPRESENTATION OF ACUTE CORONARY SYNDROME CLINICAL PRESENTATION
6) REPRESENTATION OF DRUG DISTRIBUTION ACCORDING TO THE STUDY POPULATION ACS CLINICAL PRESENTATION
7. REPRESENTATION OF BASELINE CHARACTERISTICS OF PATIENT WITH ACS RECEIVING CLOPIDOGREL AND PRASUGREL

TABLE 5 INDICATES THE BASELINE CHARACTERISTICS

BASE LINE CHARACTERISTICS	NUMBER OF PATIENTS (%)
CKD	5%
DM	30%

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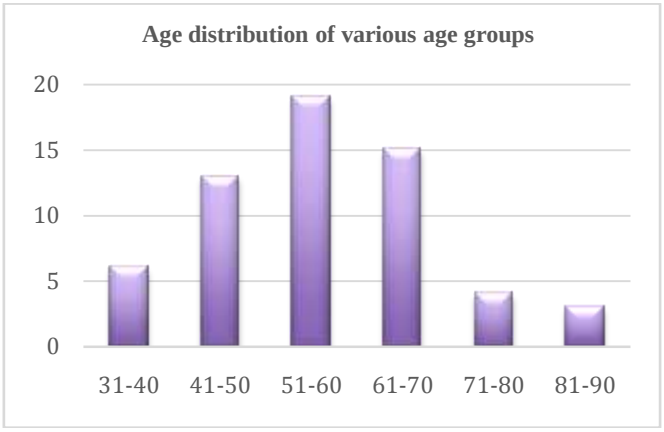

FIGURE: 4 Age distribution of various age groups

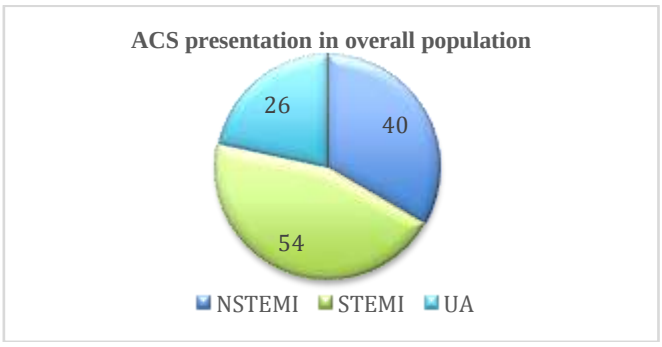

FIGURE: 5 Acs presentation

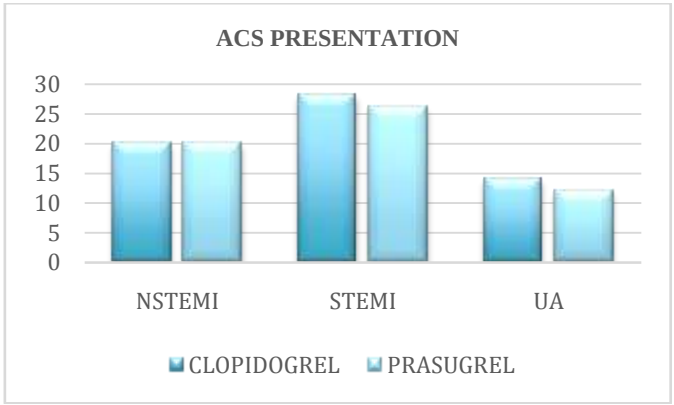

FIGURE: 6 Indicates drug distribution according to the study population according to acs clinical presentation

8. REPRESENTATION OF OUTCOMES OF PATIENTS WITH ACS AFTER RECEIVING CLOPIDOGREL AND PRASUGREL

TABLE 6 Outcomes of patients

OUTCOMES	CLOPIDOREL	PRASUGREL
CHEST PAIN or CHEST DISCOMFORTS	5	4
BLEEDING RISK		
GASTROINTESTINAL BLEEDS	2	0

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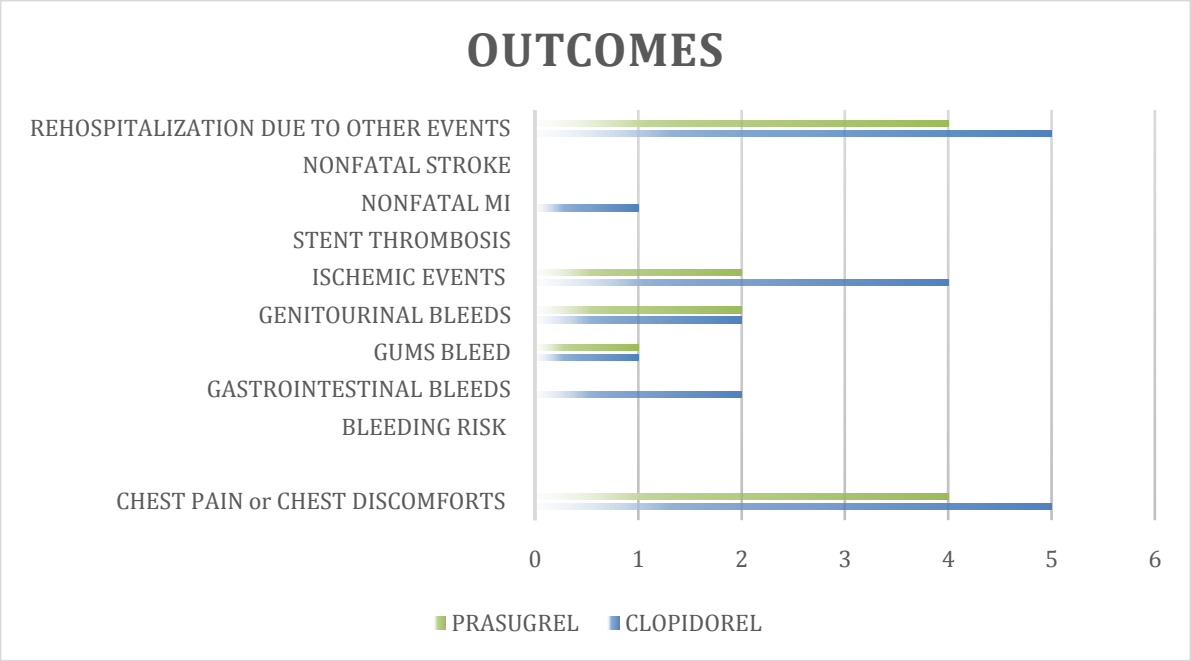
GUMS BLEED	1	1
GENITOURINAL BLEEDS	2	2
ISCHEMIC EVENTS	4	2
STENT THROMBOSIS	0	0
NONFATAL MI	1	0
NONFATAL STROKE	0	0
REHOSPITALIZATION DUE TO OTHER EVENTS	5	4



A higher prevalence of DM was observed compared to CKD. **Section 8** summarizes patient outcomes following PTCA and subsequent treatment with clopidogrel or prasugrel. Patients were assessed during follow-up visits at 30 and 90 days (Visits 1 and 2, respectively).

The outcomes revealed that among the 62 patients treated with clopidogrel, 20 experienced complications, including ischemic events, minor bleeding episodes, chest discomfort, and the need for hospital readmission. Conversely, the 58 patients receiving prasugrel demonstrated superior outcomes, with a significantly lower incidence of ischemic and bleeding events compared to those on clopidogrel. These findings are detailed in **Table 6**

IV. DISCUSSION:

The present study investigated the effectiveness and safety profiles of prasugrel and clopidogrel in patients with acute coronary syndrome (ACS) undergoing percutaneous transluminal coronary angioplasty (PTCA). Our findings underscore critical differences between the two antiplatelet therapies in terms of clinical outcomes, demographic distribution, and drug-related contraindications.

Therapeutic Distribution and Demographic Characteristics

The relatively equal distribution of prasugrel (48%) and clopidogrel (52%) in our study population highlights their widespread use in ACS management.

While prescribing trends were balanced overall, prasugrel was avoided in patients aged ≥75 years or weighing <60 kg due to its known contraindications associated with bleeding risk. This aligns with current guidelines that recommend cautious use of prasugrel in high-risk populations to minimize adverse outcomes. Gender distribution within each treatment group showed no significant bias, with a near-equal male-to-female ratio across both drug groups.

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Age Distribution and Risk Stratification

The preponderance of patients in the 51–60 age group suggests that ACS is highly prevalent in this middle-aged demographic. Importantly, prasugrel was underutilized in older patients due to its contraindications in those with elevated HAS-BLED scores, emphasizing the need for individualized treatment strategies based on bleeding risk and clinical characteristics. This careful stratification aligns with evidence from previous studies advocating risk-adjusted antiplatelet therapy to optimize outcomes while minimizing harm.

Clinical Presentation and Drug Allocation

The distribution of ACS subtypes in the study population revealed a predominance of STEMI cases (45%), followed by NSTEMI (33%) and unstable angina (22%). This mirrors global epidemiological trends, where STEMI often constitutes the most severe and urgent ACS presentation. Patients with STEMI were more likely to receive prasugrel, possibly reflecting its higher potency in reducing ischemic events in high-risk presentations. Conversely, clopidogrel was more commonly prescribed in cases with relatively lower ischemic burden, such as unstable angina, likely due to its favourable safety profile in less severe presentations.

Clinical Outcomes and Comparative Efficacy

The outcome analysis revealed significant differences in the clinical performance of prasugrel and clopidogrel. Patients treated with prasugrel experienced fewer complications, including ischemic events and bleeding episodes, compared to those receiving clopidogrel. These findings are consistent with large-scale clinical trials, such as the TRITON-TIMI 38 study, which demonstrated superior efficacy of prasugrel in preventing major adverse cardiac events (MACE) in ACS patients undergoing PTCA.

The 32.3% complication rate observed in the clopidogrel group (20 of 62 patients) underscores the need for improved therapeutic strategies in this subgroup. The higher recurrence of ischemic events and hospital readmissions among clopidogrel users may reflect suboptimal platelet inhibition, particularly in individuals with clopidogrel resistance or high platelet reactivity. Prasugrel's superior performance in reducing ischemic and bleeding events (with no major complications reported in our study) supports its role as a more effective antiplatelet agent in appropriately selected patients.

Implications for Clinical Practice

Our findings reaffirm the importance of tailoring antiplatelet therapy based on patient-specific factors, including age, weight, comorbidities, and ACS subtype. While prasugrel offers significant advantages in terms of efficacy, its use must be balanced against its higher bleeding risk, particularly in older or frail patients. Clopidogrel remains a viable alternative in patients where prasugrel is contraindicated, but its relatively lower efficacy underscores the need for enhanced risk stratification and potential combination strategies.

V. LIMITATIONS AND FUTURE DIRECTIONS

This study has several limitations. First, the sample size was relatively small, limiting the generalizability of the findings. Additionally, genetic factors influencing clopidogrel metabolism, such as CYP2C19 polymorphisms, were not evaluated, which may have contributed to variability in clinical outcomes. Future studies with larger, more diverse populations and pharmacogenomic analyses are warranted to refine antiplatelet therapy selection further.

VI. CONCLUSION:

In a real-world cohort of ACS patients undergoing PCI, we noticed that prasugrel is not commonly used and is primarily given to lower risk patients when compared to those who receive clopidogrel. Its usage has been resisted in real-world settings due to concerns about its safety profile.

But through our study we observed that Prasugrel is more effective in preventing ischemic events and stent thrombosis in post PCI in the setting of ACS. Because prasugrel is more effective in higher risk patient. Prasugrel is preferred over the clopidogrel.

However, in our study it has been observed that prasugrel has reduced ischemic events and very minor bleeding events leading to a decrease in major adverse cardiovascular events in ACS patients.

VII. ACKNOWLEDGEMENT:

We wholeheartedly express our gratitude to everyone who contributed to the successful completion of this project. We would like to

convey our sincere gratitude towards our esteemed guides Dr. SagarBhuyar, Senior Consultant Cardiologist, Kamineni Hospitals and Dr. D. Swathi, Department of pharmacy practice, Samskruti College of Pharmacy for their enduring patience with our inexperience. It is their able guidance, meticulous supervision and constant encouragement given during this course of project work. We wish to express our profound gratitude to the Principal of Samskruti College of Pharmacy for providing invigorative and conductive environment to pursue our project work with great ease. We extend our heartfelt gratitude to the many individuals who supported and encouraged us throughout this project. It brings us immense joy to acknowledge their valuable assistance, guidance, and unwavering support. We owe them significant recognition for the successful completion of this study.

CONFLICT OF INTEREST:

The authors declare that there is no conflict of interest.

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