



# **A Prospective Observational Study on Evaluation of Therapeutic Efficacy of Antiplatelets in Coronary Artery Disease with Percutaneous Transluminal Coronary Angioplasty**

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## **Authors' contributions**

*This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.*

## **Article Information**

DOI: 10.9734/JPRI/2021/v33i46B32952

### *Editor(s):*

(1) Dr. Aurora Martínez Romero, Juarez University, Mexico.

### *Reviewers:*

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(2) Halley Ferraro Oliveira, Universidade Federal de Sergipe, Brazil.

Complete Peer review History: <https://www.sdiarticle4.com/review-history/74209>

**Original Research Article**

**Received 25 July 2021**

**Accepted 30 September 2021**

**Published 22 October 2021**

## **ABSTRACT**

Coronary artery disease otherwise named as Coronary heart disease. Coronary Artery Disease means narrowing of the coronary arteries. This narrowing causes reduction of blood flow to the heart muscle by buildup of plaque in the arteries of heart. A common symptom of Coronary artery disease is chest pain or chest discomfort which can travel to the shoulder, arm, back, neck or jaws. Other symptoms may include Shortness of breath, palpitations and even fatigue. Majorly antiplatelets are given in the treatment of CAD and followed by angioplasty for the clearing of plaques in the coronary artery. Collected a sample size of 200 patients, among them 126 are males and 74 are females. Patient with age group of 51-60 are more prone to CAD in both males and females. Chest pain is majorly seen in males compared to females. Chest pain, Sweating and shortness of breath is seen in both males and females and the number of male patients are more

when compared to females. Patients with only shortness of breath are less when compared to other chief complaints. Social history includes Smokers are 26 (47.2%), alcoholic are 48 (57.14%).. Among all these patients the length of hospital stay of patients treated with combination of aspirin and clopidogrel is less when compared with ticagrelor, aspirin, clopidogrel. Based on the follow up observations we may consider that combination of antiplatelet therapy is effective in CAD patients undergone with percutaneous transluminal coronary angioplasty.

**Keywords:** *Coronary artery disease; aspirin; clopidogrel; ticagrelor; percutaneous transluminal coronary angioplasty.*

## 1. INTRODUCTION

Coronary artery disease (CAD) is the most common type of heart disease in the world. It is the leading cause of mortality in the United States in both men and women. CAD happens when the arteries of heart that supply blood to heart muscle become hardened and narrowed. It happens due to the build up of cholesterol, plaques and other materials in the inner walls of the arteries. This type of build up at the walls of arteries is known as Atherosclerosis. As it grows day by day, less blood flow to the arteries can lead to death of some arteries. As a result, the heart muscle cannot get sufficient amount of oxygen to the heart muscle. Finally it can lead to chest pain (Angina) or a heart attack. Most of the heart attacks happen when a blood clot suddenly stops the blood flow to the heart muscle, causing the heart damage.

CAD was once widely thought to be a man's disease. On average, men develop it about 10 years earlier than women because, until menopause, women are protected by high levels of estrogen. After menopause, coronary artery disease becomes more common among women. Among people aged 75 and older, a higher proportion of women have the disease because women live longer.

### 1.1 Classification

Other names for Coronary Artery Disease are:

- Atherosclerosis
- Coronary Artery Disease (CAD)
- Hardening of Arteries
- Heart disease
- Ischemic Heart Disease
- Narrowing of the arteries.

In Atherosclerosis, plaque builds up on the inside wall of arteries. Plaque is made up of several substances including cholesterol. This build up is called hardening of arteries or Atherosclerosis. It can start at any period of age and it is

caused by the combination of genetic and life style factors. Atherosclerosis can cause the narrowing in the arteries that supply blood to the various parts of the body such that blood flow is slowed or blocked. Poor blood flow to the brain can cause Stroke. Poor blood flow to the heart is called Coronary Artery Disease (CAD) and can cause Angina or Heart attack.

### 1.2 Heart Attack

If the heart is starving for the blood and not getting enough oxygen for more than 20 minutes, then a part of heart muscle dies causing some permanent damage. This is called a heart attack or Myocardial infarction (MI). Some heart attacks involve only a small area of the heart and can be managed with the standard medical treatment in hospital. Some heart attacks involve a larger area of heart and show some specific pattern on Electro Cardiogram. These heart attacks are called S-T elevation myocardial infarctions (STEMI) and require immediate treatment with anticoagulants or opening up the artery with Balloon Angioplasty and Stents.

Over time, CAD can also weaken the heart muscle and contribute to heart failure and arrhythmias. Heart failure means the heart cannot pump blood to the body parts. Human body needs the oxygen-rich blood. The Right Coronary Artery (RCA) supplies the oxygen rich blood to the bottom part of the heart. The Short Left Main Artery (LM) branches into the Left Anterior Descending (LAD) artery that supplies the oxygen rich blood to the front portion of the heart and the Circumflex (Cx) artery that supplies oxygen rich blood to the back portion of the heart.

The cornerstone for the management of patients with Coronary Artery Disease is antiplatelet therapy. In recent years several new antiplatelet drugs have been introduced and the most recent guidelines suggest the usage of newly potent antiplatelet drugs like Ticagrelor and Prasugrel in addition to Aspirin after CAD [1,2].

Coronary artery disease is the primary cause of death in world-wide. With the obesity pandemic and expected worsening of cardiovascular risk factors in the general population, the incidence and prevalence of heart disease is expected to rise [3]. Dual antiplatelet therapy (DAPT) is an integral to the management of coronary artery disease (CAD) but it remains uncertainty as to the optimal approach for balancing on individual's risk of atherothrombotic events versus their risk of bleeding complications.

Aspirin, the primogenial antiplatelet agent, has been shown to reduce the incidence of recurrent major adverse cardiovascular events (MACE) by approximately one-fifth. Dual antiplatelet therapy includes the combination of the aspirin with a P2Y12 inhibitor, provides greater platelet inhibition resulting in an incremental reduction in the risk of MACE but at the cost of an increased risk of major bleeding [4]. Prescribers are faced with the challenge of identifying where this risk: benefit ratio lies for each individual patient, and producing a tailored approach based on the clinical presentation, management strategy and patient characteristics. The American College of Cardiology /American Heart Association (ACC/AHA) and European Society of Cardiology (ESC) released focused updates on the prescribing DAPT in Coronary Artery Disease [5-7]. The Bromley Coronary period Registry is a contemporary community registry used to identify all symptomatic medical presentation of CAD in one population [8]. In the ARIC study in participants aged from 45 to 64 years, the average age-adjusted CAD incidence rates per 1000 person-years were 12.5 in white men and 10.6 in black men [9]. Approximately every 26's, an American will have a coronary event, and about every minute someone will die of one [10].

## 2. METHODS

### 2.1 Study Design

It is a prospective observational study.  
Investigated Group:

- Patients with informed consent form
- Patients with age group >35 years.
- Patient with suspected CAD symptoms
- Patients with complaint of cardiac chest pain
- Patients who are obese/overweight.

### 2.2 Source of Data

- Data is collected from all the Coronary artery disease patients who are visiting the cardiology department of the Santhiram general hospital, Nandyal.

### 2.3 Methods of Collection of Data

The following information was collected by interviewing the patients by using the below annexure:

Annexure-I: (patient demographic characteristics proforma and collected values of bleeding time, clotting time, INR ratio before and after administration of antiplatelets, length of hospital stay of patients after giving different class of antiplatelets drugs)

Annexure-II: (Patient consent form in Telugu)

Annexure-III: (patient consent form in English)

## 3. RESULTS

Here antiplatelet therapy is given to the Coronary artery disease patients who have undergone percutaneous transluminal coronary angioplasty. Length of hospital stay is also observed in the patients after giving antiplatelets like aspirin, clopidogrel, combination of both aspirin and clopidogrel and only ticagrelor. The values of bleeding time, clotting time and also INR values are also assessed to determine the efficacy of antiplatelet drug therapy. Among 200 patients 139 patients are given with both clopidogrel and aspirin, 35 patients are given only aspirin, 24 patients are given only clopidogrel and 2 patients are given only ticagrelor.

Patients of 51-60 age group are more prone to Coronary artery disease with PTCA in both Males and Females.

Chest pain alone majorly seen in males compared to females. Chest pain with sweating majorly seen in males compared to females. Shortness of breath majorly seen in males compared to females. Chest pain with SOB is seen majorly in female compared to males. Here SOB alone are less likely occurred in 200 members.

Hypertension is more in females when compared to males whereas Diabetes is more in males than females. Patients having both HTN and DM are more in males than females.

**Table 1. Age wise gender distribution of cad patients with PTCA**

Age	Male	Female	Total	Percentage (%)
21-30	4	-	4	2%
31-40	2	3	5	2.5%
41-50	30	24	54	27 %
51-60	32	26	58	29%
61-70	30	12	42	21%
71-80	26	7	33	16.5%
81-90	2	2	4	2%
Total	126	74	200	100%

**Table 2. Chief complaints of patients**

Chief complaints	Males	Percentage	Females	Percentage
Chest pain	47	23.5%	26	13%
Chest pain and Sweating	13	6.5%	4	2%
Shortness of breath	16	8%	7	3.5%
Chest pain, sweating and SOB	50	25%	37	18.5%

**Table 3. Co-morbid conditions of cad patients**

Comorbidity	Males	Percentage	Females	Percentage
Hypertension	12	10.90%	24	21.81%
Diabetes mellitus	19	17.27%	14	12.72%
HTN and DM	32	29.09%	9	8.18 %

**Table 4. Social history of patients**

	Smoker	%	Alcoholic	%	Both	%
Yes	26	47.2%	48	57.14%	49	80.3%
No	29	52.7%	36	42.85%	12	19.6%
Total	55	99.9%	84	99.9%	61	99.9%

Here, both alcoholics and smokers are more prone to coronary artery disease when compared to non-smokers and non-alcoholics.

Majority of the patients with coronary artery disease show positive troponin levels. Patients with troponin positive are more in males and females than with troponin negative.

In Coronary artery disease patients, most of the 2d echo results are showing positive Regional wall motion abnormality.

Among 200 patients with coronary artery disease 21 patients have normal Left Ventricular systolic dysfunction, 43 patients are with mild Left Ventricular systolic dysfunction, 49 patients are

at moderate stage and 87 patients are with severe stage of Left Ventricular systolic dysfunction.

Diastolic dysfunction occurs mainly due to Chronic Hypertension. It leads to left ventricular hypertrophy which decrease cardiac compliance. The number of male patients with Grade-1, Grade-2, Grade-3, Grade-4 diastolic dysfunction are more in number than females.

Patients with Coronary artery disease are mainly treated with combination therapy of both aspirin and clopidogrel. Ticagrelor is given in less number of patients when compared to aspirin and clopidogrel.

**Table 5. Troponin levels of study population**

Troponin levels	Males	%	Females	%
Positive	94	47%	70	35%
Negative	32	16%	4	2%

**Table 6. 2D Echo results of cad patients with PTCA**

2d echo values	Males	%	Females	%
Regional wall motion abnormality +ve	97	48.5%	56	28%
Regional wall motion abnormality-ve	29	14.5%	18	9%

**Table 7. Stages of left ventricular systolic dysfunction in coronary artery disease patients**

Stages	Males	%	Females	%
Normal	11	5.5%	9	4.5%
Mild	25	12.5%	18	9%
Moderate	34	17%	15	7.5%
Severe	56	28%	32	16%

**Table 8. Grades of diastolic dysfunction in cad patients**

Grades	Males	%	Females	%
Grade-I	33	16.5%	24	12%
Grade-II	45	22.5%	16	8%
Grade-III	36	18%	28	14%
Grade-IV	12	6%	6	3%

**Table 9. Antiplatelet drug therapy in Coronary artery disease patients**

Antiplatelet drugs	Males	%	Females	%
Aspirin	25	12.5%	10	5%
Clopidogrel	17	8.5%	7	3.5%
Both	82	41%	57	28.5%
Only Ticagrelor	2	1%	0	0%

**Table 10. Length of hospital stay of patients according to the antiplatelets given**

Antiplatelets given	No.of patients	Length of hospital stay
Aspirin	35	6 days
Clopidogrel	24	8 days
Both	139	5 days
Only ticagrelor	2	8 days

In this table 35 patients are given with aspirin and their hospital stay is for 6 days, 24 patients are given clopidogrel and their stay in hospital is for 8 days, both aspirin and clopidogrel are given for -139 patients and their hospital stay is for 5 days, 2 patients are given ticagrelor whereas their stay in hospital is for 8 days. This indicates that, the length of hospital stay of patients treated with both aspirin and clopidogrel is less when compared with individual drug therapy.

#### 4. DISCUSSION

Coronary artery diseases involves the impairment of blood flow through the coronary arteries, commonly by atherosclerotic plaques. In developed countries coronary artery disease is the most common cause of death. The right and

left coronary arteries arise from right and left coronary sinuses in the root of Aorta. These arteries divided into small and large arteries surrounded the heart surface.

This study includes 200 patients of coronary artery disease with Percutaneous Transluminal Coronary Angioplasty attending in cardiology In and Out patient department of tertiary care teaching hospital. Patient proforma include different parameters like Age, Sex, Chief complaints, Diagnosis, Management before and after administration of Antiplatelets. Among all those patients 200 cases collected for the study. This study conducted in the age group of 21-90 years. Out of 200 patients of Coronary artery disease is more in the age group of 51-60 years (29%) and in the age group of 61-70 years (27%)

less in the age group of 21-30years(2%) and in the age group of 81-90years.

Out of 200 study sample,was observed to be 126 males and 74 females.In Males Coronary artery disease condition was observed to be more in the age group of 61-70&41-50 compared to the age group of 21-30,less in the age group of 41-50&61-70.In females Coronary artery disease condition was observed to be more in the age group of 51-60yearscompared to the age group of 41-50,less in the age group of 81-90 and there are no patients in the age group of 21-30.Coronary artery disease was observed more in the age group of 51-60 in both males and females,less in the age group of 21-30&81-90.

Out of the 200 patients of Coronary artery disease there are 126 members of male patients where the male patients are being divided into two social habits like smokers and alcoholic. There are more number of alcoholics 48(57.14%) than smokers 26(47.2%).Both smokers and alcoholics are found to be 49(80.3%).There is direct relationship with the social history in males.Out of 200 members of coronary artery disease with PTCA patients Troponin levels was observed positive in males are 94(47%) and in females are 70(35%).Although Troponin negative was observed in males are 32(16%) and in females are 4(2%) .Out of 200 members of CAD with PTCA patients 2D-ECHO results of RWMA Positive are found to be 97(48.5%) are males and 56(28%) are females.Although RWMA negative was found to be 29(14.5%)in males and 18(9%) in females .

Out of 200 members of CAD with PTCA patients Stages of LV systolic dysfunction was found to be normal in 11(5.5%)males and 9(4.5%)in females.Mild LV systolic dysfunction was observed in males are 25(12.5%) and in females are 18(9%).Moderate LV systolic dysfunction was observed in males are found to be 34(17%) and in females are 15(7.5%).Severe LV systolic dysfunction was found to be56(28%0 and in females are 32(16%).Among 200 patients with CAD normal LV systolic dysfunction was observed in 21 patients,mild LV systolic dysfunction was observed in 43 patients,moderate LV systolic dysfunction was observed in 49 patients,Severe LV systolic dysfunction was observed in 87 patients.Out of 200 patients of CAD with PTCA length of hospital stay of patients after the administration of antiplatelet drugs. Aspirin was administered by 35 patients,the length of stay of patients at hospital was observed as 6 days.Clopidogrel was

administered by 24 patients,the length of stay of patients at hospital was observed as 8 days. Aspirin along with clopidogrel was administered by 139 patients,the length of stay of patients at hospital was observed as 5 days. Ticagrelor was administered by 2 patients,the length of stay of patients at hospital was observed as 8 days.Here length of stay of patients who are diagnosed with CAD with PTCA was found.Duration of hospital stay was decreased by using the combination drugs such as aspirin and clopidogrel.Hence it proves that both aspirin and clopidogrel decreases the hospital stay and improves the outcome of patient than the single drug therapy.

On follow-up of antiplatelets therapy only headache with nausea have been reported by 90(45%) patients. Based on the follow-up observations we may consider Antiplatelet therapy is effective with least side effects and nil Adverse Drug Reactions.

## 5. CONCLUSION

In our study, we conclude that out of 200 cases , antiplatelets are showing more efficacy in the treatment of Coronary artery disease patients undergone with PTCA .We can descry it on the basis of length of hospital stay of patients after giving antiplatelet therapy and among all the antiplatelets, combination of aspirin and clopidogrel is having more efficacy than other antiplatelets in terms of hospital stay. It is also noticed that bleeding time, clotting time, and INR values can also be included to assess the efficacy of antiplatelets. It is also noticed that the rate of reoccurrence of CAD in patients after undergoing PTCA with antiplatelet therapy is less. So we conclude that, Aspirin with clopidogrel are showing better safety profile with minimal side effects which do not affect the patients more. Economic burden for patient also reduces when combination of antiplatelets are given.

## CONSENT AND ETHICAL APPROVAL

As per international standard or university standard guideline Patient's consent and ethical approval has been collected and preserved by the authors.

## ACKNOWLEDGEMENT

The authors thank the Dean, Principal, Teaching and non-teaching staff, Faculty members of Santhiram Medical College & General Hospital

for supporting our observational study. Also, we thank Santhiram College Of Pharmacy for providing the hospital facility and special features.

## COMPETING INTERESTS

Authors have declared that no competing interests exist.

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*Peer-review history:*  
The peer review history for this paper can be accessed here:  
<https://www.sdiarticle4.com/review-history/74209>