# A CLINICAL PHARMACIST APPROACH ON CORONARY ARTERY DISEASE THROUGH CARDIAC REHABILITATION PROGRAM AT TERTIARY CARE HOSPITAL

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**ABSTRACT:**
Globally, coronary artery disorders (CAD) continue to be the primary cause of morbidity and mortality. Therefore, successful care of CAD requires a comprehensive and multidisciplinary approach. The objective of the study is to evaluate the role of clinical pharmacists in tertiary care institutions' cardiac rehabilitation programs and their impact on the management of coronary artery disorders (CAD). This prospective study enrolled hospital patients consulting physicians for coronary artery disease over six months. Statistical analyses were performed using Statistical Package for Social Science (SPSS) version 16 to evaluate demographic characteristics, clinical presentations, medication prescriptions, and physiological parameters. The investigation of 70 CAD patients revealed a male predominance and varied clinical manifestations, with acute coronary syndrome being most prevalent. Pharmacotherapy focused on antiplatelet, antihypertensive, anti-hyperlipidaemic, and anti-anginal agents, addressing drug therapy problems such as interactions and duplications. Physiological parameters improved post-rehabilitation, including ejection fraction, BMI, blood pressure, heart rate, FBS, Serum Creatinine, serum potassium, and total cholesterol. Patient knowledge and adherence significantly increased through Dose, Frequency, Indication, Method of administration and Medication Adherence Rating Scale assessments. The integration of clinical pharmacists in tertiary care institutions' cardiac rehabilitation programs is essential for the comprehensive management of CAD. Their

involvement improves medication adherence, clinical outcomes, and overall quality of life for patients with CAD. Incorporating clinical pharmacists into multidisciplinary teams enhances the effectiveness of cardiac rehabilitation programs and underscores the importance of a holistic approach to CAD management.

**Keywords:** Clinical Pharmacist; Coronary Artery Diseases; Cardiac Rehabilitation; Tertiary Care Hospital Approach

**INTRODUCTION:**

Coronary artery disorders (CAD) continue to be a major cause of morbidity and mortality worldwide, placing a heavy strain on health systems around the world. The treatment of CAD is still complicated and multifaceted despite advances in medical research, necessitating a comprehensive strategy that goes beyond conventional medication. Particularly in specialized settings like cardiac rehabilitation programs in tertiary care hospitals, the integration of clinical pharmacists into healthcare teams has emerged as a potential way to maximize patient care in recent years. This introduction examines how clinical pharmacists' participation in cardiac rehabilitation programs plays a critical role in overcoming the difficulties presented by CAD. [1]

Atherosclerotic plaque buildup in the coronary arteries causes a range of disorders known as coronary artery disease (CAD), which can result in myocardial ischemia and potentially deadly effects like myocardial infarction and sudden cardiac death. The foundation of managing CAD is pharmacotherapy; yet, due to the intricacy of treatment plans, possible drug interactions, and individual differences in drug response, specific knowledge in medication management is essential. Clinical pharmacists are in a unique position to address these issues and maximize pharmacological therapies for patients with CAD because of their advanced expertise in pharmacotherapy and patient-centered care. Cardiac rehabilitation programs are an essential part of comprehensive care for people with CAD and secondary prevention. [2]

These programs use a multidisciplinary approach that includes nutritional counseling, fitness training, risk factor management, and psychosocial support to promote overall quality of life and cardiovascular health. In this context, clinical pharmacists are essential to medication reconciliation because they make sure the right drugs are chosen, dosed, and monitored along the course of rehabilitation. Clinical pharmacists help to reduce cardiovascular risk factors and optimize the management of CAD by doing thorough medication evaluations, recognizing any drug-related issues, and educating patients on medication adherence. [3]

In order to provide patients with CAD with coordinated and individualized care, clinical pharmacists can work closely with cardiologists, nurses, physiotherapists, and other medical professionals in the setting of tertiary care hospitals. This presents a unique opportunity for clinical pharmacist integration into cardiac rehabilitation programs. Clinical pharmacists improve the efficacy and safety of pharmacological therapies, encourage drug adherence, and enable people with CAD to actively engage in their treatment through their knowledge of pharmacotherapy and dedication to patient-centered practice. [4]

As a proactive and patient-centered approach to addressing the complicated needs of persons with

CAD, tertiary care institutions are including clinical pharmacists into their cardiac rehabilitation programs. Clinical pharmacists improve clinical results, save healthcare costs, and improve the quality of life for patients with CAD undergoing cardiac rehabilitation by streamlining medication management and providing all-encompassing care. [5]

## MATERIALS AND METHODS:

### *Study design*

This prospective observational study investigates the impact of pharmacist-led interventions in cardiac rehabilitation for coronary artery disease (CAD) at a tertiary care hospital. It assesses medication adherence, risk factor modification, and patient outcomes to elucidate the benefits of integrating clinical pharmacists into cardiac care teams. Inclusion criteria encompass patients diagnosed with CAD, ability for regular physical activity, and accessibility by telephone. Exclusion criteria include cognitive impairment, terminal illness, severe arrhythmia, systemic or cardiac inflammatory diseases, and incapacities hindering medication administration at home.

### *Study Site*

Cardiology Department, Kovai Medical Center and Hospital, Coimbatore. The study site is the Cardiology Department at Kovai Medical Center and Hospital in Coimbatore, where the research is conducted. This tertiary care hospital serves as the backdrop for implementing and evaluating the clinical pharmacist's involvement in managing coronary artery diseases within the context of cardiac rehabilitation programs. The setting provides a structured environment for the study's interventions, patient assessments, and data collection, facilitating a thorough exploration of the pharmacist's role in optimizing care for individuals with CAD.

### *Study Period*

Patients consulting the physician for coronary artery disease during the study period. The study period for "A Clinical Pharmacist Approach on Coronary Artery Diseases Through Cardiac Rehabilitation Program at Tertiary Care Hospital" spans six months. This timeframe encompasses the implementation of pharmacist-led interventions within the cardiac rehabilitation program at Kovai Medical Center and Hospital in Coimbatore. It allows for the collection of data on patient outcomes, medication adherence, and the overall effectiveness of integrating clinical pharmacists into the care team for individuals undergoing rehabilitation for coronary artery diseases.

### *Ethics*

Ethics in clinical pharmacy for coronary artery disease entail patient autonomy, beneficence, and non-maleficence. Pharmacists ensure informed consent, prioritize patient well-being, and mitigate harm. Upholding professional integrity, they foster trust, confidentiality, and equitable access to cardiac rehabilitation, promoting holistic care within tertiary settings. The study protocol was approved by Institutional scientific and ethical committee (Ref No. SRC/394/2024) and ethical committee (Ref No. EC/AP/1126/02/2024). A written informed consent was taken from all the patients prior to their enrollment in the study.

### *Study procedure*

The study began with patient enrollment based on specific criteria. At the first visit, baseline data was collected, and pharmaceutical care issues were reviewed, with medication reconciliation recommended as needed. Counseling and education sessions focused on medication management. Follow-up visits included reminders, comprehensive reviews, and updates to medication lists and lab results. Pharmaceutical interventions were initiated and discussed with prescribers, with patients informed of any changes. Counseling covered medication and devices. Records were meticulously updated. The study concluded with outcome determination, assessing the effectiveness of interventions and the clinical pharmacist approach's impact. Insights gained informed the optimization of patient care through Cardiac rehabilitation program.

***Statistical Analysis***

Frequency and percentages were used to summarize each of the categorical variables. Depending on the degree of data normality, the Mean (SD)/Median (Quartiles: Q1, Q3) was used to summarize all continuous variables. Utilizing Shapiro-Wilk's test, the normalcy was evaluated. Depending on normalcy, the continuous variables (EF, DFIT, FBS, Weight, BMI, Pulse, etc.) were compared between the first and second visit using the Wilcoxon signed rank test/paired t test. SPSS version 16 was used for all statistical analyses. A statistically significant p-value was defined as one that was less than 0.05. [6]

***Clinical Outcome Measures***

***Medication Adherence Rating Scale (MARS)***

The user-friendly Medication Adherence Rating Scale (MARS) was created by Thompson et al. to evaluate patients' adherence to their prescribed regimens. There are ten questions in all. In order to indicate how they felt about their drug, the participants were asked to check the sentence that best reflected how they felt about it. Participants who answered "NO" to questions 1-6 and 9–10 and "YES" to questions 7-8 were deemed to be medication compliant, based on the scale. The assessment of medication adherence was conducted using MARS as a guidance aid. A correct response received a score of 1, while an incorrect response received a score of 0. Based on these figures, adherence can receive a maximum score of 10 or a minimum score of 0. Thus, each patient's score was determined and totaled. The scale categorizes individuals as non-adherent if they score between 0 and 3, partially adherent if they score between 4 and 7, and adherent if they score between 8 and 10.

***Medication Knowledge Assessment***

On the first and second visit, medication knowledge was evaluated, including Dose, Frequency, Indication, and Method of administration (DFIT). There were three categories created from the research population. Less knowledge was defined as 0–30%, moderate knowledge as 31-60%, and high knowledge as 61–100%. [7]

## RESULTS:

***Demographics of the Study Population***

Three age groups were analyzed: 30-50, 51-70, and 71-90. The highest prevalence of coronary artery disease (55.7%, n=39) was observed among individuals aged 51–70. Those aged 71-90 and

30-50 comprised 22.49% (n=16) and 21.4% (n=15), respectively. Notably, no allergies were reported among the 70 patients. Smoking was prevalent in 34.3% (n=24), with 34.3% expressing a desire to quit, while alcohol consumption was active in 34.3% (n=24), with 11.4% (n=8) having a history of alcoholism. The demographic variables of patients are given in **Table 1.** [9]

***Clinical Presentation of the Study Population***

In the study, patients were diagnosed with acute coronary syndrome (61.4%, n=43), angina (14.3%, n=10), NSTEMI (11.4%, n=8), and STEMI (12.9%, n=9). Acute coronary syndrome prevailed, followed by angina, STEMI, and NSTEMI. All participants (9.9%, n=9) received thrombolysis. Patients were categorized based on PCI status: those undergoing PCI and those not. [10]

Among patients, 57.1% (n=40) underwent PCI, while 42.9% (n=30) opted for medical therapy or CABG. Categories based on angiographic state included individuals without angiography (24.3%, n=17), single vessel disease (25.7%, n=18), two vessel disease (21.4%, n=15), and three vessel disease (28.6%, n=20). [11]

Following single-vessel illness and two-vessel disease, three-vessel disease was the most prevalent. Chest discomfort (75.7%, n=53) was the primary reason for admission, followed by breathing difficulties (11.4%, n=8). The clinical presentation of patients are given in **Table 2.**[12]

***Drug Therapy Problems***

Patients undergoing medication therapy were classified into four groups based on associated problems: those without drug-therapy issues, those with drug interactions, those requiring duplicate therapy, and those with drug addiction. The majority, comprising 91.4% (n = 64) of cases, fell into the first category. Drug interactions affected 2.9% (n = 2) of patients, while duplicate therapy and drug addiction each accounted for 2.9% (n = 2) of cases. During the trial, it was discovered that some patients received duplicate therapy due to simultaneous administration of a proton pump inhibitor and an H2 receptor antagonist. Additionally, prescriptions for pantoprazole + domperidone and ondansetron were found to contain unnecessary drugs. The addition of a proton pump inhibitor was deemed necessary for patients on dual antiplatelet medication. The drug therapy problems found are given in **Table 3.** [13]

***Physiological Parameters***

The Trial participants were categorized based on their ejection fraction (EF), initially ranging from 10–40% (42.9%, n=30) and 41–70% (57.1%, n=40). At the second visit, EF between 10–40% decreased to 20% (n=14), while EF between 41–70% increased to 80% (n=56). Significant reduction in EF among those with EF 10–40% potentially mitigated heart failure risk. [14]

The In the study, participants were categorized into weight groups (40–60, 61–80, 81–100), with 61–80 being the most prevalent initially, followed by 81–100 and 40–60. Subsequently, 61–100 constituted the majority, indicating significant weight reduction. Patients were also classified by BMI (healthy, overweight, obese), initially skewed towards overweight. Blood pressure decreased notably between visits, spanning all categories. Initially, a minority exhibited heart rates above

100 bpm, which decreased significantly by the study's end. Fasting blood sugar levels notably decreased post-trial, shifting towards normalcy. Serum creatinine remained stable, with no marked decline observed. Potassium levels, initially within the normal range, saw a slight decrease by the study's conclusion. Total cholesterol levels decreased significantly pre- and post-program, signifying positive management of coronary artery disease risk factors. This comprehensive analysis highlights beneficial changes across various health parameters, suggesting the effectiveness of the intervention in improving overall health outcomes and mitigating cardiovascular risks. The physiological factors associated with coronary artery disease are given in **Table 4.** The risk factors associated with coronary artery disease are given in **Table 5.** [15]

***Medication Knowledge Assessment***

The DFIT evaluation scale revealed a significant increase in medication knowledge post-rehabilitation. Initially, 1.4% (n=1) had high knowledge, while 88.6% (n=62) had low knowledge, and 10% (n=7) had moderate knowledge. After the program, 91.4% (n=64) showed high knowledge, with 8.6% (n=6) having moderate knowledge; no decrease occurred. [8]

***Mars Response***

Three Three groups emerged from the study based on MARS questionnaire: nonadherence, partial adherence, and full adherence. Initially, 41.4% (n=29) adhered fully, while 20% (n=14) did not. Partial adherence was observed in 38.6% (n=27). By the second visit, full adherence rose to 92.9% (n=65), with partial adherence dropping to 7.1% (n=5). No patients ceased medication, indicating significant MARS improvement post-program. The medication adherence and medication knowledge are given in **Table 6.** [9]

**DISCUSSION:**

The implementation and evaluation of cardiac rehabilitation programs (CRP) are vital for enhancing patient outcomes and reducing the burden of coronary artery disease (CAD). This study aimed to assess the effectiveness of a CRP and the role of clinical pharmacists in CAD management. The findings revealed several significant outcomes and underscored the importance of multidisciplinary collaboration in optimizing patient care.

Firstly, the demographic characteristics of the study population revealed a higher prevalence of CAD among males, consistent with previous research. Notably, the age range most impacted by CAD was 51-70 years, aligning with the typical age of CAD onset reported in literature. Additionally, chest pain emerged as the primary reason for admission, emphasizing the clinical relevance of symptom management in CAD.

One of the primary outcomes of this study was the continuity and enhancement of patient care. By integrating clinical pharmacists into the CRP, patients received comprehensive care that encompassed medication management, risk factor modification, and lifestyle interventions. The involvement of clinical pharmacists in patient monitoring and education facilitated closer follow-up and better management of CAD, contributing to improved patient outcomes.

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Another significant outcome was the impact of secondary prevention drugs on CAD management. Clinical pharmacists played a crucial role in assessing medication therapy, identifying potential adverse effects, and optimizing treatment regimens. This proactive approach to medication management led to better tolerability, adherence, and overall treatment outcomes, ultimately reducing the risk of cardiovascular events in CAD patients.

The successful collaboration between clinical pharmacists and other healthcare professionals was also highlighted in this study. The development and implementation of the CRP required close coordination among various healthcare team members, including physicians, nurses, dietitians, and rehabilitation specialists. This interdisciplinary approach facilitated comprehensive care delivery, ensuring that patients received tailored interventions to address their individual needs and risk factors

The CRP led to substantial improvements in several key clinical parameters. Significant increases in ejection fraction (EF) post-rehabilitation indicate improved cardiac function, essential for reducing the risk of heart failure. Moreover, reductions in weight, BMI, systolic and diastolic blood pressure, heart rate, total cholesterol, and fasting blood sugar levels reflect positive modifications in modifiable risk factors associated with CAD. These numerical improvements underscore the effectiveness of the CRP in addressing cardiovascular risk factors and promoting overall cardiac health.

In terms of secondary outcome measures, improved adherence to medication regimens was observed following the intervention. Clinical pharmacists played a crucial role in the success of the CRP by providing medication management, education, and counselling. Notably, the study reported a significant enhancement in patients' medication knowledge and adherence following pharmacist-led interventions. The substantial increase in adherence from 41.4% to 92.9% highlights the impact of pharmacist involvement on treatment compliance, which is crucial for optimizing therapeutic outcomes in CAD management.The significant increase in medication adherence observed at the end of the study underscores the importance of patient education and pharmacist-led interventions in promoting treatment adherence among CAD patients.

Furthermore, patient education emerged as a key component of the CRP. Clinical pharmacists provided valuable information to patients regarding their medications, lifestyle modifications, and self-management strategies. By empowering patients with knowledge and skills to manage their condition, clinical pharmacists helped foster a sense of autonomy and self-efficacy, ultimately promoting better long-term outcomes and quality of life.

This study demonstrates the significant impact of clinical pharmacists in the management of CAD through their involvement in CRP. By providing comprehensive care, optimizing medication therapy, and promoting patient education and adherence, clinical pharmacists contribute to improved patient outcomes and enhanced quality of care for CAD patients. This underscores the importance of integrating clinical pharmacists into multidisciplinary healthcare teams to optimize the management of cardiovascular diseases.

One limitation of our study evaluating the effectiveness of a cardiac rehabilitation program in India is its single-site design, potentially constraining the generalizability of findings to the broader Indian population. To enhance applicability, multicentre studies involving diverse regions and socioeconomic backgrounds are necessary. Additionally, our study's relatively short follow-up duration of six months may not fully capture the program's long-term impact on cardiovascular outcomes. Furthermore, while focusing on clinical metrics like lipid profiles and blood pressure, we did not extensively explore culturally relevant patient-reported outcomes and quality of life measures specific to India. Moreover, the unique cultural context and healthcare infrastructure in India present challenges to program implementation and uptake, such as socioeconomic disparities and cultural beliefs. Addressing these limitations through further research and tailored program adaptations is crucial to realizing the full potential of cardiac rehabilitation in India.

## CONCLUSION:

In conclusion, cardiac rehabilitation programs offer a multidisciplinary approach that significantly enhances the well-being of individuals recovering from heart-related ailments. Our findings underscore the positive impact of these programs on cardiovascular fitness, symptom management, and quality of life. Integration of pharmacists into these programs is crucial for optimizing medication therapy and ensuring comprehensive patient care. Moving forward, continued advocacy for pharmacist involvement in cardiac rehabilitation programs is essential for advancing patient outcomes and promoting holistic cardiovascular care. Together, these efforts epitomize a patient-centered approach to heart health, fostering recovery and empowerment in those affected by cardiovascular disease.

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## TABLES:

**Table No.1 Distribution of patients based on demographic variables (n=70)**

| Demographic Variables | Categories | Frequency | Percentage |
|---|---|---|---|
| Gender | Male | 53 | 75.7% |
| | Female | 17 | 24.3% |
| Age | 30-50 | 15 | 21.4% |
| | 51-70 | 39 | 55.7% |
| | 71-90 | 16 | 22.9% |
| Allergy | No | 70 | 100.0% |
| Smoker | No | 46 | 65.7% |
| | Yes | 24 | 34.3% |

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| | | | |
|---|---|---|---|
| Keen to quit | Yes | 24 | 34.3% |
| Ex-Smoker | Yes | 14 | 20.0% |
| Alcoholic | No | 46 | 65.7% |
| | Yes | 24 | 34.3% |
| Ex- Alcoholic | Yes | 8 | 11.4% |
| | No | 62 | 88.6% |

**Table No.2 Clinical presentation (n=70)**

| Variables | Categories | Frequency | Percentage (%) |
|---|---|---|---|
| Diagnosis | ACS | 43 | 61.4% |
| | Angina | 10 | 14.3% |
| | NSTEMI | 8 | 11.4% |
| | STEMI | 9 | 12.9% |
| Thrombolysis | No | 61 | 87.1% |
| | Yes | 9 | 12.9% |
| PCI status | No | 30 | 42.9% |
| | Yes | 40 | 57.1% |
| Angiogram | No | 17 | 24.3% |
| | Single VD | 18 | 25.7% |
| | 2 VD | 15 | 21.4% |
| | 3 VD | 20 | 28.6% |
| Reason for Admission | Chest pain | 53 | 75.7% |
| | Breathing Difficulty | 8 | 11.4% |
| | Check-up | 3 | 4.3% |
| | Shoulder pain | 3 | 4.3% |
| | Giddiness & Sweating | 2 | 2.9% |
| | Cough | 1 | 1.4% |

PCI: Percutaneous Coronary Intervention; ACS: Acute Coronary Syndrome; NSTEMI: Non ST Elevated Myocardial Infarction; STEMI: ST Elevated Myocardial Infarction; VD: Vessel Disease.

**Table No.3 Drug therapy problems (n=70)**

| Class of Drugs | Categories | Frequency | Percentage (%) |
|---|---|---|---|
| Drug therapy problems | Drug Interaction | 2 | 2.9% |
| | Duplicate Therapy | 2 | 2.9% |
| | Drug Addition | 2 | 2.9% |

Table No.4 Physiological Factors associated with coronary artery disease. (n=70)

| Parameters | Visit | Median | $Q_1$ | $Q_3$ | Sample size(n) | Z statistic | p-value |
|---|---|---|---|---|---|---|---|
| Ejection Fraction | Visit 1 | 45 | 35 | 60 | 70 | 6.25 | <0.001* |
| | Visit 2 | 50 | 45 | 60 | 70 | | |
| FBS | Visit 1 | 126 | 95 | 145 | 70 | 5.58 | <0.001* |
| | Visit 2 | 114.5 | 95 | 128 | 70 | | |
| SrCr | Visit 1 | 0.9 | 0.8 | 1.1 | 70 | 2.04 | 0.40 |
| | Visit 2 | 0.9 | 0.8 | 1.1 | 70 | | |
| Total Cholesterol | Visit 1 | 146.5 | 124 | 191 | 70 | 7.06 | <0.001* |
| | Visit 2 | 117 | 97 | 151 | 70 | | |
| Systolic Blood Pressure | Visit 1 | 120.0 | 110.0 | 140.0 | 70 | 3.99 | <0.001* |
| | Visit 2 | 110.0 | 100.0 | 120.0 | 70 | | |
| Diastolic Blood Pressure | Visit 1 | 80.0 | 80.0 | 80.0 | 70 | 2.07 | 0.04* |
| | Visit 2 | 70.0 | 70.0 | 80.0 | 70 | | |

SrCr: Serum Creatinine; * Values statistically significant

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**Table No.5 Risk factors associated with coronary artery disease. (n=70)**

| Parameters | Visit | Mean | Standard Deviation | t- test statistic | p-value |
|---|---|---|---|---|---|
| WEIGHT | Visit 1 | 74.63 | 6.92 | 7.96 | <0.001* |
| | Visit 2 | 73.66 | 6.78 | | |
| BMI | Visit 1 | 26.45 | 2.50 | 7.70 | <0.001* |
| | Visit 2 | 26.10 | 2.47 | | |
| PULSE | Visit 1 | 78.93 | 15.81 | 2.82 | 0.006* |
| | Visit 2 | 83.11 | 10.74 | | |
| Potassium | Visit 1 | 4.08 | 0.45 | 2.26 | 0.03* |
| | Visit 2 | 4.23 | 0.37 | | |

* Values statistically significant

**Table No.6 Medication adherence and Medication knowledge (n=70)**

| Parameters | Median | $Q_1$ | $Q_3$ | Sample size(n) | Z statistic | p-value |
|---|---|---|---|---|---|---|
| MARS Visit 1 | 7 | 5 | 8 | 70 | 6.21 | <0.001* |
| MARS Visit 2 | 9 | 8 | 9 | 70 | | |
| DFIT Visit 1 | 15 | 9 | 21 | 70 | 7.27 | <0.001* |
| DFIT Visit 2 | 90 | 80 | 95 | 70 | | |

MARS: Medication Adherence Rating Scale; DFIT: Dose, Frequency, Indication and Method of administration; * Values statistically significant.

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