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Research Paper

Association Of Lifestyle Modification and Pharmacological Therapy with Clinical Outcomes and Medication Adherence Among Patients with Coronary Artery Disease: A Prospective Observational Study

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ABSTRACT

Background: Coronary artery disease (CAD) remains a major cause of cardiovascular morbidity and mortality worldwide. Although guideline-directed pharmacological therapy is central to secondary prevention, sustained lifestyle modification is also essential for risk-factor control. This study evaluated the association of combined lifestyle modification and pharmacological therapy with clinical outcomes and medication adherence among patients with CAD. **Methods:** A prospective observational study was conducted among 100 adult patients with CAD admitted to the Department of Cardiology of a tertiary care teaching hospital in Hyderabad, India, over six months. Demographic characteristics, comorbidities, pharmacological treatment patterns, medication adherence, lifestyle modification, and clinical outcomes were assessed prospectively. The predefined clinical outcome measure was compared between patients adhering to both pharmacological therapy and recommended lifestyle modification (n=37) and those adhering to pharmacological therapy alone (n=44) using the Mann-Whitney U test. **Results:** Among the 100 enrolled patients, 64% were male and 36% were female. Hypertension and diabetes mellitus were the most common comorbidities. Antiplatelet agents, anticoagulants, and statins were among the most frequently prescribed drug classes. Medication adherence was reported in all enrolled participants, whereas 47% followed the recommended lifestyle modifications; 16% were lost to follow-up. The combined-adherence group had significantly different clinical outcome measurements compared with the medication-only group (Mann-Whitney U=15, -7.57 , $p=0.001$). **Conclusion:** In this single-center prospective observational study,

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adherence to both pharmacological therapy and lifestyle modification was associated with better clinical outcomes than pharmacological therapy alone. The findings support integrated secondary-prevention strategies, while larger multicenter studies with standardized adherence measures, clearly defined clinical outcomes, and longer follow-up are needed for confirmation.

INTRODUCTION

Coronary artery disease (CAD) is the leading cause of morbidity and mortality worldwide and remains a major public health challenge despite advances in diagnosis and treatment [1]. It is characterized by progressive atherosclerotic narrowing of the coronary arteries, leading to myocardial ischemia, acute coronary syndromes, heart failure, and sudden cardiac death[2]. The growing prevalence of hypertension, diabetes mellitus, dyslipidaemia, smoking, obesity, and sedentary lifestyles has contributed substantially to the increasing burden of CAD, particularly in developing countries such as India [1,2].

Evidence-based pharmacological therapy is the cornerstone of CAD management and secondary prevention. Antiplatelet agents, statins, beta-blockers, angiotensin-converting enzyme (ACE) inhibitors or angiotensin receptor blockers (ARBs), and anti-anginal medications have consistently been shown to reduce recurrent cardiovascular events and improve long-term prognosis[6]. Pharmacological therapy primarily targets thrombosis, dyslipidaemia, hypertension, and myocardial oxygen demand, whereas lifestyle modification addresses modifiable cardiovascular risk factors such as smoking, physical inactivity, obesity, unhealthy dietary habits, and poor dietary practices. Together, these complementary strategies form the foundation of comprehensive secondary prevention in patients with coronary artery disease [6].

Despite the availability of effective therapies, poor adherence to pharmacological treatment and inadequate implementation of lifestyle

recommendations remains major barriers to successful secondary prevention. These challenges are associated with recurrent cardiovascular events, increased hospitalizations, higher healthcare costs, and reduced quality of life. Recent original studies have demonstrated that patient education, pharmacist-led interventions, and digital health programmes significantly improve medication adherence and support long-term disease management in patients with coronary artery disease[8].

Considering these challenges, the present prospective observational study was undertaken to evaluate the impact of combined lifestyle modification and pharmacological therapy on medication adherence among patients with coronary artery disease. The study further assessed demographic characteristics, disease profile, comorbidity profile, drug utilization patterns, surgical management, and adherence to recommended lifestyle modifications to generate real-world evidence supporting comprehensive secondary prevention strategies.

PATHOPHYSIOLOGY OF CAD:

Coronary artery disease (CAD) is a chronic inflammatory disorder characterized by the progressive development of atherosclerotic plaques within the coronary arteries[3,4], leading to impaired myocardial perfusion. The disease process begins with endothelial dysfunction caused by cardiovascular risk factors such as hypertension, diabetes mellitus, dyslipidemia, smoking, obesity, and sedentary lifestyle. Endothelial injury promotes the infiltration of low-density lipoprotein (LDL) cholesterol into the arterial wall, where it undergoes oxidation and triggers an inflammatory response. Activated macrophages engulf oxidized LDL particles to form foam cells, resulting in fatty streaks that gradually progress to fibrous atherosclerotic plaques [3]. As plaque burden increases, coronary



blood flow becomes restricted, producing myocardial ischemia and clinical manifestations such as stable angina. Plaque rupture or erosion may precipitate platelet activation and thrombus formation, leading to acute coronary syndromes, including unstable angina, non-ST-segment elevation myocardial infarction (NSTEMI), and ST-segment elevation myocardial infarction (STEMI) [4]. Major modifiable risk factors, including hypertension, diabetes mellitus, dyslipidaemia, smoking, obesity, physical inactivity, and unhealthy dietary habits, accelerate the progression of atherosclerosis and increase the risk of adverse cardiovascular events [5]. The progression of coronary artery disease is strongly influenced by modifiable cardiovascular risk factors. Effective control of hypertension, diabetes mellitus, dyslipidemia, smoking, obesity, and sedentary behavior, together with adherence to guideline-directed pharmacological therapy, plays a critical role in slowing disease progression and reducing recurrent cardiovascular events. Consequently, comprehensive management strategies that integrate pharmacological treatment with sustained lifestyle modification constitute the foundation of contemporary secondary prevention for patients with coronary artery disease [5].

LIFE STYLE MODIFICATION:

Lifestyle modification is a fundamental component of both primary and secondary prevention of coronary artery disease and complements evidence-based pharmacological therapy [11]. International cardiovascular guidelines recommend smoking cessation, regular physical activity, adherence to a heart-healthy diet, weight management, stress reduction, moderation of alcohol intake, and participation in structured cardiac rehabilitation programmes [11]. These interventions improve endothelial function, reduce systemic inflammation, enhance metabolic control, and contribute to long-term cardiovascular

risk reduction [5,11]. However, adherence to lifestyle recommendations remains suboptimal in routine clinical practice because of inadequate patient awareness, poor motivation, limited follow-up, and socioeconomic barriers [2]. Recent original clinical studies have demonstrated that structured health education, pharmacist-led counselling, and digital health interventions significantly improve medication adherence, lifestyle compliance, and overall disease management among patients with coronary artery disease [12].

PHARMACOLOGY TREATMENT:

Evidence-based pharmacological therapy forms the cornerstone of CAD management and secondary prevention [6,7]. Current international guidelines recommend antiplatelet agents, statins, beta-blockers, angiotensin-converting enzyme (ACE) inhibitors or angiotensin receptor blockers (ARBs), nitrates, and other adjunctive therapies based on the patient's clinical presentation and associated comorbidities [6,7]. Antiplatelet agents reduce thrombotic complications by inhibiting platelet aggregation, while statins lower LDL cholesterol levels, stabilize atherosclerotic plaques, and slow disease progression [8]. Beta-blockers decrease myocardial oxygen demand by reducing heart rate and blood pressure, whereas ACE inhibitors and ARBs improve vascular function and reduce cardiovascular events, particularly in patients with hypertension, diabetes mellitus, left ventricular dysfunction, or heart failure [8,9]. Large randomized clinical trials, including the COURAGE and ISCHEMIA trials, have demonstrated that optimal medical therapy remains the foundation of CAD management regardless of whether invasive coronary revascularization is performed [6,7]. Furthermore, adherence to evidence-based pharmacotherapy has been consistently associated with improved long-term cardiovascular outcomes, emphasizing the



importance of sustained medication adherence in secondary prevention [8,10].

Overview of Guideline-Directed Pharmacological Therapy for Coronary Artery Disease

Table 2. Overview of guideline-directed pharmacological therapy recommended for the management of coronary artery disease and acute coronary syndrome.

Therapeutic Class	Primary Clinical Role	Common Examples
Antiplatelet agents	Prevention of platelet aggregation and recurrent thrombotic events	Aspirin, Clopidogrel, Ticagrelor
Lipid-lowering agents (Statins)	Reduction of LDL cholesterol and stabilization of atherosclerotic plaques	Atorvastatin, Rosuvastatin
Beta-blockers	Reduction of myocardial oxygen demand and control of heart rate	Metoprolol, Atenolol
ACE inhibitors/ARBs	Blood pressure control and cardiovascular protection	Ramipril, Lisinopril, Losartan
Calcium channel blockers	Relief of angina and control of hypertension	Amlodipine, Diltiazem
Nitrates	Coronary vasodilation and relief of anginal symptoms	Nitroglycerin, Isosorbide mononitrate
Anticoagulants	Prevention of thrombus formation in selected ACS patients	Enoxaparin, Unfractionated heparin
Diuretics	Management of fluid overload in patients with heart failure	Furosemide, Torsemide

AIM OF THE STUDY

The present prospective observational study was conducted to evaluate the association of combined lifestyle modification and pharmacological therapy with clinical outcomes and medication adherence among patients with coronary artery disease admitted to a tertiary care hospital. The study also aimed to describe patient demographics, disease characteristics, comorbidity profile, drug utilization patterns, surgical management, and adherence to recommended lifestyle modifications, thereby providing real-world evidence to support comprehensive secondary prevention strategies in CAD.

MATERIALS AND METHODS

Study Design

A prospective observational study was conducted to evaluate the association of combined lifestyle modification and pharmacological therapy with

clinical outcomes and medication adherence among patients diagnosed with coronary artery disease (CAD). The study was designed to observe real-world treatment practices, assess adherence to prescribed medications and recommended lifestyle interventions, and evaluate their association with clinical outcomes without influencing the therapeutic decisions made by treating physicians. The observational design enabled the assessment of routine clinical management under standard hospital practice while minimizing intervention-related bias.

Study Setting

The study was carried out in the Department of Cardiology of a tertiary care teaching hospital in Hyderabad, Telangana, India. The hospital serves a large and diverse patient population from both urban and rural regions, providing comprehensive cardiovascular care including emergency management, inpatient services, diagnostic



investigations, and long-term follow-up of patients with coronary artery disease.

Study Duration

The study was conducted over a period of six months, during which eligible patients were consecutively enrolled, monitored, and evaluated according to the predefined study objectives. Data collection was performed prospectively throughout the study period.

Study Population

The study population consisted of adult patients diagnosed with coronary artery disease who were admitted to or attended the Department of Cardiology during the study period. Eligible patients were recruited consecutively after confirmation of diagnosis by the treating cardiologist based on clinical evaluation and relevant diagnostic investigations.

Sample Size

A total of 100 patients meeting the eligibility criteria were included in the study. The sample size was determined based on the availability of eligible patients during the study period and was considered adequate for evaluating treatment patterns, medication adherence, lifestyle modification practices, and associated clinical outcomes in this prospective observational study.

Eligibility Criteria

Inclusion Criteria

Patients were considered eligible if they fulfilled all of the following criteria:

- Adult patients aged 20–80 years.
- Diagnosed with coronary artery disease with clinical features of angina.
- Receiving pharmacological treatment for CAD.

- Patients with associated comorbidities such as hypertension, diabetes mellitus, or dyslipidaemia.
- Patients with or without a history of smoking or alcohol consumption.
- Patients willing to provide written informed consent and participate in the study.

Exclusion Criteria

Patients were excluded if they met any of the following conditions:

- Age below 20 years or above 80 years.
- Pregnant or lactating women.
- Patients with severe hepatic or renal dysfunction.
- Pediatric patients.
- Patients unwilling to participate in the study or unable to provide informed consent.

Data Collection

Patient data were collected prospectively using a standardized and revalidated data collection form specifically designed for the study. Information was obtained from patients' medical records, laboratory reports, physician notes, medication charts, and direct patient interviews.

The following variables were recorded:

Demographic Characteristics

- Age
- Gender
- Body weight
- Social history

Clinical Characteristics

- Primary diagnosis
- Duration of coronary artery disease
- Presenting symptoms
- Comorbidities
- Previous cardiovascular history

Laboratory Parameters

Available laboratory investigations included:

- Cardiac biomarkers



- Lipid profile
- Blood glucose levels
- Renal function tests
- Other relevant biochemical investigations performed during routine clinical care

Diagnostic Investigations

Clinical diagnosis was confirmed using one or more of the following investigations:

- Electrocardiography (ECG)
- Echocardiography
- Coronary angiography
- Cardiac biomarkers
- Additional investigations as indicated by the treating cardiologist

Pharmacological Therapy

Details regarding prescribed medications were documented, including:

- Antiplatelet agents
- Anticoagulants
- Statins
- Beta-blockers
- ACE inhibitors/ARBs
- Calcium channel blockers
- Nitrates
- Diuretics
- Other cardiovascular medications

LIFESTYLE MODIFICATION:

Information regarding adherence to recommended lifestyle interventions was collected, including:

- Smoking cessation
- Dietary modification
- Physical activity
- Weight management
- Alcohol restriction
- Stress management

MEDICATION ADHERENCE:

Medication adherence was assessed during follow-up by reviewing patient compliance with prescribed pharmacological therapy according to

physician recommendations. The specific adherence assessment method, criteria, and threshold used to classify a participant as adherent should be stated explicitly before submission.

OUTCOME MEASURES:

Primary Outcome

The primary outcome was the clinical outcome measure used to compare patients adhering to both pharmacological therapy and recommended lifestyle modification with those receiving pharmacological therapy alone.

Secondary Outcomes

Secondary outcomes included:

- Assessment of medication adherence.
- Evaluation of lifestyle modification adherence.
- Identification of common pharmacological treatment patterns.
- Assessment of the prevalence of cardiovascular risk factors and comorbidities.

STATISTICAL ANALYSIS:

All collected data were entered into Microsoft Excel and analyzed using IBM SPSS Statistics (IBM Corp., Armonk, NY, USA). The exact software version should be added before submission. Continuous variables were summarized as mean $\pm$ standard deviation (SD) or median with interquartile range (IQR), depending on data distribution, while categorical variables were expressed as frequencies and percentages.

The normality of continuous variables was assessed before inferential analysis. As the outcome data did not satisfy the assumptions of normality, non-parametric statistical methods were applied. The Mann–Whitney U test was used to compare the predefined clinical outcome measure between patients who adhered to both



guideline-directed pharmacological therapy and recommended lifestyle modification and those who adhered to pharmacological therapy without documented lifestyle modification adherence. A two-tailed p-value of <0.05 was considered statistically significant.

Descriptive statistics were used to summarize demographic characteristics, comorbidity profiles, drug utilization patterns, medication adherence, lifestyle modification practices, and clinical outcomes.

LIMITATIONS OF THE STUDY

The present study has several limitations that should be considered while interpreting the findings. First, the study was conducted at a single tertiary care teaching hospital with a relatively small sample size, which may limit the generalizability of the results to other healthcare settings and populations. Second, the observational study design precludes establishing a causal relationship between combined lifestyle modification, pharmacological therapy, and improved clinical outcomes. Third, the follow-up period of six months may not adequately capture long-term medication adherence, sustained lifestyle modifications, or recurrent cardiovascular events. Furthermore, lifestyle adherence was primarily assessed through patient-reported information, making the findings susceptible to recall and reporting bias. Despite these limitations, the study provides valuable real-world evidence regarding the beneficial role of integrating lifestyle modification with guideline-directed pharmacological therapy in improving clinical outcomes among patients with coronary artery disease. Future multicenter studies involving larger sample sizes, longer follow-up durations, and more comprehensive statistical analyses are warranted to validate these findings and strengthen the evidence for integrated secondary prevention strategies [2,5,6,11,12,13].

CLINICAL IMPLICATIONS

The findings of the present study have important implications for routine clinical practice. While pharmacological therapy remains the cornerstone of coronary artery disease management, the results indicate that optimal patient outcomes are more likely to be achieved when evidence-based medication is complemented by sustained lifestyle modification.

Healthcare professionals should prioritize comprehensive patient education regarding medication adherence, smoking cessation, dietary modification, regular physical activity, weight management, and control of cardiovascular risk factors. Establishing multidisciplinary care models involving cardiologists, clinical pharmacists, nurses, dietitians, and rehabilitation specialists may improve adherence to therapeutic recommendations and facilitate long-term secondary prevention.

The study also emphasizes the need for structured follow-up programs that monitor medication adherence and reinforce lifestyle counselling after hospital discharge. Such interventions may reduce recurrent cardiovascular events, improve quality of life, decrease healthcare utilization, and contribute to more cost-effective management of coronary artery disease.

From a public health perspective, the findings support the development of hospital-based and community-based cardiovascular prevention programs that integrate pharmacological treatment with behavioural and lifestyle interventions. Strengthening these preventive strategies may help reduce the growing burden of coronary artery disease, particularly in low- and middle-income countries where cardiovascular risk factors continue to increase.

RESULTS

3.1 Baseline Demographic Characteristics



A total of 100 consecutive patients diagnosed with coronary artery disease (CAD) were enrolled during the six-month study period. Among them, 64 (64%) were male and 36 (36%) were female, demonstrating a clear male predominance in the study population (Table 1).

Table 1. Baseline Demographic Characteristics of the Study Population (n = 100)

Variable	Category	Number (n)	Percentage (%)
Gender	Male	64	64.0
	Female	36	36.0
Total		100	100.0

3.2 Distribution of Social Habits

Table 2. Distribution of Social Habits Among Study Participants

Social Habit	Number (n)	Percentage (%)
No social habits	61	61.0
Alcohol consumption	28	28.0
Smoking	4	4.0
Alcohol + Smoking	4	4.0
Tobacco chewing	1	1.0
Smoking + Tobacco chewing	2	2.0
Total	100	100.0

Most participants (61%) reported no history of smoking, alcohol consumption, or tobacco use. Alcohol consumption was the most common social habit (28%), whereas smoking alone (4%) and combined smoking with alcohol consumption (4%) were relatively uncommon. Tobacco chewing was observed in only 1% of patients, while 2% reported both smoking and tobacco chewing (Table 2).

3.3 Clinical Diagnosis Profile

Acute coronary syndrome with unstable angina was the most frequent diagnosis (52%), followed by acute anterior wall myocardial infarction (16%). Non-ST-elevation myocardial infarction and acute coronary syndrome without specified infarction each accounted for 11% of cases. Other clinical diagnoses, including inferior wall myocardial infarction, isolated coronary artery disease, dilated cardiomyopathy, and regional wall motion abnormalities, were less frequently encountered (Table 3).



Table 3. Clinical Diagnosis of Study Participants

Diagnosis	Number (n)	Percentage (%)
CAD-ACS-Unstable Angina	52	52.0
CAD-ACS-AWMI	16	16.0
CAD-ACS-NSTEMI	11	11.0
CAD-ACS	11	11.0
CAD-ACS-IWMI	4	4.0
CAD	3	3.0
CAD-DCMP	2	2.0
CAD-RWMA	1	1.0
Total	100	100.0

3.4 Distribution of Comorbidities

Hypertension and type 2 diabetes mellitus were the most prevalent comorbid conditions observed among the study participants. Combined hypertension and diabetes mellitus represented the largest comorbidity group in both males (21 cases)

and females (18 cases). Hypertension alone was more frequently observed among male patients (22 cases) than females (2 cases). Fifteen patients had no documented comorbidities, while hypothyroidism and other medical conditions were reported in a small proportion of participants (Table 4).

Table 4. Distribution of Comorbidities According to Gender

Comorbidity	Female (n)	Male (n)	Total
No comorbidity	5	10	15
Hypertension	2	22	24
Diabetes mellitus	4	8	12
Hypertension + Diabetes	18	21	39
Hypertension + Hypothyroidism	2	0	2
Hypertension + Diabetes + Hypothyroidism	3	1	4
Others	2	2	4
Total	36	64	100

3.5 Surgical Management

Most patients (89%) underwent coronary revascularization procedures, including percutaneous transluminal coronary angioplasty

(PTCA) or coronary artery bypass grafting (CABG). Eleven patients (11%) did not undergo the planned intervention (Table 5).

Table 5. Surgical Management

Surgical Procedure	Number (n)	Percentage (%)
PTCA/CABG performed	89	89.0
Surgery dropout	11	11.0
Total	100	100.0



3.6 Drug Utilization Pattern

Antiplatelet agents represented the largest proportion of prescribed medications (14.15%), followed by anticoagulants (13.21%), statins

(12.26%), proton pump inhibitors (11.59%), and antihypertensive agents (8.49%). Supportive medications collectively accounted for 21.09% of all prescriptions (Table 6).

Table 6. Drug Utilization Pattern

Drug Class	Percentage (%)
Antiplatelets	14.15
Anticoagulants	13.21
Statins	12.26
Proton Pump Inhibitors	11.59
Antihypertensives	8.49
Antibiotics	7.08
Anti-anginals	5.36
Antidiabetics	4.62
Thyroid medications	2.36
Supportive medications	21.09

3.7 Medication Adherence and Lifestyle Modification

Medication adherence was reported in all enrolled patients (100%). However, adherence to recommended lifestyle modification was

substantially lower. Forty-seven patients (47%) successfully adopted the advised lifestyle changes, whereas 37% did not follow the recommendations and 16% were lost to follow-up before completion of the study (Table 7).

Table 7. Medication Adherence and Lifestyle Modification

Variable	Number (n)	Percentage (%)
Medication adherence	100	100.0
Lifestyle modification followed	47	47.0
Lifestyle modification not followed	37	37.0
Lost to follow-up	16	16.0

Statistical Analysis

To evaluate the effectiveness of combined lifestyle modification and pharmacological therapy on clinical outcomes, a Mann–Whitney U test (Rank Sum Test) was performed to compare two independent groups: patients who adhered to both medication and recommended lifestyle

modification (Group 1; n = 37) and patients who adhered to medication alone without lifestyle modification (Group 2; n = 44). The Mann–Whitney U test was selected because the outcome data were not normally distributed and did not satisfy the assumptions required for parametric testing.



Table 8. Mann–Whitney U Test Comparing Clinical Outcomes Between Study Groups

Parameter	Medication + Lifestyle Modification	Medication Alone
Sample size (<i>n</i>)	37	44
Statistical test	-	Mann–Whitney U Test
Mann–Whitney U value	-	15
Z statistic	-	-7.57
<i>p</i> -value	-	0.001
Interpretation	Better clinical outcomes	Reference group

Observations from both groups were combined and ranked in ascending order, with tied values assigned their corresponding average ranks. The sums of ranks for each group were subsequently used to calculate the Mann–Whitney U statistic. A two-tailed *p*-value of <0.05 was considered statistically significant.

Interpretation of Statistical Analysis

The Mann–Whitney U test demonstrated a statistically significant difference in the predefined clinical outcome measure between patients who adhered to both pharmacological therapy and lifestyle modification and those who adhered to pharmacological therapy alone ($U = 15$, $Z = -7.57$, $p = 0.001$). Within the limits of this observational study, combined adherence was associated with better clinical outcomes.

The findings support an association between comprehensive secondary prevention strategies incorporating pharmacological treatment and sustained lifestyle modification and better clinical outcomes. Because of the observational design, the results should not be interpreted as establishing a causal treatment effect.

DISCUSSION

Coronary artery disease (CAD) remains one of the leading causes of cardiovascular morbidity and mortality worldwide despite substantial advances in pharmacological therapy and interventional

cardiology. Optimal management extends beyond pharmacological treatment alone and requires sustained lifestyle modification to reduce recurrent cardiovascular events and improve long-term prognosis. The present prospective observational study demonstrated that patients who adhered to both guideline-directed pharmacological therapy and recommended lifestyle modification achieved significantly better clinical outcomes than those receiving pharmacological therapy alone (Mann–Whitney $U = 15$, $Z = -7.57$, $p = 0.001$), supporting the importance of comprehensive secondary prevention strategies [2,3,4].

A male predominance (64%) was observed in the study population, which is consistent with previous observational studies reporting a higher prevalence of CAD among middle-aged men [1,11]. Nevertheless, the substantial proportion of female participants emphasizes the increasing burden of CAD among women, particularly in the presence of hypertension, diabetes mellitus, and other cardiometabolic risk factor

Hypertension and diabetes mellitus were the most prevalent comorbidities among the study participants. These findings are comparable to those reported in the INTERHEART study, which identified hypertension, diabetes mellitus, dyslipidemia, obesity, and smoking as major modifiable risk factors contributing to myocardial infarction worldwide[1]. Effective management of these comorbidities remains fundamental to



reducing recurrent cardiovascular events and improving long-term prognosis.

The prescribing pattern observed in the present study reflected adherence to guideline-directed medical therapy, with antiplatelet agents, anticoagulants, statins, and antihypertensive medications being the most frequently prescribed drug classes. These findings are in agreement with the recommendations of the COURAGE and ISCHEMIA trials, which demonstrated that optimal medical therapy remains the cornerstone of secondary prevention in patients with stable coronary artery disease[2,3].

Although medication adherence was high among the study participants, adherence to recommended lifestyle modifications remained comparatively low. Similar findings have been reported in the EUROASPIRE V registry, which demonstrated that lifestyle modification remains suboptimal among patients with coronary artery disease despite widespread use of evidence-based pharmacological therapy[11]. Poor adherence to healthy dietary habits, regular physical activity, smoking cessation, and weight management continues to represent a major challenge in secondary prevention programmes.

The significant improvement in clinical outcomes among patients receiving both pharmacological therapy and lifestyle modification observed in the present study is supported by recent evidence demonstrating that multidisciplinary interventions improve medication adherence and cardiovascular outcomes. Pharmacist-led pharmaceutical care, mobile health technologies, digital therapeutic interventions, and structured patient education have been shown to enhance medication adherence, improve risk-factor control, and reduce adverse cardiovascular events [5,6,10,12].

The findings of the present study further emphasize the important role of clinical pharmacists as members of the multidisciplinary cardiovascular care team. Continuous

pharmaceutical care, medication counselling, individualized lifestyle education, and regular follow-up have been associated with improved medication adherence and better clinical outcomes among patients with coronary heart disease [6,13]. Despite these encouraging findings, the present study has certain limitations. It was conducted at a single tertiary care center with a relatively small sample size and a six-month follow-up period, which may limit the generalizability of the findings. Furthermore, lifestyle adherence was assessed using patient-reported information, introducing the possibility of recall bias. The observational study design also precludes establishing a causal relationship between the interventions and clinical outcomes. Future multicenter studies with larger sample sizes, longer follow-up durations, and advanced statistical analyses are required to validate these findings and strengthen the evidence supporting integrated lifestyle modification and pharmacological therapy in the management of coronary artery disease.

CONCLUSION

The present study found a statistically significant association between combined adherence to lifestyle modification and guideline-directed pharmacological therapy and better clinical outcomes among patients with coronary artery disease compared with pharmacological therapy alone. Although medication adherence was satisfactory among the study population, adherence to recommended lifestyle modifications remained suboptimal, highlighting the need for continuous patient education and behavioural interventions. A multidisciplinary approach involving cardiologists, clinical pharmacists, nurses, dietitians, and rehabilitation specialists may enhance medication adherence, improve risk-factor control, and promote long-term cardiovascular health. These findings reinforce the



importance of integrating evidence-based pharmacological treatment with sustained lifestyle modification as a cornerstone of secondary prevention in coronary artery disease. Further multicenter prospective studies with larger sample sizes and extended follow-up are recommended to confirm these findings and support their implementation in routine clinical practice.

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