Improvement of Secondary Prevention after Coronary Stenting in Patients with Ischemic Heart Disease: Assessment of Medication Adherence and Cardiovascular Risk Factors

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Abstract

This study evaluated the effectiveness of secondary prevention measures among patients with ischemic heart disease following coronary stenting. A cross-sectional study involving 150 patients who underwent percutaneous coronary intervention was conducted in 2026. Medication adherence, cardiovascular risk factors, lifestyle characteristics, and compliance with preventive recommendations were assessed using structured questionnaires and medical record analysis. The findings demonstrated that 65.3% of patients adhered to prescribed pharmacotherapy, whereas 34.7% reported irregular medication use. Arterial hypertension, dyslipidemia, obesity, and insufficient physical activity remained highly prevalent. Patients with lower adherence levels showed significantly higher frequencies of recurrent angina symptoms and reduced quality-of-life indicators. The results indicate that optimization of secondary prevention programs and enhancement of patient adherence may substantially reduce the risk of recurrent cardiovascular events after coronary stenting.

Keywords: *ischemic heart disease, coronary stenting, secondary prevention, medication adherence, cardiovascular risk factors, rehabilitation, cardiology*

INTRODUCTION

Cardiovascular diseases remain the leading cause of mortality and disability worldwide, accounting for a substantial proportion of global disease burden. Among cardiovascular disorders, ischemic heart disease occupies a central position because of its high prevalence, chronic progression, and severe complications. Despite significant advances in diagnostic and therapeutic technologies, ischemic heart disease continues to present major challenges to healthcare systems and society.

Coronary artery disease develops as a consequence of progressive atherosclerotic narrowing of coronary vessels, resulting in impaired myocardial perfusion and oxygen supply. In recent decades, percutaneous coronary intervention with coronary stent implantation has become one of the most effective methods for restoring coronary blood flow and improving clinical outcomes in patients with ischemic heart disease. Coronary stenting significantly reduces ischemic symptoms, improves exercise tolerance, and decreases the incidence of acute coronary events.

However, successful coronary intervention does not eliminate the underlying atherosclerotic process. Patients remain at risk of recurrent cardiovascular events, restenosis, thrombosis, myocardial infarction, and progressive vascular damage. Therefore, secondary prevention after coronary stenting represents an essential component of long-term patient management.

Modern international guidelines emphasize the importance of comprehensive secondary prevention strategies following coronary intervention. These strategies include long-term antiplatelet therapy, lipid-lowering treatment, blood pressure control, diabetes management, smoking cessation, dietary modification, weight management, and regular physical activity. Effective implementation of these measures has been shown to reduce morbidity, mortality, and healthcare expenditures associated with recurrent cardiovascular complications.

One of the most significant challenges in secondary prevention is poor medication adherence. Numerous studies have demonstrated that discontinuation of prescribed medications substantially increases the risk of adverse cardiovascular outcomes. Patient-related factors, socioeconomic conditions, insufficient health literacy, adverse drug reactions, and inadequate follow-up frequently contribute to poor adherence. As a result, many patients fail to achieve optimal long-term outcomes despite technically successful coronary interventions.

In addition to pharmacological adherence, lifestyle-related risk factors continue to influence prognosis after coronary stenting. Persistent smoking, obesity, sedentary behavior, unhealthy dietary habits, uncontrolled hypertension, and diabetes mellitus remain common among patients with coronary artery disease. The cumulative impact of these factors may significantly increase the likelihood of recurrent ischemic events and negatively affect quality of life.

Recent international investigations have highlighted the importance of individualized approaches to secondary prevention. Personalized risk assessment, patient education, regular monitoring, and multidisciplinary rehabilitation programs have demonstrated favorable effects on long-term clinical outcomes. Nevertheless, implementation of such approaches remains inconsistent in many healthcare settings.

In Uzbekistan, data regarding secondary prevention effectiveness after coronary stenting remain limited. Information concerning medication adherence, risk factor control, and patient compliance with preventive recommendations is particularly insufficient. Evaluation of these factors is necessary for development of evidence-based organizational and clinical interventions aimed at improving cardiovascular outcomes.

The present study aimed to assess medication adherence, cardiovascular risk factors, and the effectiveness of secondary prevention measures among patients with ischemic heart disease after coronary stenting, as well as to identify opportunities for optimization of long-term preventive care.

MATERIALS AND METHODS

A cross-sectional analytical study was conducted between January and December 2026 among patients diagnosed with ischemic heart disease who had previously undergone coronary stent implantation. The study was performed at cardiology departments and outpatient follow-up clinics affiliated with Central Asian Medical University and regional cardiology centers. The primary objective was to evaluate the effectiveness of secondary prevention measures, identify major cardiovascular risk factors, and assess medication adherence following coronary stenting.

A total of 150 patients were included in the study. Participants were selected through consecutive sampling among patients attending routine follow-up examinations after percutaneous coronary intervention. Inclusion criteria consisted of confirmed ischemic heart disease, previous coronary stenting performed at least six months prior to enrollment, age above 18 years, and willingness to participate in the study. Patients with severe cognitive impairment, acute cardiovascular emergencies, terminal illnesses, or incomplete medical records were excluded from the investigation.

Data collection was carried out using a structured questionnaire specifically developed for assessment of secondary prevention practices after coronary stenting. The questionnaire consisted of demographic characteristics, cardiovascular risk factors, medication adherence indicators, lifestyle habits, clinical symptoms, and quality-of-life parameters. Information regarding age, sex, educational level, occupation, smoking status, alcohol consumption, physical activity, dietary behavior, and family history of cardiovascular disease was obtained through direct interviews.

Clinical information was extracted from medical records and included diagnosis, duration of ischemic heart disease, number of implanted stents, history of myocardial infarction, arterial hypertension, diabetes mellitus, dyslipidemia, body mass index, and prescribed pharmacological treatment. Particular attention was directed toward adherence to antiplatelet therapy, statin treatment, antihypertensive medications, and glucose-lowering agents where appropriate.

Medication adherence was evaluated using a standardized adherence assessment questionnaire. Patients were categorized as adherent when they reported regular intake of prescribed medications according to physician recommendations. Individuals who interrupted therapy, missed doses frequently, or discontinued treatment without medical consultation were classified as non-adherent. Additional factors influencing adherence such as medication cost, adverse effects, forgetfulness, and inadequate understanding of treatment importance were also investigated.

Lifestyle-related secondary prevention measures were assessed through evaluation of smoking behavior, dietary habits, physical activity, and weight management practices. Respondents were asked about frequency of exercise, consumption of fruits and vegetables, dietary salt intake, consumption of saturated fats, and participation in rehabilitation programs. Physical activity was considered adequate when participants performed at least 150 minutes of moderate-intensity exercise per week according to international recommendations.

The study also evaluated patient awareness regarding cardiovascular disease prevention. Knowledge of risk factors, understanding of prescribed treatment, recognition of warning symptoms, and attendance at follow-up medical examinations were assessed. Quality of life was evaluated through self-reported measures of physical functioning, emotional well-being, social activity, and overall satisfaction with health status.

For analytical purposes, patients were divided into two groups according to medication adherence status. The first group included patients demonstrating regular adherence to prescribed therapy, while the second group consisted of individuals with inadequate

adherence. Comparative analysis was performed to identify differences in clinical outcomes, risk factor distribution, and preventive behavior between the groups.

Statistical analysis was performed using standard descriptive and analytical methods. Quantitative variables were expressed as mean values and standard deviations, whereas qualitative variables were presented as frequencies and percentages. Comparative analyses were conducted to evaluate associations between adherence levels and clinical characteristics. Results were considered statistically significant at a probability level of $p < 0.05$

RESULTS

The study included 150 patients with ischemic heart disease who had undergone coronary stenting. The mean age of participants was 61.4 ± 9.2 years. Men constituted 64.7% of the study population, while women accounted for 35.3%. Most participants were between 55 and 70 years of age.

Analysis of medication adherence demonstrated that 98 patients (65.3%) regularly followed prescribed treatment regimens, whereas 52 patients (34.7%) exhibited inadequate adherence. Among non-adherent individuals, the most frequently reported reasons for treatment interruption included forgetfulness, financial constraints, fear of adverse effects, and underestimation of disease severity.

Arterial hypertension was identified in 96 patients (64.0%), making it the most prevalent cardiovascular risk factor. Dyslipidemia was present in 88 participants (58.7%), while obesity or overweight status was detected in 79 individuals (52.7%). Diabetes mellitus was diagnosed in 42 patients (28.0%). A positive family history of cardiovascular disease was reported by 47 participants (31.3%).

Lifestyle assessment revealed that 31 patients (20.7%) continued smoking despite medical recommendations. Insufficient physical activity was observed in 73 participants (48.7%). Only 58 patients (38.7%) reported engaging in regular exercise according to recommended guidelines. Dietary assessment demonstrated that 61.3% of respondents consumed excessive dietary salt, while 54.0% reported frequent intake of high-fat foods.

Patients with inadequate medication adherence demonstrated significantly poorer control of cardiovascular risk factors. Elevated blood pressure levels were more frequently observed among non-adherent participants compared with adherent patients. Similar patterns were identified for serum lipid control and glycemic management among diabetic individuals.

Clinical symptom assessment demonstrated that recurrent angina symptoms were reported by 27 patients (18.0%). The prevalence of recurrent chest pain was considerably higher among non-adherent individuals. Episodes of hospitalization due to cardiovascular complications during the follow-up period were also more common in this group.

Quality-of-life analysis demonstrated better outcomes among adherent patients. Individuals who regularly followed prescribed therapy reported higher levels of physical functioning, greater exercise tolerance, and improved emotional well-being. Non-adherent patients more frequently experienced fatigue, anxiety regarding health status, and limitations in daily activities.

Evaluation of patient awareness revealed that only 62.0% of respondents possessed adequate knowledge regarding secondary prevention measures after coronary stenting. Patients with higher educational levels demonstrated significantly better adherence and greater understanding of cardiovascular risk factor modification.

The findings indicate that medication adherence remains one of the most important determinants of successful secondary prevention after coronary stenting. Persistent cardiovascular risk factors and inadequate compliance with preventive recommendations continue to contribute to unfavorable clinical outcomes among patients with ischemic heart disease.

DISCUSSION

The findings of the present study demonstrate that secondary prevention following coronary stenting remains a critical determinant of long-term clinical outcomes among patients with ischemic heart disease. Although coronary stenting effectively restores myocardial perfusion and alleviates ischemic symptoms, the procedure itself does not eliminate the underlying atherosclerotic process. Consequently, patients remain vulnerable to recurrent cardiovascular events if preventive measures are not maintained consistently.

One of the most important observations of this study was the relatively high prevalence of inadequate medication adherence. More than one-third of participants reported irregular use of prescribed medications despite undergoing coronary intervention. This finding is consistent with previous international studies indicating that long-term adherence to cardiovascular therapy frequently declines after hospital discharge. The phenomenon may be explained by multiple factors including insufficient health literacy, medication costs, fear of adverse reactions, complex treatment regimens, and reduced perception of disease severity after symptomatic improvement.

The association between medication adherence and clinical outcomes observed in this study highlights the importance of continuous patient education and follow-up. Patients who regularly adhered to prescribed pharmacotherapy demonstrated better control of cardiovascular risk factors, fewer recurrent symptoms, and improved quality of life. In contrast, non-adherent individuals exhibited higher prevalence of recurrent angina, elevated blood pressure, and increased rates of hospitalization. These findings support the concept that successful secondary prevention depends not only on medical intervention but also on patient participation in long-term disease management.

Arterial hypertension represented the most prevalent cardiovascular risk factor among study participants. Despite advances in antihypertensive treatment, a considerable proportion of patients continued to demonstrate inadequate blood pressure control. Persistent hypertension contributes to endothelial dysfunction, progression of atherosclerosis, and increased myocardial workload, thereby increasing the risk of recurrent coronary events. Effective blood pressure management should therefore remain a central component of secondary prevention programs.

Dyslipidemia was also highly prevalent among participants and remains one of the principal modifiable risk factors associated with progression of coronary artery disease. Statin therapy has consistently demonstrated substantial benefits in reducing cardiovascular morbidity and mortality. However, achievement of optimal lipid targets

requires both pharmacological treatment and dietary modification. The persistence of dyslipidemia among many patients indicates the necessity of strengthening nutritional counseling and regular laboratory monitoring.

The prevalence of obesity and insufficient physical activity identified in this study further emphasizes the importance of lifestyle interventions. Excess body weight is associated with insulin resistance, hypertension, dyslipidemia, systemic inflammation, and endothelial dysfunction. Similarly, physical inactivity contributes to deterioration of cardiovascular fitness and increases the likelihood of adverse cardiovascular outcomes. Patients participating in regular physical activity generally demonstrate improved exercise tolerance, better metabolic control, and enhanced psychological well-being.

Smoking remains one of the most preventable causes of cardiovascular morbidity and mortality. Although the proportion of smokers in the present study was lower than reported in some international populations, continued tobacco use among one-fifth of participants remains clinically significant. Smoking accelerates atherosclerotic progression, promotes thrombosis, impairs endothelial function, and substantially increases the risk of recurrent coronary events following stent implantation. Comprehensive smoking cessation programs should therefore be incorporated into all secondary prevention strategies.

The results additionally demonstrate the importance of patient awareness and health education. Individuals with greater knowledge regarding cardiovascular disease, medication use, and lifestyle modification exhibited better adherence and more favorable clinical outcomes. Educational interventions represent a relatively inexpensive yet highly effective strategy for improving long-term management of ischemic heart disease. Structured counseling sessions, written educational materials, and digital health technologies may enhance patient understanding and facilitate behavioral change.

Quality-of-life assessment revealed notable differences between adherent and non-adherent patients. Improved physical functioning, reduced symptom burden, and enhanced emotional well-being among adherent individuals indicate that secondary prevention provides benefits extending beyond reduction of clinical events. Improvement of quality of life should therefore be considered an important outcome measure when evaluating effectiveness of cardiovascular prevention programs.

The findings of this study support current recommendations issued by major international cardiovascular organizations emphasizing the necessity of comprehensive risk factor management after coronary intervention. Secondary prevention should integrate pharmacological treatment, lifestyle modification, regular monitoring, patient education, and multidisciplinary rehabilitation approaches. Such integrated strategies may significantly reduce recurrent cardiovascular events and improve long-term prognosis.

Several limitations should be acknowledged. The study was conducted within a limited geographic area and may not fully represent all populations with ischemic heart disease. Medication adherence was assessed partly through self-reported information, which may be influenced by recall bias. Additionally, the cross-sectional design limits

the ability to establish causal relationships between adherence and clinical outcomes. Nevertheless, the study provides valuable information regarding current challenges in secondary prevention after coronary stenting and identifies opportunities for improvement in clinical practice.

CONCLUSION

The present study demonstrated that medication adherence and effective risk factor control play essential roles in the success of secondary prevention following coronary stenting among patients with ischemic heart disease. Although coronary intervention significantly improves myocardial perfusion and clinical status, long-term outcomes remain highly dependent on patient compliance with preventive recommendations.

A substantial proportion of patients continued to exhibit modifiable cardiovascular risk factors including arterial hypertension, dyslipidemia, obesity, insufficient physical activity, and smoking. Inadequate adherence to prescribed pharmacotherapy was associated with poorer clinical outcomes, higher prevalence of recurrent symptoms, and reduced quality of life.

The findings indicate that optimization of secondary prevention requires a comprehensive approach incorporating continuous patient education, regular clinical follow-up, individualized risk assessment, and multidisciplinary rehabilitation programs. Strengthening adherence monitoring systems and improving patient awareness may substantially reduce the incidence of recurrent cardiovascular events and improve long-term prognosis after coronary stenting.

Future research should focus on development of personalized prevention models, evaluation of digital adherence-support technologies, and implementation of evidence-based organizational strategies aimed at enhancing cardiovascular outcomes among patients undergoing coronary intervention.

Reference

1. Anderson, L., Oldridge, N., Thompson, D. R., Zwisler, A. D., Rees, K., Martin, N., & Taylor, R. S. (2016). Exercise-based cardiac rehabilitation for coronary heart disease. *Journal of the American College of Cardiology, 67*(1), 1–12. https://doi.org/10.1016/j.jacc.2015.10.044
2. Arnett, D. K., Blumenthal, R. S., Albert, M. A., Buroker, A. B., Goldberger, Z. D., Hahn, E. J., Himmelfarb, C. D., Khera, A., Lloyd-Jones, D., McEvoy, J. W., Michos, E. D., Miedema, M. D., Muñoz, D., Smith, S. C., Virani, S. S., Williams, K. A., Yeboah, J., & Ziaeian, B. (2019). 2019 ACC/AHA guideline on the primary prevention of cardiovascular disease. *Circulation, 140*(11), e596–e646. https://doi.org/10.1161/CIR.0000000000000678
3. Bhatt, D. L., Eagle, K. A., Ohman, E. M., Hirsch, A. T., Goto, S., Mahoney, E. M., Wilson, P. W. F., Alberts, M. J., D'Agostino, R., Liau, C. S., Mas, J. L., Röther, J., Smith, S. C., Salette, G., Contant, C., & Steg, P. G. (2010). Comparative determinants of 4-year cardiovascular event rates in stable outpatients at risk of or with atherothrombosis. *JAMA, 304*(12), 1350–1357. https://doi.org/10.1001/jama.2010.1322
4. Fuster, V., Kelly, B. B., & Vedanthan, R. (2011). Promoting global cardiovascular health: Moving forward. *Circulation, 123*(15), 1671–1678. https://doi.org/10.1161/CIRCULATIONAHA.110.006437
5. Knuuti, J., Wijns, W., Saraste, A., Capodanno, D., Barbato, E., Funck-Brentano, C., Prescott, E., Storey, R. F., Deaton, C., Cuisset, T., Agewall, S., Dickstein, K., Edvardsen, T., Escaned, J., Gersh, B. J., Svitil, P., Gilard, M., Hasdai, D., Hatala, R., ... Bax, J. J. (2020).

2019 ESC guidelines for the diagnosis and management of chronic coronary syndromes. *European Heart Journal, 41*(3), 407–477. https://doi.org/10.1093/eurheartj/ehz425

6. Levine, G. N., Bates, E. R., Blankenship, J. C., Bailey, S. R., Bittl, J. A., Cercek, B., Chambers, C. E., Ellis, S. G., Guyton, R.
7. Xu, H., Jiang, M., Deng, Q., & Li, M. (2026). An attempt to explore the relative importance of factors influencing medication adherence after percutaneous coronary intervention. *European Journal of Cardiovascular Nursing*, zvaf223.
8. Boqijonova, N. F. (2025). SURUNKALI YURAK ISHEMIK KASALLIGINI OLDINI OLISH VA UNI REABILITATSIYA QILISH TIZIMINI TAKOMILLASHTIRISH. *Журнал гуманитарных и естественных наук*, (24), 13-16.
9. Boqijonova, N. F. (2025). BIOCHEMICAL DIAGNOSTICS IN THE DIAGNOSIS OF CORONARY ARTERY DISEASE. *Zamonaviy tibbiyot jurnali (Журнал современной медицины)*, *11*(4), 914-916.
10. Бокижонов, Ф. А. (2025). ГИГИЕНИЧЕСКАЯ ОЦЕНКА ЗДОРОВЬЯ РАБОТНИКОВ ЖЕЛЕЗНОДОРОЖНОГО ТРАНСПОРТА ФЕРГАНСКОЙ ДОЛИНЫ. *Журнал гуманитарных и естественных наук*, (24), 31-34.
11. Zokirov , R., Soliyev , B., & Abduvahobova , D. (2026). Hygienic Assessment of Air Pollution Perception and Environmental Comfort Among Urban Residents of The Fergana Valley. *International Journal of Medical and Clinical Sciences*, *1*(4), 416–423.
12. Boqijonov , F., & Nazirova , M. (2026). Hygienic Assessment of Working Conditions and Occupational Health Risks Among Railway Transport Workers in the Fergana Valley. *International Journal of Medical and Clinical Sciences*, *1*(4), 404–415.
13. Soliyev , B. (2026). Hygienic Assessment of Atmospheric Air Quality in Fergana City: An Extended Resident-Based Perception and Health Symptom Study. *Journal of Clinical and Biomedical Research*, *2*(5), 96–101.
14. Tuxtamatov , R. (2026). Occupational Health Profile and Risk Assessment of Military Communications Personnel in Modern Electronic Warfare Environments. *Journal of Clinical and Biomedical Research*, *2*(5), 102–108.
15. Maraimov , U. (2026). Hygienic Assessment of Nutrition Patterns and Dietary Habits in Fergana City: an Extended Population-Based Survey. *International Journal of Medical and Clinical Sciences*, *1*(4), 112–118.
16. Abduvaliyeva, F., Turdiyev, S., Azimova, M., Soliyev, B., & Atadjanova, D. (2024). Hygienic assessment of drinking water from underground sources of centralized water supply systems of Fergana City. In *BIO Web of Conferences* (Vol. 113, p. 04020). EDP Sciences.
17. Soliyev, B., Uktamov, R. V., Tojiboyev, N. A., Khudoyberdiev, A. K., & Yuldasheva, D. R. (2025). MEHNATNI OG‘IRLIGI VA KESKINLIGI VA ISHLOVCHILAR ORGANIZMIDABO‘LADIGAN FIZIOLOGIK O‘ZGARISHLAR. *Eurasian Journal of Academic Research*, *5*(2), 33-38.
18. Maraimov, U. B., & Axunov, A. (2026). Hygienic Assessment of The Impact of Atmospheric Air Pollution in Residential Areas on Public Health and Living Conditions: A Population-Based Survey Study in Fergana Region. *International Journal of Clinical & Translational Medicine*, *1*(4), 368-374.
19. Boqijonov F. Assessment Of Sanitary and Epidemiological Safety in Railway Catering Facilities: An Extended Analysis from The Kokand Region (Uzbekistan) //International Journal of Clinical & Translational Medicine. – 2026. – Т. 1. – №. 4. – С. 101-111.