



Systematic Review Article

## Lifestyle Modifications After Myocardial Infarction: A Systematic Review of Diet, Physical Activity, Smoking and Alcohol Cessation

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### ABSTRACT

**Introduction:** Myocardial infarction (MI) remains a major cause of morbidity and mortality worldwide, and individuals who survive a first MI are at high risk of recurrent cardiovascular events. Lifestyle modification—including dietary changes, regular physical activity, alcohol and smoking cessation—is a cornerstone of secondary prevention. However, adherence to these recommendations varies widely, and the overall effectiveness of these interventions in real-world post-MI populations requires comprehensive evaluation. This systematic review aims to assess the impact of diet, physical activity, alcohol and smoking cessation on recurrent MI, cardiovascular mortality, hospital readmissions, and quality of life among adults following myocardial infarction.

**Objectives:** This systematic review aims to evaluate the impact of dietary modification, physical activity, smoking and alcohol cessation on cardiovascular outcomes after myocardial infarction, assess adherence rates, and identify their effects on recurrent MI, mortality, hospital readmissions, and factors influencing long-term adherence.

**Methodology:** This systematic review followed PRISMA guidelines. A comprehensive search of PubMed/MEDLINE, Embase, and Scopus was conducted from inception to the most recent date. Eligible study designs comprised randomized controlled trials, cohort, case-control, and cross-sectional studies, and review articles. Non-English articles, studies lacking extractable data, or those without clear outcome measures, editorials, commentaries, and conference abstracts, were excluded.

**Results:** Lifestyle modification is central to secondary prevention after MI. Mediterranean-style diets were associated with reduced cardiovascular events and mortality, though evidence in secondary prevention remains limited. Exercise-based cardiac rehabilitation lowered cardiovascular mortality and hospitalizations and improved functional and psychosocial outcomes. Smoking cessation reduced recurrent events by approximately one-third. Light-to-moderate alcohol intake showed mixed associations with mortality.

**Conclusion:** Effective secondary prevention after MI requires integrated lifestyle modification, cardiac rehabilitation, and optimal risk-factor control. Although these strategies improve survival and psychosocial outcomes, adherence remains suboptimal. Personalized, multidisciplinary, and digitally supported rehabilitation models may enhance long-term cardiovascular outcomes.

**Keywords:** Myocardial infarction, Secondary prevention, Lifestyle modification, Dietary quality, Physical activity, Cardiac rehabilitation, Smoking cessation, Alcohol cessation. .

## INTRODUCTION

Myocardial infarction (MI), or heart attack, remains a leading global cause of illness and death. It results from abrupt obstruction of coronary blood flow, typically due to plaque rupture and thrombus formation. Advances in pathophysiology, diagnostic strategies, and therapeutic interventions have markedly improved survival and outcomes. This review summarizes current evidence-based management strategies, recent developments, and persistent challenges in optimizing MI care across healthcare settings (Saha T et al., 2025).<sup>1</sup>

The 2023 AHA/ACC/ACCP/ASPC/NLA/PCNA Guideline for the management of patients with chronic coronary disease updates and integrates the latest evidence, replacing the earlier 2012 guideline on stable ischemic heart disease and its 2014 focused update. It consolidates prior recommendations while incorporating new research to reflect current standards of care in chronic coronary disease management. This guideline outlines an evidence-based, patient-centred framework for managing chronic coronary disease, integrating social determinants of health, shared decision-making, and multidisciplinary care. It addresses treatment strategies to relieve symptoms and prevent future cardiovascular events, considerations for revascularization, management of special populations, follow-up and monitoring, and current research gaps. Updated recommendations reflect emerging evidence, and where data permit, cost-effectiveness is incorporated to support value-based clinical decision-making (Virani SS et al., 2023).<sup>2</sup>

Since the 2006 AHA/ACCF secondary prevention update, substantial clinical trial evidence has strengthened support for intensive risk-reduction strategies in patients with coronary and other atherosclerotic vascular diseases, including peripheral, aortic, and carotid disease. In light of this expanded evidence base and its clinical implications, the guideline title was revised to reflect a broader focus on secondary prevention and risk reduction across atherosclerotic conditions (Smith SC Jr et al., 2011).<sup>3</sup>

Survey-based research provides valuable insight into patient-reported behaviours, perceptions, and barriers related to lifestyle modification after MI. Understanding the extent to which patients adopt recommended lifestyle changes after MI, as well as factors influencing adherence, is essential for designing targeted interventions and improving secondary prevention strategies. This study therefore aims to assess lifestyle modification practices—focusing on diet, exercise, and smoking cessation—among patients following myocardial infarction.

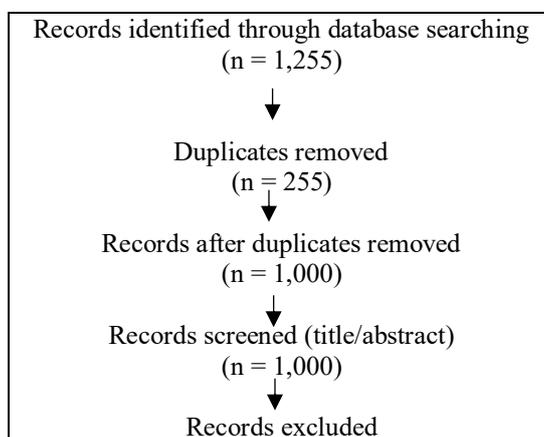
## OBJECTIVES

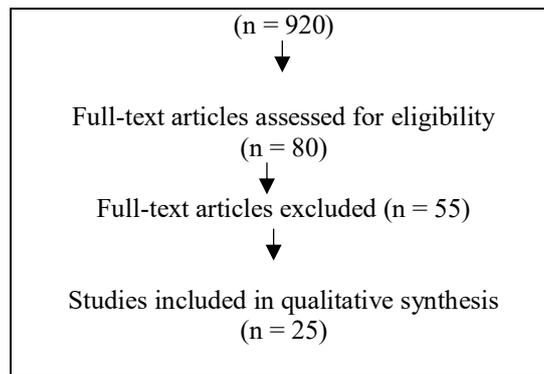
This systematic review evaluates the effects of dietary modification, physical activity, alcohol and smoking cessation on cardiovascular outcomes after myocardial infarction. It also examines adherence rates to these lifestyle interventions and analyses their impact on recurrent myocardial infarction, mortality, hospital readmissions, and factors that influence long-term adherence.

## METHODOLOGY

The review conducted in accordance with the PRISMA guidelines. A comprehensive literature search was performed using databases including PubMed, Scopus, Web of Science, and Google Scholar using key words Myocardial infarction, Secondary prevention, Lifestyle modification, Dietary quality, Physical activity, Cardiac rehabilitation, Smoking cessation, and alcohol cessation. Eligible study designs included randomized controlled trials, cohort studies, case-control studies, cross-sectional studies and review articles. Non-English papers without extractable data, lacked clear outcome measures or evaluable results, editorials, commentaries and conference abstracts, were excluded.

Titles, abstracts, and full texts were independently screened by three reviewers, with disagreements resolved by consensus. Data extraction and quality assessment were performed independently using standardized tools appropriate to study design. Due to heterogeneity among studies, a qualitative synthesis was conducted.





**Figure: PRISMA Flow chart of Study Selection Process**

## RESULTS

All individuals with chronic coronary disease (CCD) are advised to adopt lifestyle-based interventions, such as maintaining a balanced diet and engaging in regular physical activity, as part of their management plan (Virani SS et al., 2023).<sup>2</sup>

### Dietary modification after myocardial infarction

In a study by Estruch R et al., 2018, a total of 288 primary endpoint events were recorded: 96 (3.8%) in the Mediterranean diet plus extra-virgin olive oil group, 83 (3.4%) in the Mediterranean diet plus nuts group, and 109 (4.4%) in the control group. In the intention-to-treat analysis adjusted for baseline factors, both Mediterranean diet interventions significantly reduced risk compared with the control diet (Hazard Ratio [HR] 0.69; 95% Confidence Interval [CI] 0.53–0.91) for olive oil, and (HR 0.72; 95% CI 0.54–0.95) for nuts. Findings remained consistent even after excluding participants with protocol deviations.<sup>4</sup>

In a meta-analysis by Rees K et al., 2019, concluded that although many studies were included, uncertainty remains about the impact of a Mediterranean-style diet on clinical outcomes and cardiovascular risk factors in both primary and secondary prevention. Evidence supporting modest benefits in primary prevention is of low to moderate quality, with few reported harms, while data for secondary prevention are limited. Ongoing trials may help clarify its long-term effects.<sup>5</sup>

During follow-up (682 female and 451 male deaths), median survival after MI was ~9 years. Higher post-MI Alternate Healthy Eating Index (AHEI)-2010 scores were associated with lower all-cause mortality (HR 0.76; 95% CI 0.60–0.96) and a trend toward lower cardiovascular mortality (HR 0.73; 95% CI 0.51–1.04). Greater improvement in diet quality after MI further reduced all-cause (HR 0.71; 95% CI 0.56–0.91) and cardiovascular mortality (HR 0.60; 95% CI 0.41–0.86), with similar results after excluding alcohol (Li S et al., 2013).<sup>6</sup>

Seventy percent of participants demonstrated poor knowledge of recommended lifestyle modifications. Overall scores ranged from 38.9% to 94.4%, with a mean of 60.7% ± 14.1%. No significant associations were identified between knowledge scores and demographic characteristics, although responses varied across specific questions (Al-Tamimi TR et al., 2017).<sup>7</sup>

From 2003–2004, 1,003 patients were followed with repeated clinical visits (mean 5.8), during which inflammatory markers were measured, and diet was assessed using an Food Frequency Questionnaire (FFQ) and Mediterranean diet score. Higher adherence to the Mediterranean diet was independently associated with lower C-reactive protein (CRP) (–3.1% per unit increase) and (interleukin) IL-6 (–1.9%), but not fibrinogen; moderate red wine intake was also linked to lower levels of all three inflammatory markers (Panagiotakos DB et al., 2009).<sup>8</sup>

In the Nurses' Health Study, higher saturated and trans-fat intake was associated with increased coronary heart disease (CHD) risk, while mono- and polyunsaturated fats were linked to lower risk, regardless of the energy-adjustment model used. Associations were stronger when cumulative average diet was analysed, and the residual and nutrient density models showed more significant linear trends than other methods (Hu FB et al., 1999).<sup>9</sup>

**Table 1: Summary of Key Finding Related to Dietary Modification After Myocardial Infarction**

Author (Year)	Key Findings
Estruch R et al., 2018	Mediterranean diet interventions significantly reduced risk compared with the control diet (HR 0.69; HR 0.72).
Rees K et al., 2019	Uncertainty remains about the impact of a Mediterranean-style diet; data for secondary prevention are limited.

Li S et al., 2013	Higher post-MI AHEI-2010 scores were associated with lower all-cause mortality (HR 0.76); greater improvement diet quality further reduced mortality (HR 0.71).
Al-Tamimi TR et al., 2017	Seventy percent demonstrated poor knowledge of recommended lifestyle modifications.
Panagiotakos DB et al., 2009	Higher adherence to the Mediterranean diet was independently associated with lower CRP (-3.1%) and IL-6 (-1.9%).
Hu FB et al., 1999	Higher saturated and trans-fat intake increased CHD risk; mono- and polyunsaturated fats were linked to lower risk.

### Physical activity and cardiac rehabilitation

Regular physical activity following MI improves cardiorespiratory fitness, endothelial function, and metabolic health while reducing cardiovascular mortality. Exercise-based cardiac rehabilitation programs, which combine supervised exercise with education and risk-factor modification, are strongly recommended for post-MI patients.

In a Cochrane systematic review by Anderson L et al., 2016, a total of 63 studies involving 14,486 participants (median follow-up: 12 months) were analysed. Exercise-based cardiac rehabilitation (CR) was associated with reduced cardiovascular mortality (RR 0.74; 95% CI 0.64–0.86) and fewer hospital admissions (RR 0.82; 95% CI 0.70–0.96), without significant effects on overall mortality, myocardial infarction, or revascularization. Most studies reported improvements in at least one domain of health-related quality of life. Overall, exercise-based CR lowers cardiovascular death, reduces hospitalizations, and enhances quality of life, with benefits consistent across patient groups and intervention settings.<sup>10</sup>

During the high-risk period following MI or percutaneous coronary intervention (PCI), close clinician-patient collaboration is essential to strengthen secondary prevention. This includes optimizing medical therapy, reinforcing healthy lifestyle behaviors, and encouraging enrolment in cardiac rehabilitation. Key measures involve adopting a balanced diet rich in whole grains, fruits, and vegetables, increasing physical activity, addressing psychosocial factors, and achieving smoking cessation. Cardiac rehabilitation provides a structured, multidisciplinary approach that integrates these strategies to enhance quality of life and reduce recurrent events and mortality (Nguyen N et al., 2025).<sup>11</sup>

In a six-week outpatient cardiac rehabilitation program involving 147 patients with coronary heart disease, physical activity, quality of life (MacNew), and psychological status (Hospital Anxiety and Depression Scale- HADS) were assessed at baseline, 6 weeks, 6 months, and 12 months. Significant improvements over time were observed in total energy expenditure, anxiety, depression, and quality of life (all  $p < 0.001$ ), with post hoc analysis confirming sustained benefits beyond baseline (Yohannes AM et al., 2010).<sup>12</sup>

Sixty patients with NYHA class II–III congestive heart failure (CHF) were randomized to an 8-week treadmill-based aerobic training program (three times weekly) or usual care. Of the 44 who completed the study, those in the exercise group showed significant improvements in peak oxygen uptake, exercise duration, and metabolic equivalents (METs), along with reductions in depression and anxiety scores. No significant changes were observed in the control group, and quality of life scores remained unchanged in both groups (Kulcu DG et al., 2007).<sup>13</sup>

In this retrospective SWEDHEART registry study of 19,136 post-MI patients (75% men; mean age  $62.8 \pm 8.7$  years), 43% participated in exercise-based cardiac rehabilitation. After adjustment for clinical factors, attendees were more likely to quit smoking and reported higher physical activity at one year compared with non-attendees ( $p < 0.001$ ). They also showed modestly greater improvements in triglycerides, with men gaining less weight and women achieving better total and LDL cholesterol reduction. Overall, participation in exercise-based cardiac rehabilitation was associated with more favourable cardiovascular risk factor changes one year after MI (Sjölin I et al., 2020).<sup>14</sup>

**Table 2: Summary of Key Finding Related to Physical Activity and Cardiac Rehabilitation**

Author (Year)	Key Findings
Anderson L et al., 2016	Exercise-based CR reduced cardiovascular mortality (RR 0.74) and hospital admissions (RR 0.82).
Nguyen N et al., 2025	Cardiac rehabilitation integrates lifestyle strategies to enhance quality of life and reduce recurrent events and mortality.
Yohannes AM et al., 2010	Significant improvements in physical activity, anxiety, depression, and quality of life ( $p < 0.001$ ).
Kulcu DG et al., 2007	Aerobic training improved peak oxygen uptake, exercise duration, and depression and anxiety scores.
Sjölin I et al., 2020	Exercise-based CR was associated with more favourable cardiovascular risk factor changes one year after MI.

### Smoking and alcohol cessation after myocardial infarction

Smoking is a major modifiable risk factor for coronary artery disease, and continued smoking after MI markedly increases the risk of recurrent infarction and death. Evidence consistently shows that smoking cessation after MI leads to substantial reductions in both all-cause and cardiovascular mortality. Moderate-certainty evidence indicates that quitting smoking at the time of diagnosis reduces the risk of recurrent cardiovascular events by about one-third. This effect is biologically plausible, given the improvement in endothelial and platelet function after cessation. Individuals who stop smoking have a lower risk of secondary cardiovascular disease (CVD) events and may experience better quality of life compared with those who continue. Further well-controlled studies are needed to address potential confounders, including the use of cardioprotective medications (Wu AD et al., 2022).<sup>15</sup>

Most patients who successfully quit smoking did so immediately after the acute coronary syndrome (ACS) event and remained abstinent at one year without additional support (82%). Successful cessation was associated with higher education, no prior history of cardiovascular disease, and achieving target LDL levels at follow-up (all  $p < 0.01$ ) (Snarterse M et al., 2015).<sup>16</sup>

Among 1,253 women followed after MI, light-to-moderate alcohol consumption was associated with lower 10-year mortality compared with abstinence (HR ~0.65–0.66;  $p$ -trend=0.008), with no variation by beverage type. Benefits appeared at intake levels below current recommended limits (Rosenbloom JI et al., 2012).<sup>17</sup>

In a cohort of 1,913 post-MI patients followed for 3.8 years, those who reported moderate alcohol intake prior to MI had lower all-cause and cardiovascular mortality compared with abstainers. The inverse association persisted after adjustment and was consistent across sexes and beverage types (Mukamal KJ et al., 2001).<sup>18</sup>

In a cohort study by Romelsjö A et al., 1999, followed 49,618 Swedish men conscripted in 1969–1970 using national mortality and hospitalization registers (1970–1995). Alcohol intake was quantified in grams of ethanol per day and analysed against mortality, myocardial infarction (MI), and stroke. Higher alcohol consumption ( $\geq 15$  g/day) was associated with increased overall mortality (Relative Risk [RR] 1.37; 95% CI 1.01–1.85) and a nonsignificant rise in stroke risk, while MI risk showed a nonsignificant inverse trend. Much of the excess mortality was linked to concurrent smoking. Alcohol was attributable to 14% of deaths and 37% of strokes but was associated with fewer MI's.<sup>19</sup>

In adults over 35, consistent data do not show increased mortality with up to 2–3 drinks per day in men and 1–2 in women, but non-drinkers should not be advised to start drinking. Higher intake should be discouraged. Further research is needed, especially among younger individuals, women, and older adults (Beaglehole R et al., 1992).<sup>20</sup>

**Table 3: Summary of Key Finding Related to Smoking and Alcohol Cessation After Myocardial Infarction**

Author (Year)	Key Findings
Wu AD et al., 2022	Quitting smoking reduces recurrent cardiovascular events by about one-third.
Snarterse M et al., 2015	Immediate quitters remained abstinent at one year without additional support (82%).
Rosenbloom JI et al., 2012	Light-to-moderate alcohol consumption was associated with lower 10-year mortality compared with abstinence (HR ~0.65–0.66).
Mukamal KJ et al., 2001	Moderate alcohol intake prior to MI had lower all-cause and cardiovascular mortality compared with abstainers.
Romelsjö A et al., 1999	Higher alcohol consumption ( $\geq 15$ g/day) was associated with increased overall mortality (RR 1.37).
Beaglehole R et al., 1992	No increased mortality with up to 2–3 drinks per day; higher intake should be discouraged.

### CONCLUSION

Among individuals who survive an MI, better adherence to a high-quality dietary pattern—previously linked to reduced CHD risk in primary prevention—is associated with decreased risk of subsequent all-cause mortality (Li S et al., 2013).<sup>6</sup>

Greater adherence to a traditional Mediterranean dietary pattern was linked to lower inflammatory marker levels in MI survivors. This anti-inflammatory effect may partly underlie its protective role against chronic conditions such as atherosclerosis and cancer, supporting its value in secondary prevention (Panagiotakos DB et al., 2009).<sup>8</sup>

A six-week cardiac rehabilitation program significantly improved physical activity, quality of life, anxiety, and depression, with benefits sustained at 12 months (Yohannes AM et al., 2010).<sup>12</sup>

Overall, aerobic training was well tolerated and improved physical capacity and psychological status, though short-term quality of life did not significantly improve (Kulcu DG et al., 2007).<sup>13</sup>

Findings suggest that many patients who stop smoking after a life-threatening event can maintain abstinence independently, with low relapse rates over one year (Snaterse M et al., 2015).<sup>16</sup>

In the study by Kotseva K et al., 2019, of 8,261 patients under 80 years old assessed at least six months after a coronary event or intervention, unhealthy lifestyle patterns were common: 19% were smokers (over half continued smoking), 38% were obese, 59% had central obesity, and 66% were insufficiently physically active. Risk factor control was suboptimal, with 42% having elevated blood pressure, 71% above LDL cholesterol targets, and 29% reporting diabetes, despite high use of cardioprotective medications. Overall, many patients failed to meet recommended lifestyle and risk factor goals, underscoring the need for comprehensive, multidisciplinary preventive cardiology programs to reduce recurrent cardiovascular risk.<sup>21</sup>

After an acute myocardial infarction, patients benefit significantly from comprehensive risk-factor management, including lifestyle modification and control of both established and emerging risks. Because atherosclerosis is multifactorial, effective secondary prevention must be equally multidimensional. Implementing secondary prevention after acute coronary syndrome reduces cardiovascular events, overall mortality, and healthcare costs, making broad and consistent application essential (Tuka V et al., 2022).<sup>22</sup>

Cardiac rehabilitation is a key secondary prevention strategy built on structured exercise. Ongoing focus on training approaches, participation barriers, and telemedicine is crucial to sustain its effectiveness and accessibility (Winnige P et al., 2021).<sup>23</sup>

Chong MS et al., 2024, found that among 240 coronary heart disease patients, 70% attended phase II cardiac rehabilitation. Logistical and healthcare-related barriers reduced participation, while greater social support and anxiety were linked to higher attendance. High acceptance of digital tools suggests home-based or hybrid models may help overcome barriers and improve adherence.<sup>24</sup>

Effective programs rely on personalized care, early and consistent two-way communication, and structured exercise monitoring. Equally important are user-friendly platforms backed by reliable technical support (Gallegos-Rejas VM et al., 2024).<sup>25</sup>

Despite strong evidence, adherence to lifestyle modification after MI remains suboptimal due to limited awareness and practical barriers. Survey-based studies are essential to identify patient challenges and inform targeted strategies to enhance rehabilitation uptake and secondary prevention.

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