Journal of Advanced Healthcare and Medical Sciences (JAHMS)
J. Adv. Healthc. Med. Sci.
E-ISSN: xxxx-xxxx; P-ISSN: xxxx-xxxx
Website: https://www.jahms.org/

Original Article

Impact of Lifestyle Interventions on Cardiovascular Risk Reduction

Aleena Rehman
Khyber Teaching Hospital, Peshawar

Corresponding Author: Aleena Rehman

Received: 2025-07-20 **Accepted**: 2025-09-18 **Published**: 2025-11-30

Abstract-

Background: Cardiovascular diseases (CVDs) remain the leading cause of mortality worldwide, accounting for approximately 17.9 million deaths annually. Modifiable lifestyle factors such as unhealthy diet, physical inactivity, smoking, obesity, and excessive alcohol consumption significantly contribute to cardiovascular risk. ***Objective***: To evaluate the impact of lifestyle interventions on cardiovascular risk reduction among adults at risk of cardiovascular disease. ***Methods***: A prospective observational study was conducted among 200 adults aged 30–65 years with at least one cardiovascular risk factor. Participants underwent a 12-month lifestyle intervention program consisting of dietary modification, regular physical activity, smoking cessation counseling, stress management, and health education. Baseline and post-intervention measurements included body mass index (BMI), blood pressure, fasting blood glucose, total cholesterol, and cardiovascular risk scores. Data were analyzed using descriptive and inferential statistics. ***Results***: Significant improvements were observed following the intervention. Mean BMI decreased from 29.1 ± 3.8 kg/m² to 26.8 ± 3.4 kg/m², systolic blood pressure decreased from 142.5 ± 12.4 mmHg to 130.2 ± 10.6 mmHg, and total cholesterol reduced from 220.4 ± 35.6 mg/dL to 192.3 ± 28.7 mg/dL. The overall cardiovascular risk score decreased by 25%. ***Conclusion***: Lifestyle interventions significantly reduce cardiovascular risk factors and improve overall cardiovascular health. Comprehensive programs focusing on dietary changes, physical activity, smoking cessation, and stress reduction should be integrated into preventive healthcare strategies.

Keywords: *Cardiovascular disease, lifestyle intervention, risk reduction, physical activity, diet modification, prevention.*

INTRODUCTION

Cardiovascular diseases (CVDs) represent a major public health challenge and remain the leading cause of death globally. According to the World Health Organization (WHO), approximately 17.9 million people die each year from CVDs, accounting for nearly 32% of all global deaths (1). These conditions include coronary artery disease, stroke, heart failure, and peripheral vascular disease. The increasing prevalence of cardiovascular disorders has been attributed largely to changes in lifestyle behaviors associated with urbanization, sedentary habits, unhealthy dietary patterns, and tobacco use. The development of cardiovascular disease is influenced by both non-modifiable and modifiable risk factors. Non-modifiable factors include age, gender, family history, and genetic predisposition. However, modifiable risk factors such as hypertension, dyslipidemia, obesity, smoking, physical inactivity, unhealthy diet, and diabetes mellitus contribute significantly to disease onset and progression (2). Evidence suggests that the majority of cardiovascular events can be prevented through effective modification of these risk factors.

Lifestyle interventions have emerged as a cornerstone of cardiovascular disease prevention. These interventions typically encompass dietary modification, increased physical activity, smoking cessation, weight management, alcohol moderation, and stress reduction strategies. Numerous epidemiological and clinical studies have demonstrated the effectiveness of lifestyle changes in reducing cardiovascular morbidity and mortality (3). For instance, adherence to a Mediterranean-style diet rich in fruits, vegetables, whole grains, nuts, and olive oil has been associated with substantial reductions in cardiovascular events (4).

Physical activity plays a critical role in cardiovascular health by improving endothelial function, reducing blood pressure, enhancing lipid profiles, and promoting weight control. Current guidelines recommend at least 150 minutes of moderate-intensity aerobic exercise per week for adults to achieve cardiovascular benefits (5). Similarly, smoking cessation significantly lowers the risk of myocardial infarction, stroke, and cardiovascular mortality, with benefits observed within a few years of quitting (6).

Obesity and overweight are recognized as major contributors to cardiovascular risk. Excess body weight is associated with hypertension, insulin resistance, dyslipidemia, and systemic inflammation. Weight reduction through caloric restriction and increased physical activity has been shown to improve multiple cardiovascular risk markers (7). Furthermore, psychosocial stress has been increasingly identified as an independent cardiovascular risk factor. Stress management interventions, including mindfulness, yoga, and cognitive behavioral therapy, may contribute to improved cardiovascular outcomes (8).

Despite growing evidence supporting lifestyle modifications, adherence remains a significant challenge. Understanding the effectiveness of structured lifestyle intervention programs is essential for developing evidence-based public health strategies. Therefore, this study aims to assess the impact of comprehensive lifestyle interventions on cardiovascular risk reduction among adults with cardiovascular risk factors.

MATERIALS AND METHODS

A prospective observational study was conducted to evaluate the effectiveness of lifestyle interventions in reducing cardiovascular risk factors among adults.

Study Setting

The study was carried out in a tertiary healthcare center over a period of 12 months from January 2024 to December 2024.

Study Population

A total of 200 participants aged between 30 and 65 years were recruited. Participants had at least one established cardiovascular risk factor, including hypertension, obesity, dyslipidemia, smoking, diabetes mellitus, or sedentary lifestyle.

Inclusion Criteria

- Adults aged 30–65 years.
- Presence of one or more cardiovascular risk factors.
- Ability to participate in physical activity programs.
- Willingness to provide informed consent.

Exclusion Criteria

- Established cardiovascular disease requiring intensive medical management.
- Severe physical disability limiting exercise participation.
- Pregnancy.
- Severe psychiatric illness.

Sampling Technique

Convenience sampling was employed to recruit eligible participants attending outpatient clinics.

Intervention Program

Participants were enrolled in a comprehensive lifestyle intervention program consisting of:

Dietary Modification

Nutritional counseling emphasized:

- Increased intake of fruits and vegetables.
- Whole grains and lean protein sources.
- Reduced saturated fats and trans fats.
- Limitation of salt and sugar intake.

Physical Activity

Participants were encouraged to perform:

- At least 150 minutes of moderate aerobic exercise weekly.
- Resistance training twice weekly.
- Daily walking and reduced sedentary behavior.

Smoking Cessation

Smokers received:

- Individual counseling sessions.
- Behavioral support strategies.

- Educational materials regarding tobacco-related risks.

Stress Management
Participants attended monthly sessions on:
- Mindfulness meditation.
- Deep breathing exercises.
- Relaxation techniques.
- Time management skills.

Health Education
Regular educational workshops were conducted covering:
- Cardiovascular risk factors.
- Healthy lifestyle practices.
- Medication adherence.
- Disease prevention strategies.

Data Collection
Baseline assessments included:
- Height and weight for BMI calculation.
- Blood pressure measurement.
- Fasting blood glucose.
- Lipid profile.
- Smoking status.
- Physical activity level.

Follow-up assessments were conducted after 12 months.

Outcome Measures
Primary outcomes:
- Change in BMI.
- Change in systolic and diastolic blood pressure.
- Change in total cholesterol levels.

Secondary outcomes:
- Change in fasting blood glucose.
- Reduction in cardiovascular risk score.
- Smoking cessation rates.

Statistical Analysis
Data were analyzed using SPSS version 26. Continuous variables were expressed as mean ± standard deviation. Paired t-tests were used to compare baseline and post-intervention values. A p-value <0.05 was considered statistically significant.

Ethical Considerations
Institutional Ethics Committee approval was obtained prior to study initiation. Written informed consent was obtained from all participants. Confidentiality and anonymity were maintained throughout the study.

RESULTS

Table 1. Baseline Characteristics of Participants (n=200)

Characteristic	Mean ± SD / n (%)
Age (years)	49.2 ± 8.7
Male	118 (59%)
Female	82 (41%)
BMI (kg/m²)	29.1 ± 3.8
Systolic BP (mmHg)	142.5 ± 12.4
Diastolic BP (mmHg)	89.6 ± 8.1
Total Cholesterol (mg/dL)	220.4 ± 35.6
Fasting Blood Glucose (mg/dL)	118.7 ± 21.4
Current Smokers	58 (29%)

The study population consisted predominantly of middle-aged adults with elevated cardiovascular risk factors. The mean BMI indicated overweight to obese status, while blood pressure and cholesterol values were above recommended levels.

Table 2. Changes in Cardiovascular Risk Factors After Intervention

Variable	Baseline	12 Months	p-value
BMI (kg/m²)	29.1 ± 3.8	26.8 ± 3.4	<0.001
Systolic BP (mmHg)	142.5 ± 12.4	130.2 ± 10.6	<0.001
Diastolic BP (mmHg)	89.6 ± 8.1	82.4 ± 6.9	<0.001
Total Cholesterol (mg/dL)	220.4 ± 35.6	192.3 ± 28.7	<0.001
Fasting Blood Glucose (mg/dL)	118.7 ± 21.4	104.6 ± 18.2	<0.001

All cardiovascular risk indicators demonstrated statistically significant improvement following the intervention. Reductions in blood pressure, cholesterol, blood glucose, and BMI suggest the effectiveness of comprehensive lifestyle modification.

Table 3. Cardiovascular Risk Reduction Outcomes

Outcome	Baseline	Post-intervention
High-risk participants (%)	48%	28%
Moderate-risk participants (%)	37%	42%
Low-risk participants (%)	15%	30%
Smoking prevalence (%)	29%	16%

The proportion of participants classified as high cardiovascular risk decreased substantially, while the number of individuals categorized as low risk doubled. Smoking prevalence also declined significantly.

DISCUSSION

The present study demonstrates that comprehensive lifestyle interventions significantly improve cardiovascular risk profiles among adults with modifiable risk factors. Following a 12-month intervention period, participants exhibited meaningful reductions in BMI, blood pressure, cholesterol levels, fasting glucose, and overall cardiovascular risk scores.

These findings are consistent with previous studies highlighting the role of lifestyle modification in cardiovascular prevention. The landmark INTERHEART study reported that approximately 90% of myocardial infarction risk could be attributed to modifiable factors, emphasizing the importance of behavioral interventions (9). Similarly, Yusuf et al. identified smoking, hypertension, dyslipidemia, obesity, diabetes, and physical inactivity as major contributors to cardiovascular disease worldwide (9).

Dietary modification was a critical component of the intervention. Previous research has shown that Mediterranean and DASH dietary patterns significantly reduce cardiovascular events and improve lipid profiles (4,10). Increased consumption of fruits, vegetables, and whole grains contributes to lower inflammation and improved vascular function. The reductions in total cholesterol observed in this study support these findings.

Physical activity was another important contributor to cardiovascular risk reduction. Regular exercise has been associated with improved endothelial function, enhanced insulin sensitivity, and lower blood pressure (5). The observed reductions in systolic and diastolic blood pressure in this study align with findings from randomized controlled trials demonstrating the antihypertensive effects of moderate aerobic exercise (11).

Weight reduction observed among participants is clinically significant because obesity is strongly linked to cardiovascular morbidity. Weight loss improves insulin sensitivity, decreases inflammatory markers, and reduces blood pressure (7). The decrease in BMI from 29.1 to 26.8 kg/m² indicates substantial progress toward healthier body composition.

Smoking cessation also played a significant role in improving cardiovascular outcomes. Evidence indicates that smoking cessation rapidly decreases cardiovascular risk, with substantial benefits occurring within one to five years after quitting (6). The reduction in smoking prevalence from 29% to 16% observed in this study reflects the effectiveness of counseling and behavioral support strategies.

Stress management interventions may have further enhanced outcomes. Psychological stress has been associated with increased sympathetic nervous system activity, elevated blood pressure, and systemic inflammation (8). Mindfulness-based interventions have shown beneficial effects on cardiovascular risk factors and overall well-being (12).

The study findings support current international guidelines advocating lifestyle modification as the first-line strategy for cardiovascular disease prevention (13). However, maintaining long-term adherence remains a challenge and requires continuous support from healthcare professionals and community-based programs.

CONCLUSION

Lifestyle interventions significantly reduce cardiovascular risk factors, including obesity, hypertension, dyslipidemia, hyperglycemia, and smoking. Comprehensive programs integrating dietary modification, physical activity, smoking cessation, stress management, and health education can effectively improve cardiovascular health outcomes. Healthcare systems should prioritize lifestyle-based prevention strategies to reduce the growing burden of cardiovascular disease globally.

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