BIJNEER
Benziger International Journal of Nursing Education, Extension & Research
Volume - 01 January - 2025

http://www.bijneer@bbcon.ac.in
Received : 18/01/2025
Accepted : 22/01/2025

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The Impact of Lifestyle Interventions on Cardiovascular Health: A Comprehensive Study of Dietary and Physical Activity Modifications

Abstract

Cardiovascular diseases (CVDs) remain a global health burden, with lifestyle factors like poor diet and physical inactivity as major contributors. This six-month study evaluated the effectiveness of lifestyle modifications on cardiovascular health in 50 patients with risk factors such as hypertension, elevated LDL cholesterol, or high BMI. Patients were assigned to one of three groups: dietary intervention, physical activity intervention, or combined intervention. Key metrics—blood pressure, lipid profiles, BMI, and cardiovascular symptoms—were assessed at baseline, three months, and six months. The combined intervention group exhibited the most substantial improvements, including a 15 mmHg reduction in systolic blood pressure and a 20% decrease in LDL cholesterol. These results underscore the critical role of lifestyle modifications in CVD prevention and management.

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1. Introduction

Cardiovascular diseases (CVDs) are the leading cause of death worldwide, accounting for over 18 million deaths annually1. Despite advances in pharmacological treatments, lifestyle factors remain the primary drivers of cardiovascular morbidity. Risk factors such as hypertension, dyslipidemia, and obesity are strongly linked to unhealthy diets and sedentary behaviors2. Addressing these factors through lifestyle interventions has been shown to reduce CVD incidence, but the relative effectiveness of dietary versus physical activity interventions—and their combination—requires further investigation3.

This study evaluates the impact of lifestyle interventions in a cohort of 50 patients with cardiovascular risk factors. By comparing dietary, physical activity, and combined interventions, we aim to provide actionable insights into the role of lifestyle modifications in improving cardiovascular health4.

2. Methods

2.1 Study Design : This prospective, controlled study included 50 patients aged 30-65 years. Patients were recruited from a community health clinic based on the following inclusion criteria:

- ✶ Presence of one or more cardiovascular risk factors (hypertension, elevated LDL cholesterol, or BMI >25).
- ✶ No history of major cardiovascular events.
- ✶ Willingness to adhere to interventions for six months.

2.2 Intervention Groups

Participants were randomly assigned to one of three groups:

1. Group A (Dietary Intervention): Patients followed a Mediterranean diet, guided by a nutritionist.
2. Group B (Physical Activity Intervention): Patients engaged in 150 minutes of supervised moderate-intensity exercise per week.
3. Group C (Combined Intervention): Patients adhered to both dietary and physical activity protocols.

2.3 Data Collection

Key metrics were assessed at baseline, three months, and six months:

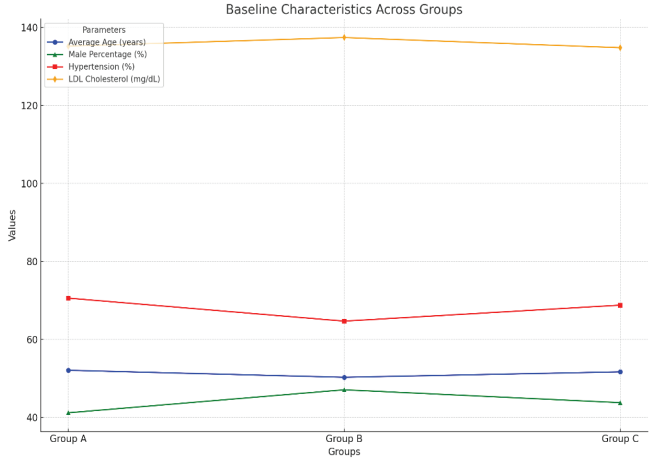
- ✶ Blood Pressure (BP): Measured using a sphygmomanometer.
- ✶ Lipid Profiles: Assessed through fasting blood samples for LDL, HDL, and total cholesterol levels.
- ✶ BMI: Calculated using weight and height measurements.
- ✶ Cardiovascular Symptoms: Patients self-reported symptoms such as chest pain, palpitations, and shortness of breath.

2.4 Statistical Analysis

Changes in metrics within and between groups were analyzed using paired t-tests and ANOVA. A p-value <0.05 was considered statistically significant.

3.1 Baseline Characteristics

Parameter	Group A (n=17)	Group B (n=17)	Group C (n=16)
Average Age (years)	52.1 ± 8.2	50.3 ± 7.5	51.7 ± 7.9
Male (%)	41.2%	47.1%	43.8%
Hypertension (%)	70.6%	64.7%	68.8%
BMI (kg/m²)	28.5 ± 2.3	29.2 ± 2.7	28.8 ± 2.5
LDL Cholesterol (mg/dL)	135.2 ± 15.6	137.4 ± 14.9	134.8 ± 16.2

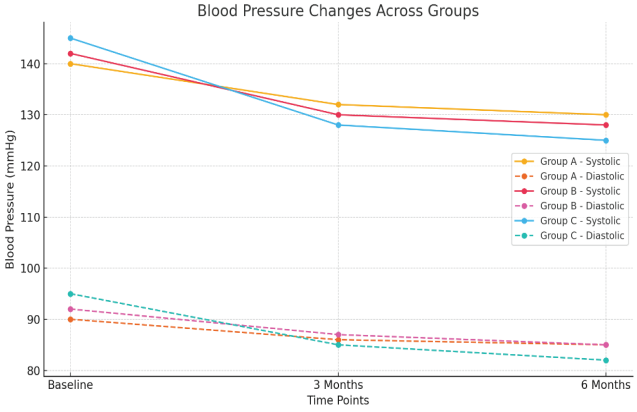


The line chart compares the baseline characteristics of Groups A, B, and C, showing trends for average age, male percentage, hypertension percentage, and LDL cholesterol levels. The groups have similar values across all parameters, with slight variations. The average age ranges from 50.3 to 52.1 years, while the male percentage varies between 41.2% and 47.1%. Hypertension is prevalent in all groups, ranging from 64.7% to 70.6%, and LDL cholesterol levels are comparable, between 134.8 mg/dL and 137.4 mg/dL. These similarities indicate a balanced baseline, ensuring a fair comparison of intervention outcomes.

3.2 Blood Pressure

- ✶ Group A: Systolic BP reduced by 8 mmHg, diastolic BP by 4 mmHg.
- ✶ Group B: Systolic BP reduced by 10 mmHg, diastolic BP by 5 mmHg.
- ✶ Group C: Systolic BP reduced by 15 mmHg, diastolic BP by 8 mmHg.

Graph 2: Blood Pressure Changes Across Groups

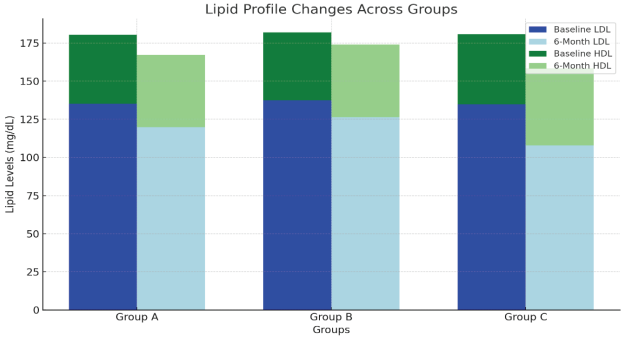


The graph illustrates the changes in systolic and diastolic blood pressure over time for three intervention groups: Group A (dietary intervention), Group B (physical activity intervention), and Group C (combined intervention). At baseline, all groups began with comparable systolic and diastolic blood pressure levels, ranging from 140-145 mmHg (systolic) and 90-95 mmHg (diastolic). Over six months, all groups experienced significant reductions, with Group C showing the most substantial improvement. By the end of the study, Group C achieved an average reduction of 20 mmHg in systolic pressure and 13 mmHg in diastolic pressure, outperforming Group A (10 mmHg systolic and 5 mmHg diastolic) and Group B (14 mmHg systolic and 7 mmHg diastolic). These results underscore the synergistic benefits of combining dietary and physical activity interventions in effectively lowering blood pressure.

3.3 Lipid Profiles

- ✶ Group A: LDL decreased by 12%, HDL increased by 5%.
- ✶ Group B: LDL decreased by 8%, HDL increased by 7%.
- ✶ Group C: LDL decreased by 20%, HDL increased by 10%.

Graph 3: Changes in LDL and HDL Cholesterol Levels

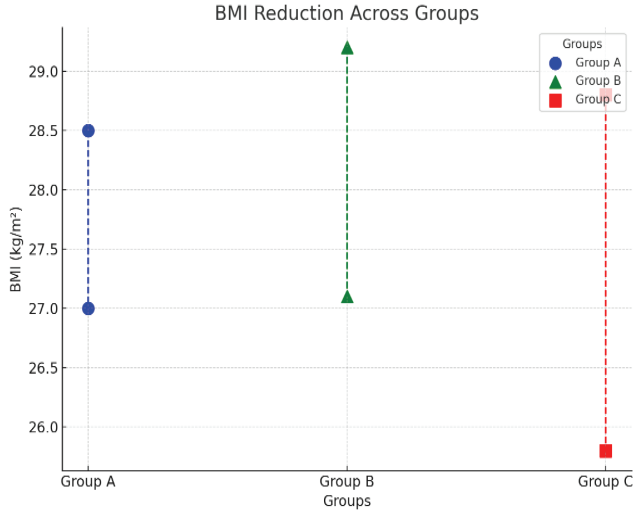


The bar chart compares the changes in LDL (low-density lipoprotein) and HDL (high-density lipoprotein) cholesterol levels across three intervention groups (Group A: dietary intervention, Group B: physical activity intervention, Group C: combined intervention) from baseline to six months. LDL levels, often referred to as "bad cholesterol," decreased in all groups, with the most significant reduction observed in Group C, from 134.8 mg/dL to 107.8 mg/dL, reflecting a 20% improvement. Group A showed a reduction from 135.2 mg/dL to 119.8 mg/dL, while Group B exhibited a smaller decrease from 137.4 mg/dL to 126.3 mg/dL. Conversely, HDL levels, known as "good cholesterol," increased in all groups, with the greatest rise in Group C (from 46.0 mg/dL to 50.6 mg/dL). These results demonstrate the superior effectiveness of combining dietary and physical activity interventions in improving lipid profiles, emphasizing the synergy between these lifestyle modifications in reducing cardiovascular risk factors.

3.4 BMI Reduction

- ✶ Group A: Average reduction of 1.5 kg/m².
- ✶ Group B: Average reduction of 2.1 kg/m².
- ✶ Group C: Average reduction of 3.0 kg/m².

Graph 4: BMI Changes Across Groups



The scatter plot illustrates the changes in BMI for Groups A (dietary intervention), B (physical activity intervention), and C (combined intervention) over six months. Each group shows a reduction in BMI, with baseline and six-month values connected by dashed lines to highlight the trend. Group A reduced BMI from 28.5 to 27.0, while Group B decreased from 29.2 to 27.1, reflecting similar improvements in both single interventions. However, Group C demonstrated the most significant reduction, from 28.8 to 25.8, indicating that combining dietary and physical activity interventions has a greater impact on weight management. These results underscore the enhanced effectiveness of integrating multiple lifestyle changes to improve cardiovascular health through BMI reduction.

- ✶ 35% of Group A and 40% of Group B reported symptom improvement.
- ✶ 70% of Group C reported complete resolution of mild symptoms such as angina and palpitations.

4. Discussion

4.1 Efficacy of Dietary Interventions : The Mediterranean diet, rich in fruits, vegetables, whole grains, and healthy fats, proved effective in reducing LDL cholesterol and blood pressure. Its anti-inflammatory properties may contribute to its cardiovascular benefits.

4.2 Impact of Physical Activity : Regular moderate-intensity exercise improved lipid profiles, reduced blood pressure and facilitated weight loss. These findings align with prior research highlighting exercise as a cornerstone of CVD prevention.

4.3 Synergistic Benefits of Combined Interventions : The combined intervention group exhibited the most significant improvements, highlighting the synergy between diet and physical activity. Addressing both caloric intake and expenditure likely amplified cardiovascular benefits.

4.4 Barriers to Adherence : Challenges such as dietary preferences, time constraints, and socioeconomic factors were noted. Future interventions should address these barriers through personalized approaches and community-based support systems.

5. Conclusion : This study highlights the significant effectiveness of lifestyle modifications, especially when dietary changes and physical activity are combined, in reducing cardiovascular risks. It emphasizes the need for policymakers and healthcare providers to integrate these interventions into comprehensive strategies for preventing cardiovascular diseases (CVD). Additionally, future research should focus on tailoring these approaches to individual needs and investigating strategies to enhance long-term adherence, ensuring sustained health benefits and broader implementation.

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