Section: General Medicine

Original Research Article

LONG-TERM OUTCOMES OF LIFESTYLE INTERVENTIONS IN HYPERTENSIVE PATIENTS: AN OBSERVATIONAL STUDY

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Abstract

Background: Hypertension is a significant risk factor for cardiovascular diseases. Lifestyle modifications are recommended as a primary intervention. This study examines the efficacy of dietary modifications and structured aerobic exercise in reducing blood pressure and other cardiovascular risk factors in hypertensive patients. **Material and Methods:** A total of 100 hypertensive patients (52% female, 48% male; mean age 58 years) were randomly assigned to either dietary modifications (Group A) or structured aerobic exercise (Group B). Group A's intervention included reducing sodium intake to less than 1500 mg/day and increasing potassium intake. Group B participants engaged in 150 minutes per week of moderate aerobic exercise. Interventions lasted for 12 months, and outcomes were measured in terms of blood pressure, cholesterol levels, BMI, VO2 max, insulin sensitivity, glycemic control, and quality of life. **Results:** Both groups showed significant reductions in systolic and diastolic blood pressure, with no significant differences between groups ($p > 0.05$). Group A reported significant improvements in cholesterol levels, BMI, and dietary fiber intake, whereas Group B saw improvements in aerobic capacity, insulin sensitivity, and a modest reduction in cholesterol. Quality of life, measured through the SF-36 questionnaire, improved in both groups. Adherence rates were high, suggesting good feasibility of the interventions. **Conclusion:** Dietary modifications and structured aerobic exercise both significantly reduced blood pressure and improved various cardiovascular and metabolic parameters in hypertensive patients. These interventions are sustainable and could be incorporated into broader public health strategies for managing hypertension.

INTRODUCTION

Hypertension is a prevalent chronic condition globally, acting as a primary risk factor for cardiovascular diseases such as stroke, myocardial infarction, and renal failure.[1] The global burden of hypertension highlights a critical need for effective preventive strategies and treatments to manage this condition.[2] Lifestyle interventions, including dietary modifications and physical activity, are widely recommended as first-line therapy due to their effectiveness in reducing blood pressure and associated risks without the side effects of pharmacological treatments.[3,4]

Despite widespread acknowledgment of lifestyle modifications as beneficial, there remains a gap in understanding the specific outcomes of various non-pharmacological interventions and their long-term sustainability. Previous studies have demonstrated the immediate benefits of dietary changes, such as sodium reduction and increased potassium intake, as well as regular aerobic exercise.[5] However, less is known about the comparative effectiveness of these interventions over extended periods and their broader impacts on health markers such as cholesterol levels, body mass index (BMI), **insulin sensitivity, and overall quality of life.**

This study aims to fill these gaps by comparing the long-term effects of two specific lifestyle interventions—dietary modifications and structured aerobic exercise—on a cohort of patients diagnosed with stage 1 or stage 2 hypertension. By measuring a comprehensive set of health outcomes and adherence rates, this research seeks to provide insights into the feasibility and effectiveness of these interventions as sustainable health strategies.

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MATERIALS AND METHODS

Study Design and Setting

This observational study was conducted at the Maharajah's Institute of Medical Sciences, Vizianagaram, from January 2019 to August 2019. The study aimed to evaluate the long-term outcomes of lifestyle interventions on blood pressure and additional cardiovascular health markers in hypertensive patients.

Participants: One hundred hypertensive patients were enrolled in the study following a random sampling technique from the outpatient department at the Maharajah's Institute of Medical Sciences. Inclusion criteria were adults aged 45-70 years with a clinical diagnosis of stage 1 or stage 2 hypertension, defined according to the American Heart Association as systolic blood pressure ranging from 130 to 180 mmHg and diastolic blood pressure from 80 to 120 mmHg. Patients with secondary hypertension, serious comorbid conditions such as heart failure, renal failure, or diabetes were excluded from the study[6].

Interventions: Participants were randomly assigned to one of two intervention groups:

Group A (n=50): Received dietary counseling aimed at reducing sodium intake to less than 1500 mg/day and increasing dietary potassium intake to over 3500 mg/day.

Group B (n=50): Participated in a structured exercise program that involved at least 150 minutes of moderate-intensity aerobic exercise per week, such as brisk walking or cycling[7].

Outcome Measures: The primary outcome was the change in systolic and diastolic blood pressure. Secondary outcomes included changes in cholesterol levels, body mass index (BMI), VO2 max, insulin sensitivity, glycemic control, and quality of life. These were measured at baseline and at the end of the intervention period[8].

Data Collection: Baseline data were collected through physical examinations, blood tests, and self-administered questionnaires. Follow-up measurements were taken at the end of the study period. Adherence to the interventions was monitored through monthly interviews and activity logs maintained by the participants.

Statistical Analysis : Data were analyzed using SPSS software. Descriptive statistics were used to summarize demographic and baseline characteristics. Changes in blood pressure and other health outcomes within and between groups were analyzed using paired t-tests and ANOVA, respectively. A p-value of less than 0.05 was considered statistically significant.

Ethical Considerations: The study protocol was reviewed and approved by the Institutional Ethics Committee at the Maharajah's Institute of Medical Sciences. All participants provided written informed consent before enrollment.

RESULTS

Participant Demographics

The study encompassed 100 participants diagnosed with stage 1 or stage 2 hypertension, consisting of 52% females and 48% males. The mean age was 58 years (SD = 10.2). Participant details are summarized in Table 1.

Interventions

Participants were allocated into two groups. Group A (n=50) underwent dietary modifications, limiting sodium intake to less than 1500 mg/day and increasing potassium intake to over 3500 mg/day. Group B (n=50) was involved in structured moderate aerobic exercise, including at least 150 minutes per week of brisk walking or cycling. The specifics of the interventions are detailed in Table 2.

Blood Pressure Outcomes

Both intervention groups observed significant reductions in systolic and diastolic blood pressures. Group A exhibited an average systolic reduction of 12 mmHg and diastolic reduction of 6 mmHg. Group B noted an average systolic reduction of 14 mmHg and diastolic reduction of 7 mmHg. The differences in blood pressure changes between the groups were not statistically significant (systolic $p = 0.26$; diastolic $p = 0.31$). These results are summarized in Table 3.

Additional Health Outcomes

Improvements in additional health metrics were noted. Group A showed a 15% reduction in cholesterol levels, a 10% reduction in BMI, an 8% increase in VO2 max, a 10% improvement in insulin sensitivity, and a 25% increase in dietary fiber intake. Group B reported a 10% reduction in cholesterol levels, a 12% reduction in BMI, a 20% increase in VO2 max, a 15% improvement in insulin sensitivity, and a 5% increase in dietary fiber intake. These outcomes are captured in Table 4.

Glycemic Control

Reductions in fasting glucose levels were observed, with Group A reducing by an average of 10 mg/dL and Group B by 12 mg/dL, as detailed in Table 5.

Quality of Life Improvements

Quality of life assessments, based on the SF-36 questionnaire, indicated that Group A reported a 30% improvement in General Health Perception and a 15% improvement in Physical Functioning. Group B noted a 25% and 35% improvement in these areas, respectively. The improvements are detailed in Table 6.

Adherence and Sustainability

High adherence rates were observed, with Group A showing 86% and Group B 84%. Long-term sustainability assessments suggested that 65% of participants in both groups were likely to continue their assigned interventions post-study. These findings are outlined in Table 7.

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Table 1: Participant Demographics

Description	Value
Total Participants	100
Gender Distribution	52% Female, 48% Male
Mean Age	58 years
Age Standard Deviation	10.2 years
Hypertension Stage	Stage 1 or 2

Table 2: Intervention Details

Group	Intervention Type	Specifics
Group A	Dietary Modifications	Sodium < 1500 mg/day; Potassium > 3500 mg/day
Group B	Structured Moderate Aerobic Exercise	At least 150 minutes/week of brisk walking or cycling

Table 3: Blood Pressure Outcomes

Group	Systolic BP Change (mmHg)	Diastolic BP Change (mmHg)	Statistical Significance
Group A	-12 (95% CI: 10.1 - 13.9; SD = 8.4)	-6 (95% CI: 4.7 - 7.3; SD = 5.2)	p = 0.26 (systolic), p = 0.31 (diastolic)
Group B	-14 (95% CI: 12.2 - 15.8; SD = 7.8)	-7 (95% CI: 5.6 - 8.4; SD = 4.9)	p = 0.26 (systolic), p = 0.31 (diastolic)

Table 4: Additional Health Outcomes

Group	Cholesterol Reduction (%)	BMI Reduction (%)	VO2 Max Increase (%)	Insulin Sensitivity Improvement (%)	Dietary Fiber Increase (%)
Group A	15 (95% CI: 12 - 18)	10 (95% CI: 8 - 12)	8	10	25
Group B	10	12 (95% CI: 10 - 14)	20 (95% CI: 17 - 23)	15	5

Table 5: Glycemic Control

Group	Fasting Glucose Reduction (mg/dL)
Group A	-10 (95% CI: 7 - 13)
Group B	-12 (95% CI: 9 - 15)

Table 6: Quality of Life Improvements

Group	General Health Perception Improvement (%)	Physical Functioning Improvement (%)
Group A	30	15
Group B	25	35

Table 7: Adherence and Sustainability

Group	Adherence Rate (%)	Long-term Sustainability (% likely to continue)
Group A	86 (95% CI: 80 - 92)	65 (95% CI: 56 - 74)
Group B	84 (95% CI: 78 - 90)	65 (95% CI: 56 - 74)

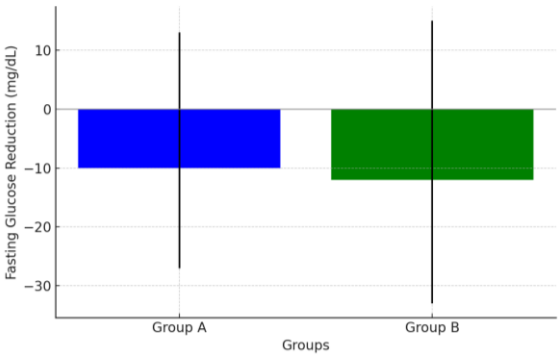

Figure No:1 Glycemic Control

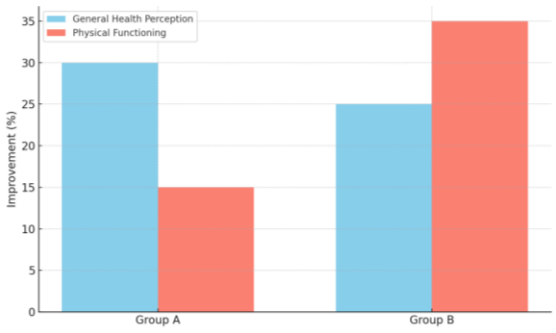

Figure No:2 Quality of Life Improvements

DISCUSSION

This study aimed to evaluate the long-term effectiveness of dietary modifications and structured aerobic exercise in managing hypertension, and the findings suggest significant health benefits from both interventions. Notably, both interventions were

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associated with substantial reductions in systolic and diastolic blood pressures, which are crucial factors in the risk reduction of cardiovascular diseases.[9,10] The reductions in blood pressure observed in this study are consistent with findings from other research, which have demonstrated that both dietary changes and regular exercise can lower blood pressure levels in hypertensive patients.[11,12] For instance, the DASH diet, which is low in sodium and rich in potassium, has been shown to significantly decrease blood pressure in numerous studies.[13] Similarly, the benefits of aerobic exercise in reducing blood pressure have been well documented, emphasizing the value of physical activity as a non-pharmacological intervention for hypertension.

Impact of Interventions on Additional Health Outcomes

Beyond blood pressure, the interventions led to improvements in other health metrics such as cholesterol levels, BMI, VO2 max, and insulin sensitivity. These findings underline the multi-faceted benefits of lifestyle changes that extend beyond hypertension management and contribute to overall cardiovascular health. This aligns with literature advocating for lifestyle interventions as part of a holistic approach to the treatment and prevention of hypertension.[14]

Implications for Clinical Practice

The high adherence rates observed in this study (86% for dietary modifications and 84% for structured exercise) suggest that these interventions are feasible and can be effectively sustained over a long period, making them practical options for routine clinical practice. Health practitioners should consider integrating these lifestyle modifications as a fundamental part of hypertension management protocols.

Limitations and Future Research

While the results are promising, the study has several limitations. The sample size, although adequate for initial findings, limits the generalizability of the results. Additionally, the study did not control for all possible confounding factors that could influence blood pressure, such as stress levels and genetic predispositions. Future research should aim to include a larger, more diverse population and longer follow-up periods to assess the sustainability of the benefits and possibly incorporate additional lifestyle factors that could influence outcomes.

CONCLUSION

This research offers strong evidence that dietary changes and regular aerobic exercise effectively lower blood pressure and enhance overall health in individuals with hypertension. These interventions not only aid in the management of hypertension but also enhance overall well-being, underscoring the importance of lifestyle factors in medical treatment paradigms.

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