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[1]Assistant Professor, Purbanchal University Teaching Hospital, Gothgaun, Morang

***Corresponding Author:**
Shashi Sharma Rijal
Email ID:
dr.shashirijal@gmail.com
ORCID iD:
https://orcid.org/0000-0003-0399-4840

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Effect of Lifestyle Modification to Control the Blood Pressure in Hypertensive Individuals of Morang District, Nepal

Shashi Sharma Rijal[1]*

Abstract

Introduction: Hypertension is a strong, independent and etiologically relevant risk factor for cardiovascular diseases and therefore, the leading cause of preventable death worldwide. The purpose of this study was to determine the effect of multifaceted lifestyle modification intervention on blood pressure among hypertensive patients.

Method: A quasi-experimental study was conducted among 67 participants in the medical Out Patient Department (OPD) of Purbanchal University Teaching Hospital. Participants were recruited through simple random sampling. The multifaceted intervention under investigation includes motivational interviews and 60-minute training sessions on dietary patterns and exercise, followed by 4 phone call follow-ups. Blood Pressure (BP) was measured both before and after the intervention, and the changes in BP were compared.

Result: The study population comprised 67 adults with a mean age of 59.17 ± 12.63 years, where 61.2% were male. Following the intervention, a statistically significant reduction in blood pressure was observed. The mean systolic blood pressure decreased by 7.65 ± 4.45 mmHg, and the mean diastolic blood pressure decreased by 5.74 ± 4.45 mmHg ($p < 0.005$).

Conclusion: The multifaceted lifestyle intervention resulted in a significant decrease in systolic and diastolic blood pressure. Thus, the use of this method as a supplementary treatment is recommended during visit to medical OPD.

Keywords: Blood pressure; Effectiveness; Lifestyle

Introduction

Cardiovascular diseases (CVDs) remain the most common cause of death worldwide, causing 17.3 million (31.5%) deaths globally.[1,2] One of the most important risk factors to develop CVDs is hypertension. Globally WHO reports suggest that estimated 1.28 billion adults aged 30–79 years worldwide have hypertension, most (two-thirds) living in low- and middle-income countries.[3,4] Studies evaluating lifestyle modifications such as weight-reducing diets, regular exercise as well as restricted alcohol and salt intake showed positive effects on blood pressure.[5]

An unhealthy diet, physical inactivity and obesity increase the risk of developing hypertension. Lifestyle change is a key component in the cardiovascular risk management and essential in decreasing blood pressure.[4,5,6] Several studies have demonstrated a benefit of lifestyle recommendation in the management of hypertension. Without interventions for elevated blood pressure, we are unlikely to meet the target of reducing by a third premature mortality from non-communicable diseases, as set in the 2015 UN Sustainable Development Goals.[7,8] A 5 mm Hg reduction in systolic blood pressure in the population has been estimated to result in a 14% overall reduction in mortality due to stroke, a 9% reduction in mortality due to coronary heart disease, and a 7% reduction in all-cause mortality. [9,10] Even modest population-wide reductions in systolic blood pressure of 1 mmHg are predicted to have substantial effects on cardiovascular death prevention.[11,12] This study aims to contribute to the growing body of evidence supporting the effectiveness of lifestyle interventions in managing hypertension. While previous studies have explored the impact of lifestyle modifications on blood pressure, this study focuses on a specific population and intervention strategy. By investigating the effectiveness of a multifaceted intervention, including dietary changes, physical activity, and social support, this study seeks to provide further insights into the optimal approach to hypertension management.

The aim of our study was to assess the effectiveness of lifestyle modification to control blood pressure in hypertensive patients in Morang district.

Method

This quasi-experimental study was conducted in the medical outpatient department of Purbanchal Teaching Hospital in Morang district. A single-group, pre-post intervention design was employed to evaluate the effectiveness of a lifestyle modification intervention.

Participants were included if they were adults aged 18 years or older with a diagnosis of hypertension, as evidenced by a systolic blood pressure ≥140 mmHg and/or diastolic blood pressure ≥ 90 mmHg during a medical outpatient department visit. Additionally, who were older adults or had limited social support had to be accompanied by a family member or been on antihypertensive medication. They also had to be able to provide informed consent and respond to questions.

Participants were excluded if they were self-reported critically ill patients with conditions such as dementia or prior heart conditions, pregnant, or planning to relocate within the next 6 months.

The study population comprised adult hypertensive patients with a blood pressure exceeding 140/90 mmHg who were able to attend training sessions and had no critical illnesses. A sample size of 70 participants was determined, with 14 individuals enrolled in each of the three intervention groups: medication-only, diet and exercise, and combined medication, diet, and exercise. This sample size calculation aimed to achieve 80% power and a 5% significance level to detect a minimum detectable mean difference of 5 mmHg in blood pressure.

The primary outcome of the trial was the net change in mean systolic blood pressure measured 6 months' post-enrollment. Secondary outcomes included the net change in mean diastolic blood pressure, the proportion of hypertensive patients achieving blood pressure control, and changes in

physical activity levels, body mass index (BMI), and diet quality, as shown in table 1.

Table 1: Study variables

Outcome	Description	Variable type	Effect measure, summary
Primary Outcome			
Systolic BP (mmHg)	Net change in mean systolic BP from baseline	Continuous	Difference in mean
Secondary Outcome			
Diastolic BP	Net change in mean diastolic BP	Continuous	Difference mean
Control BP	Participants with BP<140/90 mmHg	Binary	Difference in proportion
Body mass index	Weight measured in kilogram divided by height squared measured meters (kg/ m2)(cut-off <25kg/m2)	Binary	Difference in proportion
Diet diversity	Count of different types of fruits and vegetables consumed per week	Count (0-7)	Difference in mean
Salt intake	Daily salt intake (g/day), cut off >5g/day	Binary	Difference in proportion
Physical activity	Metabolic equivalent of task (MET) minutes per week using global physical activity questionnaire (cut off >600MET)	Binary	Difference in proportion
Confounder to adjust			
Marital status	Marital status at baseline	Binary	
Age	Measured in completed years	Continuous	
Exposure to intervention	Number of medical OPD visit	Continuous	

Sampling

A two-stage sampling technique was used. First, convenient sampling was employed to select the hospital. Second, simple random sampling was used to select participants from a list of eligible patients at the selected hospital until the predetermined sample size was reached. Initially, 300 hypertensive patients were screened at Purbanchal University Teaching Hospital. From this pool, eligible adult patients with a blood pressure exceeding 140/90 mmHg and no critical illnesses were selected. A total of 70 eligible participants were randomly assigned to one of five intervention groups using a computer-generated randomization sequence stratified by age and sex. Subsequently, 67 participants were enrolled in these groups, with 14 participants in each group. Each participant underwent three training sessions. However, 3 participants were lost to follow-up during the study period. A flowchart illustrating the participant flow is shown in Figure 1.

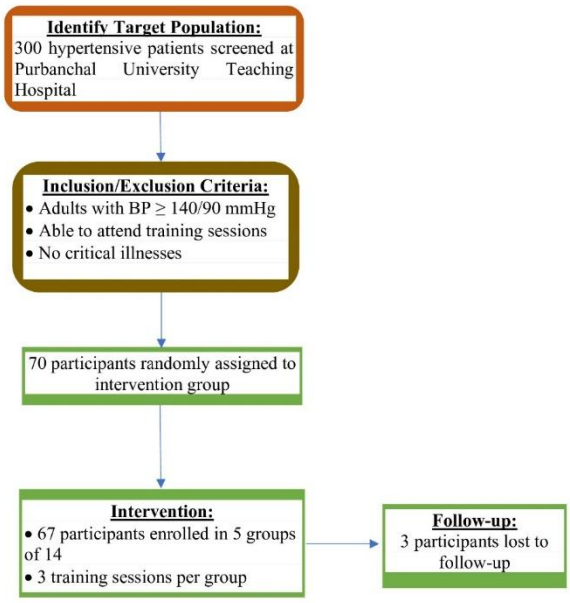

Fig 1. Flow chart of Sampling technique

Enrolment process

First, the study was explained to 70 patients referred to the medical OPD who met the inclusion criteria. Those who agreed to participate provided written informed consent. Next, participants were randomly assigned to one of five intervention groups using a computer-generated randomization sequence, stratified by age and sex.

Data were collected through a review of medical records and completion of questionnaires by the researcher. Blood pressure (BP) was measured four times using a calibrated digital blood pressure monitor by a trained research assistant. The average of the last two measurements was used for analysis.

Data collection and assessment

Socio demographic data such as age (years), gender (male/female/other), marital status (married/ unmarried/widow), education (years of education), occupation (government/ self-employed/private/ unemployed), income (annual household and per capita income) was collected at enrolment. Health behaviors such as diet, physical activity (metabolic equivalents of task minutes per week) using a global physical activity questionnaire, alcohol (drinks per week) and smoking (cigarettes per day) and salt intake were collected and BP and anthropometric measurements taken during enrolment and follow-up. Blood pressure of the participants were measured in the right hand of participants and recorded at 2 times with a 5-minute interval. In addition, multifaceted lifestyle modification programmer participants were measured and recorded at the beginning of the study follow -up in 2 months until the 6months.

Intervention

Three 60-minute training sessions were conducted over five weeks at the Purbanchal University Teaching Hospital. Led by a healthcare professional, a certified dietician, and a health educator, these sessions focused on understanding hypertension and its potential complications, the importance of adhering to prescribed medication regimens, and the benefits of adopting healthy lifestyle changes, such as dietary modifications and regular physical activity. The sessions employed a variety of teaching methods, including lectures, PowerPoint presentations, group discussions, and the distribution of a training booklet as shown in table 2.

To reinforce the information and provide ongoing support, participants and their family members received monthly 10-minute phone calls. These calls addressed questions, concerns, and provided encouragement to maintain healthy lifestyle habits and adhere to the prescribed medication regimen.

Table 2: The contents of training session

Session	Content	Method	Time
First	Introduction of the researcher and explanation of the purpose of the research ad its implementation to the participants, Motivation for the participants in research and attention to disease, Training of families to remind the drugs, Monitoring blood pressure, body weight and height.	Lecture + Power point presentation	60 min
Second	Explanation of definition of HTN and its risk factors and complication, Explanation of how to control HTN and maintain healthy lifestyle, Explanation of DASH diet and exercise to control the hypertension.	Lecture + Power Point presentation Demonstration of exercise	60 min
Third	A review of previous content, Question about the complication of not controlling hypertension, Question about the dietary pattern, Monitoring Blood pressure and daily routine.	Lecture + Power point presentation	60 min

At the end of the study, in order to adhere to ethical codes, the subjects were provided with a training booklet summarizing the key discussions from the training sessions. Numerical variables are reported as mean ± standard deviation (SD), and categorical variables are presented as frequencies and percentages. The Kolmogorov-Smirnov normality test confirmed that the variables were normally distributed.

For comparisons within the same group (paired comparisons), the paired t-test was used. For comparisons between different groups (independent comparisons), the independent t-test was used. The differences between the mean values before and after the intervention were analyzed using SPSS software version 16.

This study received approval from the Institutional Review Committee of Purbanchal

University School of Health Sciences (reference number: 038-078/79) and Purbanchal University Teaching Hospital. Confidentiality was maintained throughout the study. Data were anonymized and stored securely.

Result

The average age of the participants was 59.17 ± 12.63 years. The duration of hypertension among participants was 10.49 ± 8.91 years. Regarding employment status, 52.2% (n = 35) were employed, 17.9% (n = 12) were retired or unemployed, and 29.9% (n = 20) were housewives. In terms of tobacco use, 23.9% (n = 32) used tobacco, and 47.7% (n = 16) were smokers. The prevalence of diabetes and hyperlipidemia was 17.9% (n = 12) and 29.9% (n = 20), respectively, in the intervention group as shown in table 3.

Table 3: Clinical characteristics of participants (n= 67)

Variables	Number	Percentage (%)
Age (59.17 ± 12.63)		
Young	15	22.38c
Middle	36	53.73
Old	16	23.88
Sex		
Male	41	61.2
Female	26	38.8
Occupation		
Employed	35	52.2
Retired	12	17.9
Homemaker	20	29.9
Marital status		
Married	53	79.1
Single	14	20.9
Currently smoking habits	16	23.89
Tobacco consumption	32	47.76
Diabetes	12	17.9
Dyslipidemia	20	29.9

Table 4: Changes in blood pressure pre and post intervention (n=67)

Variables	Pre intervention Mean ±SD	Post intervention Mean ± SD	p-value
Systolic BP	133.88 ±4.75	126.22 ± 5.41	<0.001
Diastolic BP	87.04 ± 5.25	81.30±3.18	<0.001
Mean difference in systolic BP	-7.66 ± 4.2		
Mean difference of diastolic BP	-5.75 ± 4.54		

Table 4 presents the significant impact of the 6-month intervention on blood pressure. Before the intervention, the mean systolic and diastolic blood pressure was 133.88 ± 4.75 mmHg and 87.04 ± 5.25 mmHg, respectively. A paired t-test was used to compare the pre- and post-intervention blood pressure values. Following the 6-month intervention, a significant decrease was observed in both systolic blood pressure (mean difference: -7.66 ± 4.2 mmHg) and diastolic blood pressure (mean difference: -5.75 ± 4.54 mmHg).

Discussion

Hypertension remains a significant public health concern, contributing to a substantial burden of cardiovascular disease. Lifestyle modifications, including dietary changes, physical activity, and stress management, have emerged as crucial components of hypertension management. This review delves into the efficacy of a multifaceted intervention in addressing hypertension and highlights the importance of a comprehensive approach to achieve optimal blood pressure control.

A recent study underscored the pivotal role of lifestyle modifications in managing hypertension. The multifaceted intervention, encompassing dietary changes, physical activity, and social support, demonstrated a significant reduction in both systolic and diastolic blood pressure. These findings align with previous research emphasizing the efficacy of comprehensive lifestyle interventions in improving hypertension control.[13]

Adherence to lifestyle modifications is essential for effective hypertension management. Consistent engagement in lifestyle changes, such as dietary modifications, regular physical activity, and stress management, can lead to improved health outcomes in hypertensive patients. However, factors such as gender, age, occupation, and comorbid conditions can influence an individual's ability to adopt and sustain healthy behaviors.

The study's quasi-experimental design allowed for a comparison of mean blood pressure differences before and after the intervention. The results indicated a notable reduction in both systolic and diastolic blood pressure, aligning with findings from previous studies. This suggests that comprehensive approaches that incorporate education, support, and self-management strategies can effectively lower blood pressure.[14]

Lifestyle interventions, such as dietary modifications, increased physical activity, and cessation of smoking and alcohol consumption, have been shown to reduce blood pressure.[15] The study observed significant blood pressure-lowering effects primarily associated with exercise combined with dietary management, reinforcing the idea that a holistic approach to lifestyle modification can yield better health outcomes.[16]

The observed reductions in systolic and diastolic blood pressure, averaging -7.65 ± 4.45 mmHg and -5.74 ± 4.45 mmHg respectively, are clinically significant. This finding aligns with previous research demonstrating that lifestyle interventions, such as those involving dietary modifications and exercise, can effectively lower blood pressure.[17]

It's important to emphasize that even modest reductions in blood pressure can substantially diminish the risk of cardiovascular complications. However, it's crucial to acknowledge that the magnitude of these changes may vary depending on factors like the specific population studied and the nature of the intervention itself.[18]

While lifestyle modifications offer a promising approach to hypertension management, further research is needed to explore the optimal combination of interventions and identify the most effective strategies for diverse populations. The DASH diet, rich in fruits, vegetables, and whole grains, can lower blood pressure by reducing sodium intake and increasing potassium, magnesium, and calcium levels.[19] Regular physical activity, such as brisk walking or swimming, can also contribute to blood pressure reduction. Healthcare providers play a crucial role in promoting lifestyle modifications by providing education, counseling, and support. By emphasizing the importance of dietary changes, regular physical activity, and stress management, healthcare providers can empower patients to take control of their health and reduce their risk of cardiovascular disease.[20] Social support, including support groups and family involvement, can provide encouragement and motivation for patients to maintain healthy lifestyle habits.[21] Healthcare providers can further support patients by collaborating with other healthcare professionals to offer comprehensive care.[22]

However, the study also had limitations, which include a relatively small sample size, convenience sampling, and a quasi-experimental design, which may limit the generalizability of the findings and the ability to definitively attribute the observed effects solely to the intervention. Potential confounding factors such as medication use and other lifestyle factors may have influenced the results. Despite these limitations, the study suggests that multifaceted lifestyle interventions can effectively reduce blood pressure, emphasizing the crucial role of healthcare providers in promoting healthy lifestyle behaviors. Further research with larger sample sizes, randomized controlled trials, and longer follow-up periods is warranted to further investigate the effectiveness and long-term impact of these interventions.

Conclusion

In conclusion, the study reinforces the importance of multifaceted lifestyle interventions in managing hypertension. By integrating dietary changes, physical activity, and social support, healthcare providers can enhance patient adherence and improve BP control. The findings contribute to the growing body of evidence advocating for lifestyle modifications as a cornerstone of hypertension management, emphasizing their role in reducing cardiovascular risk and improving overall health outcomes.

Conflict of interest

The author declares no conflict of interest.

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