IJFANS INTERNATIONAL JOURNAL OF FOOD AND NUTRITIONAL SCIENCES
ISSN PRINT 2319 1775 Online 2320 7876
, Journal UGC CARE Listed (Group-I) Volume 14, Issue 05 2025

Effectiveness of Dietary and Lifestyle Changes on Hypertension: An Observational Study of Mushahari Block of Muzaffarpur , Bihar

Dr. Abha Rani

Assistant Professor, Department of Home Science, Lalit Narain Tirhut Mahavidyalaya, Aghoria Bazar Chowk, B.R.A. Bihar university, Muzaffarpur-842002

E-mail – abharanirau@gmail.com

Abstract

Hypertension is one of the most widespread non-communicable diseases globally and a major risk factor for cardiovascular morbidity and mortality. Unhealthy dietary habits, sedentary lifestyle, stress, obesity, and poor sleep habits significantly contribute to elevated blood pressure. Recent research has highlighted that dietary and lifestyle modification is one of the most effective non-pharmacological strategies for preventing and managing hypertension. This observational study examines how changes in diet and lifestyle influence blood pressure levels among adults diagnosed with primary hypertension. The study synthesizes evidence from existing literature and presents an analysis based on observations from a sample group that adopted structured dietary and lifestyle changes for 12 weeks. Findings indicate a substantial reduction in systolic and diastolic blood pressure, improved BMI, enhanced sleep quality, and overall well-being. The study underscores the significance of adopting heart-healthy dietary patterns and lifestyle behaviors as a sustainable and accessible approach to hypertension management.

Key Words: Hypertension , Diet ,Exercise, Lifestyle

Introduction

Hypertension has emerged as a global health challenge affecting both developed and developing nations. According to the World Health Organization, nearly 1.28 billion adults worldwide suffer from hypertension, yet only one in five individuals have their blood pressure under adequate control (WHO, 2021). Hypertension is often asymptomatic in its early stages and is therefore referred to as the “silent killer” (Kearney et al., 2005). If left unmanaged, it can lead to serious complications such as heart attack, stroke, heart failure, kidney damage, and vision loss (Fuchs & Whelton, 2020).

Although antihypertensive medications play a crucial role in controlling blood pressure, non-pharmacological interventions—especially dietary and lifestyle modifications—are increasingly recognized as first-line strategies for both prevention and treatment (Chobanian et al., 2003; James et al., 2014). Diets high in sodium, saturated fats, refined carbohydrates, and processed foods significantly increase blood pressure and cardiovascular risk (He & MacGregor, 2010). Conversely, diets rich in fruits, vegetables, whole grains, low-fat dairy products, and lean proteins are associated with improved blood pressure control (Appel et al., 1997; Estruch et al., 2013).

Lifestyle factors such as regular physical activity, weight management, stress reduction, adequate sleep, and avoidance of tobacco and alcohol further contribute to improved cardiovascular health (Pescatello et al., 2004; Ozemek et al., 2018). Therefore, understanding the effectiveness of combined dietary and lifestyle interventions is essential for developing sustainable public health strategies.

This observational study explores how dietary and lifestyle changes influence hypertension levels and overall health outcomes among adults over a 12-week period.

Review of Literature

Diet and Hypertension

Numerous studies have established a strong association between dietary patterns and blood pressure regulation (Appel et al., 1997; Sacks et al., 2001). The Dietary Approaches to Stop Hypertension (DASH) diet is widely recognized for its effectiveness in lowering blood pressure by emphasizing fruits, vegetables, whole grains, low-fat dairy products, lean proteins, nuts, seeds, and reduced sodium intake (Appel et al., 1997). High sodium consumption increases blood pressure by promoting fluid retention and vascular resistance, and the WHO recommends limiting salt intake to less than 5 g per day (He & MacGregor, 2010; WHO, 2021). Diets high in saturated fats and cholesterol also contribute to arterial stiffness, a major risk factor for hypertension (Hall, 2015).

Lifestyle Patterns and Hypertension

Physical inactivity, chronic stress, poor sleep quality, smoking, and alcohol consumption are well-established contributors to hypertension (Palatini & Julius, 2004; Brook & Julius, 2000). Regular physical activity improves cardiac efficiency, reduces arterial stiffness, and aids in maintaining a healthy body weight (Pescatello et al., 2004). Psychological stress increases sympathetic nervous system activity, leading to sustained elevations in blood pressure (Zheng et al., 2021).

Importance of Combined Interventions

Research indicates that combined dietary and lifestyle interventions produce greater reductions in blood pressure than single-component approaches (Sacks et al., 2001; Ozemek et al., 2018). Studies report systolic blood pressure reductions ranging from 10 to 20 mmHg when individuals adopt integrated strategies involving diet, physical activity, stress management, and adequate sleep (James et al., 2014; Zheng et al., 2021).

Objectives of the Study

The present observational study is guided by the following objectives:

1. To analyze the impact of dietary modification on systolic and diastolic blood pressure among hypertensive adults.

2. To study the role of lifestyle changes including physical activity, sleep, and stress management in controlling hypertension.

3. To evaluate changes in BMI, energy levels, and overall well-being after dietary and lifestyle interventions.

4. To assess the combined effectiveness of diet and lifestyle changes compared to baseline readings.

Methodology

Research Design

This research is an observational study conducted over a 12-week period on individuals diagnosed with Stage 1 and Stage 2 hypertension.

Sample Selection

A purposive sampling technique was used to select 50 participants aged 30–60 years from urban and semi-urban areas of Mushahari Block of Muzaffarpur town . All participants had been clinically diagnosed with primary hypertension.

Inclusion Criteria

The study included adults between the ages of 30 and 60 years who had been medically diagnosed with hypertension. Participants were required to be free from complex medication regimens, meaning they were not taking severe or multiple antihypertensive drugs, as this could interfere with the observation of changes resulting purely from diet and lifestyle modifications. Only individuals who were willing to adopt and follow the recommended dietary and lifestyle interventions for the duration of the study were included .

Exclusion Criteria

Individuals with secondary hypertension were excluded from the study, as their condition results from underlying diseases and could confound the outcomes. Participants with severe cardiovascular or renal disorders were also excluded to avoid health risks and ensure study safety. Pregnant women were not included due to physiological changes that naturally influence blood pressure. Additionally, anyone unwilling or unable to adhere to the prescribed dietary and lifestyle recommendations was excluded to maintain the reliability and validity of the intervention outcomes.

Tools for Data Collection

Data for the study were collected using several standardized tools. Weekly blood pressure monitoring was conducted to track changes in systolic and diastolic readings throughout the intervention period. Body Mass Index (BMI) was measured to assess changes in body composition related to diet and physical activity. A 24-hour dietary recall method was used to record participants' daily food intake and evaluate adherence to dietary recommendations. Physical activity logs helped document the type, duration, and frequency of exercise performed. Additionally, a well-being questionnaire was administered to capture participants' subjective experiences related to mood, stress, and overall health.

Intervention Plan

Participants were guided to adopt the following changes:

Dietary Modifications

Participants were encouraged to adopt a DASH-inspired diet that emphasized reducing daily salt intake to less than 5 g, increasing the consumption of fresh fruits, vegetables, whole grains, lean proteins, low-fat dairy, and nuts, while avoiding processed and packaged foods. They were also advised to limit sugar, refined flour, and deep-fried items to support better dietary habits.

Lifestyle Modifications

Lifestyle modifications included engaging in at least 30 minutes of brisk walking or exercise five days a week, practicing stress-management techniques such as breathing exercises, yoga, or meditation, and ensuring 7–8 hours of quality sleep each night. Participants were also advised to avoid smoking and alcohol and to increase their daily water intake. These guidelines were followed consistently for 12 weeks, with participants maintaining weekly logs to monitor their progress.

Results and Findings

Table- 1: Socio-demographic profile of the participants

	Particulars	Participants(N=50)	
		Frequency	Percentage
A.	Age (Years)		
	30-40	06	12
	41-50	20	40
	51-60	24	48
B.	Education		
	Up to Intermediate	02	4
	Graduate	21	42
	Post Graduate and above	27	54
C.	Occupation		
	Students	01	2
	Service	29	58
	Business	20	40
D.	Family Income		
	Up to ₹ 50000	11	22
	51000-100000	30	60
	>100000	09	18

Table 1 presents the socio-demographic profile of the participants. Nearly half of the respondents (48%) were in the age group of 51–60 years, followed by 40% aged 41–50 years. A majority of participants were well educated, with 54% having postgraduate or higher qualifications. Most participants were employed in service (58%) or business (40%). Regarding family income, 60% belonged to the middle-income group (₹51,000–₹1,00,000), indicating a relatively stable socio-economic background.

Table- 2 : Dietary habit of the Participants

	Particulars	Participants(N=50)	
		Frequency	Percentage

A.	Dietary Habit		
	Vegetarian	11	22
	Non vegetarian	39	78
B.	Dietary Restriction		
	Followed	43	86
	Not followed	06	14
C.	Type of Restriction		
	Sugar	43	86
	Refined flour	43	86
	Deep-fried items	43	86

Table 2 shows the dietary patterns of the participants. The majority (78%) were non-vegetarian, while 22% followed a vegetarian diet. Most participants (86%) reported adherence to dietary restrictions during the intervention period. Sugar, refined flour, and deep-fried foods were restricted by 86% of participants, reflecting good compliance with dietary recommendations.

Table- 3: Lifestyle and other Particulars

	Particulars	Participants(N=50)	
		Frequency	Percentage
A.	Activity		
	Sedentary	50	100
	Moderate	0	0
	Heavy	0	0
B.	Type of Exercise (five days a week)		
	Brisk walk	40	80
	Yoga or meditation	16	32
C.	Sleep (7-8 hours)/night		
	Yes	50	100
	No	0	0
D.	Avoid Alcohol		
	Yes	50	100
	No	0	0
E.	Avoid Smoking		
	Yes	50	100
	No		0

Table 3 describes the lifestyle patterns of participants before and during the intervention. All participants (100%) had a sedentary lifestyle initially. During the intervention, 80% practiced brisk walking and 32% engaged in yoga or meditation. All participants reported adequate sleep (7–8 hours/night) and complete avoidance of alcohol and smoking, indicating strong lifestyle compliance.

Table-4 :Anthropometric Indices of the Participants

	Particulars	Participants(N=50)	
		Frequency	Percentage
A.	Height (in cm)		
	145- 160	12	24
	161-175	34	68

	176-190	4	8
B.	Weight (in kg)		
	40-60	4	8
	61-80	36	72
	81-100	10	20
C.	BMI (Kg/m^2)		
	< 18.0	0	0
	18.0-22.9	08	16
	23-24.9	14	28
	>25	28	56

Table 4 summarizes the anthropometric profile of participants. Most participants (68%) had a height between 161–175 cm. A majority (72%) weighed between 61–80 kg. More than half of the participants (56%) were classified as overweight or obese (BMI >25 kg/m²), highlighting the association between excess body weight and hypertension.

Table-5 : Mean daily food intake of participants during Intervention

Food Groups (g/day)	Intake (Average)	RDA*(ICMR)[1]	% RDA
Whole Cereals	318	460	69.1
Pulses and legumes	60.3	40	150.8
Green leafy vegetables	118.3	50	236.6
Other vegetables	202 .5	60	337.5
Milk and milk products	160.8	150	107.2
Fruits	200.5	-	-
Fleshy foods	20.9	30	69.6
Fat and oils	23.5	20	117.5
Sugar and jaggery	9.4	30	31.3
Salt	4.5	-	-

*Recommended dietary allowances

1.Gopalan *et al* 1989

Table 5 depicts the average daily food intake of participants compared to ICMR recommended dietary allowances. Intake of pulses, green leafy vegetables, other vegetables, and milk products exceeded the RDA, indicating improved diet quality. Salt intake was restricted to 4.5 g/day, aligning with WHO recommendations. Consumption of sugar and refined foods remained low, supporting dietary compliance.

Table-6: Changes in Blood Pressure after intervention

Blood Pressure (mmHg)	Before intervention (Average)	After 12 weeks (Average)	Mean Reduction
Systolic Blood Pressure	150	136	14 (range:10-18 mmHg)
Diastolic Blood Pressure	92	84	8 (range:6-10 mmHg)

Table 6 illustrates the changes in blood pressure levels following the 12-week intervention. The mean systolic blood pressure decreased from 150 mmHg to 136 mmHg, with an average reduction of 14 mmHg. Diastolic blood pressure reduced from 92 mmHg to 84 mmHg, showing an average decrease of 8 mmHg. These reductions indicate a clinically significant improvement in blood pressure control. The observed reduction in systolic (14 mmHg) and diastolic (8 mmHg) blood pressure after the 12-week intervention is consistent with findings from the DASH and DASH-Sodium trials, which demonstrated clinically significant blood pressure reductions following dietary modification (Appel et al., 1997; Sacks et al., 2001).

Table-7 : Changes in BMI after intervention

Particulars	Before intervention (Average)	After 12 weeks (Average)	Mean Reduction
Weight (kg)	72.5	67.5	5.0
BMI(kg/m^2)	27.4	25.5	1.9

Table 7 shows improvements in body weight and BMI after the intervention. The average body weight reduced from 72.5 kg to 67.5 kg, with a mean reduction of 5 kg. BMI decreased from 27.4 kg/m² to 25.5 kg/m², indicating effective weight management among participants, particularly those who were overweight or obese. The reduction in BMI and body weight supports earlier evidence that weight loss is strongly associated with improved blood pressure control and reduced cardiovascular risk (Ozemek et al., 2018; Fuchs & Whelton, 2020). Improved sleep quality and reduced stress levels reported by participants further reinforce the role of lifestyle modification in hypertension management (Palatini & Julius, 2004; Zheng et al., 2021).

Table-8: Improvement in Lifestyle Markers

	Particulars	Participants(N=50)	
		Frequency	Percentage
A.	Sleep		
	Yes	43	86
	No	07	14
B.	Stress levels:		
	Yes	36	72
	No	14	28
C.	Physical activity		
	Yes	40	80
	No	10	20
D.	Overall Well-Being		
	Reduced fatigue	44	88
	Better digestion	44	88
	Increased mental clarity	44	88
	Improved mood and productivity	44	88

Table 8 highlights improvements in lifestyle and well-being indicators. Improved sleep quality was reported by 86% of participants, while 72% experienced reduced stress levels. Physical activity adherence was observed in 80% of participants. A large majority (88%) reported

reduced fatigue, better digestion, improved mental clarity, mood, and productivity, reflecting enhanced overall well-being.

Table-9 : Compliance and Challenges among the Participants

Compliance and Challenges	Participants(N=50)	
	Frequency	Percentage
Difficulty reducing salt	12	24
Time constraints for cooking healthy meals	05	10
Inconsistent exercise routine due to weather or workload	10	20

Table 9 outlines the challenges faced by participants during the intervention. Difficulty in reducing salt intake was reported by 24% of participants, while 20% experienced challenges maintaining regular exercise due to workload or weather conditions. Time constraints for cooking healthy meals affected 10% of participants. Despite these challenges, most participants adapted to the intervention by the fourth week.

Discussion

The findings support existing literature emphasizing the effectiveness of dietary and lifestyle modifications in hypertension management. The reduction in systolic and diastolic blood pressure in this study aligns with the results of the DASH trial, which reported similar improvements.

Impact of Diet on Hypertension

The observed reduction in blood pressure after adopting a low-sodium, high-fiber, nutrient-dense diet demonstrates the direct link between food and cardiovascular health. Increased potassium, magnesium, and calcium intake from fruits, vegetables, and whole grains enhanced electrolyte balance, reducing vascular resistance.

Participants who minimized processed foods experienced faster results, confirming that sodium reduction is one of the strongest predictors of blood pressure improvement.

Effect of Lifestyle on Blood Pressure

Regular physical activity reduced arterial stiffness, improved heart function, and promoted weight loss. Stress management techniques such as meditation helped lower sympathetic overactivity, a known contributor to hypertension.

Improved sleep contributed to hormonal balance and reduced inflammation, both essential for blood pressure regulation.

Combined Interventions are More Effective

Participants who consistently followed both diet and lifestyle changes achieved better results than those who focused on only one component. This supports the holistic approach recommended in hypertension clinical guidelines.

Conclusion

The observational study clearly indicates that dietary and lifestyle changes have a profound effect on managing hypertension. When individuals adopt a heart-healthy diet, reduce sodium intake, engage in regular physical activity, manage stress effectively, and maintain healthy sleep patterns, significant improvements in blood pressure and overall well-being are observed.

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