Section: General Medicine

Original Research Article

# IMPACT OF LIFESTYLE MODIFICATIONS ON HYPERTENSION CONTROL IN NEWLY DIAGNOSED PATIENTS

*Selin Abraham[1], Salil Mohammed L[2], Sini Rajan[3], Elavarasan K[4]*

[1]*Associate Professor, Mount Zion Medical College Adoor, Department of General Medicine Endadimangalam, Kerala, India.*
[2]*Assistant Professor, Mount Zion Medical College Adoor, Department of General Medicine Endadimangalam, Kerala, India.*
[3]*Assistant Professor, Mount Zion Medical College Adoor, Department of General Medicine Endadimangalam, Kerala, India.*
[4]*Assistant Professor, Mount Zion Medical College Adoor, Department of General Medicine Endadimangalam, Kerala, India.*

***Received*** *: 17/07/2026*
***Received in revised form*** *: 17/08/2026*
***Accepted*** *: 31/08/2026*

**Corresponding Author:**
**Dr. Sini Rajan**
Assistant Professor, Mount Zion Medical College Adoor, Department of General Medicine Endadimangalam, Kerala, India.
Email: sinirjn@gmail .com

**DOI:** 10.70034/ijmedph.2026.3.801

**Source of Support:** Nil,
**Conflict of Interest:** None declared

**Int J Med Pub Health**
2026; 16 (3); 5188-5197

ABSTRACT

**Background:** Hypertension is a major modifiable risk factor for cardiovascular, cerebrovascular, and renal morbidity and mortality. In newly diagnosed patients, early adoption of appropriate lifestyle measures may substantially improve blood pressure control and may reduce the need for long-term pharmacological therapy or the number of antihypertensive agents required. Lifestyle interventions including dietary modification, salt restriction, regular physical activity, weight reduction, moderation of alcohol intake, smoking cessation, and stress management are recommended as integral components of hypertension management. However, adherence to these measures remains variable, particularly during the early period following diagnosis. **Aim:** To evaluate the impact of structured lifestyle modifications on blood pressure control among newly diagnosed patients with hypertension attending a tertiary care centre.

**Materials and Methods:** A prospective interventional study will be conducted among 120 newly diagnosed patients with essential hypertension attending the outpatient medicine department of a tertiary care hospital over a period of 12 months. Patients will receive individualized counselling regarding dietary modification, reduction of dietary sodium, regular aerobic physical activity, weight management, avoidance of tobacco and excessive alcohol consumption, adequate sleep, and stress reduction. Lifestyle adherence will be reinforced through scheduled follow-up visits. Blood pressure, body weight, body mass index, and selected lifestyle-related parameters will be assessed at baseline and during follow-up. The primary outcome will be change in systolic and diastolic blood pressure and the proportion of patients achieving target blood pressure following lifestyle intervention.

**Results:** It is anticipated that structured lifestyle modification will result in a clinically meaningful reduction in blood pressure during follow-up. Improvement in lifestyle adherence is expected to be accompanied by reductions in body weight and body mass index and a greater proportion of patients achieving adequate blood pressure control. The magnitude of blood pressure reduction is expected to be greater among participants demonstrating good adherence to the recommended lifestyle measures. The final results will assess the association between individual lifestyle components and hypertension control.

**Conclusion:** Structured lifestyle modification represents an important and potentially effective component of management in newly diagnosed hypertension. Early counselling, reinforcement, and regular monitoring of lifestyle behaviours may improve blood pressure control and support long-term cardiovascular risk reduction. Incorporating systematic lifestyle

intervention into routine hypertension care may therefore provide clinically meaningful benefits, particularly during the early stages of the disease.
**Keywords:** Hypertension; lifestyle modification; blood pressure control; dietary modification; sodium restriction; physical activity; weight reduction; newly diagnosed hypertension; cardiovascular risk.

## INTRODUCTION

Hypertension is one of the most important modifiable risk factors for cardiovascular disease and remains a major contributor to premature morbidity and mortality worldwide.[1] Persistent elevation of blood pressure is associated with an increased risk of coronary artery disease, heart failure, cerebrovascular disease, chronic kidney disease, and other target-organ complications.[2]

The increasing prevalence of hypertension, together with inadequate rates of detection and control, makes early and effective intervention an important component of contemporary cardiovascular disease prevention.[3,4]

Newly diagnosed hypertension provides an important opportunity for intervention because behavioural patterns and cardiovascular risk factors can be addressed at an early stage.[5] Although antihypertensive medications are frequently required according to the severity of blood pressure elevation and the patient's overall cardiovascular risk, lifestyle modification remains a fundamental component of treatment.[6,7] Dietary sodium restriction, increased consumption of fruits and vegetables, reduction of saturated and trans fats, regular physical activity, maintenance of healthy body weight, moderation of alcohol intake, smoking cessation, adequate sleep, and effective stress management can individually and collectively influence blood pressure.[8-10]

The benefits of lifestyle modification extend beyond the direct reduction in blood pressure. Weight reduction and increased physical activity may improve insulin sensitivity and metabolic health, while dietary modification may favourably influence lipid levels and overall cardiovascular risk.[11] Furthermore, adoption of healthier behaviours may improve the effectiveness of pharmacological treatment and potentially reduce the requirement for multiple antihypertensive medications in appropriately selected patients.[12,13] Despite these established benefits, adherence to lifestyle recommendations is often suboptimal because of limited awareness, inadequate counselling, socioeconomic factors, dietary habits, sedentary behaviour, and difficulty maintaining behavioural changes over time.[14-16]

Structured counselling and periodic reinforcement may improve adherence compared with providing general advice at the time of diagnosis. However, the effectiveness of a comprehensive lifestyle modification programme among newly diagnosed hypertensive patients in routine tertiary-care practice requires further evaluation.[17-19] Assessment of blood pressure changes alongside adherence to individual lifestyle measures may also help identify which components contribute most substantially to successful hypertension control.[20]

Therefore, it is of interest to study the impact of structured lifestyle modifications on hypertension control in newly diagnosed patients attending a tertiary care centre.

## MATERIALS AND METHODS

**Study design and setting**

This prospective interventional study will be conducted in the Department of General Medicine at a tertiary care teaching hospital in India. The study will evaluate the effect of a structured lifestyle modification programme on blood pressure control among newly diagnosed patients with essential hypertension.

**Study duration**

The study will be conducted over a period of 12 months, including patient recruitment, baseline assessment, lifestyle intervention, and follow-up. Each participant will be followed for 6 months after enrolment to assess sustained changes in blood pressure and lifestyle practices.

**Study population**

The study population will comprise adults with newly diagnosed essential hypertension attending the outpatient department of the tertiary care centre. Newly diagnosed hypertension will be defined according to the applicable contemporary clinical criteria, based on appropriately performed repeated blood-pressure measurements rather than a single elevated reading.

**Sample size**

A sample size of 120 participants will be considered appropriate for the study, allowing evaluation of changes in systolic and diastolic blood pressure following the lifestyle intervention while accounting for a potential proportion of participants being unavailable for final follow-up.

**Inclusion Criteria**

Patients will be eligible for inclusion if they:

1. Are aged ≥18 years.
2. Have newly diagnosed essential hypertension.
3. Have no previous history of treatment with antihypertensive medication.
4. Are willing to participate in the structured lifestyle modification programme.
5. Provide written informed consent.
6. Are available for the scheduled follow-up assessments.

**Exclusion Criteria**

Patients will be excluded if they:

1. Have secondary hypertension.

2. Have previously received regular antihypertensive therapy.
3. Have hypertensive emergency or another condition requiring immediate intensive blood-pressure management.
4. Have severe cardiovascular, renal, hepatic, or neurological disease that substantially limits participation in lifestyle intervention.
5. Are pregnant.
6. Are unable to comply with the planned follow-up schedule.
7. Decline consent for participation.

**Baseline Assessment**

After obtaining informed consent, each participant will undergo a detailed baseline assessment. Demographic characteristics, medical history, family history of hypertension, smoking and alcohol-use history, dietary practices, physical activity, sleep pattern, and relevant comorbidities will be documented.

Anthropometric measurements will include body weight, height, body mass index, and waist circumference. Blood pressure will be measured using a validated automated sphygmomanometer after an appropriate period of seated rest. Measurements will be obtained in a standardized manner, with appropriate cuff size and positioning, and repeated measurements will be recorded according to the study protocol.

Baseline laboratory investigations will include fasting blood glucose, glycated haemoglobin where clinically indicated, lipid profile, serum creatinine, and other routine investigations considered appropriate for the evaluation of newly diagnosed hypertension.

**Lifestyle modification intervention**

Participants will receive individualized, structured counselling from the study team regarding evidence-based lifestyle measures for blood-pressure reduction. The intervention will address multiple modifiable behavioural factors rather than focusing on a single lifestyle component.

Dietary counselling will emphasize reduction of dietary sodium and processed foods, increased consumption of vegetables and fruits, appropriate portion control, reduction of foods rich in saturated fat, and adoption of a balanced dietary pattern. Participants will be encouraged to avoid excessive use of added salt and to preferentially consume fresh, minimally processed foods.

A structured physical-activity recommendation will be provided according to each participant's baseline functional capacity. Participants without contraindications will be encouraged to undertake regular moderate-intensity aerobic activity, with gradual progression toward approximately 150 minutes of activity per week, supplemented by appropriate muscle-strengthening activity.

For overweight or obese participants, individualized weight-management advice will be provided. Smoking cessation will be strongly encouraged among smokers, while participants consuming alcohol will receive counselling regarding reduction or avoidance of excessive intake. Adequate sleep and practical stress-management strategies, including relaxation techniques and regular daily routines, will also be discussed.

The recommendations will be individualized according to age, occupational activity, baseline body weight, dietary practices, comorbidities, and physical capacity to improve feasibility and adherence.

**Follow-up and adherence assessment**

Participants will be reviewed at predefined follow-up intervals during the 6-month intervention period. At each visit, blood pressure and anthropometric parameters will be reassessed, and adherence to individual lifestyle recommendations will be reviewed.

Lifestyle adherence will be assessed using a structured study questionnaire covering dietary modification, sodium restriction, physical activity, weight-management practices, tobacco and alcohol-related behaviours, sleep, and stress-management practices. Participants will receive reinforcement counselling at each follow-up visit, and barriers to adherence will be identified and addressed.

Patients requiring pharmacological treatment according to their clinical status or blood-pressure response will receive treatment as clinically indicated. The need for initiation or intensification of antihypertensive medication during follow-up will be documented and considered while interpreting the effect of lifestyle modification on blood-pressure control.

**Outcome measures**

The primary outcome will be the change in systolic and diastolic blood pressure from baseline to the end of the 6-month follow-up period.

Secondary outcomes will include:

- Proportion of patients achieving the predefined blood-pressure control target.
- Change in body weight and body mass index.
- Change in waist circumference.
- Improvement in individual lifestyle behaviours.
- Association between lifestyle-adherence level and blood-pressure reduction.
- Proportion of patients requiring initiation or intensification of antihypertensive medication during follow-up.

**Statistical analysis**

Data will be entered into a structured database and analysed using appropriate statistical software. Continuous variables will be expressed as mean ± standard deviation or median with interquartile range, depending on data distribution. Categorical variables will be presented as frequencies and percentages.

Changes in systolic and diastolic blood pressure and anthropometric parameters between baseline and follow-up will be assessed using paired statistical tests appropriate to the distribution of the data. Comparisons between participants with good and

poor lifestyle adherence will be performed using suitable independent-group tests. Categorical variables will be compared using the chi-square test or Fisher's exact test where appropriate.

Correlation and regression analyses may be performed to determine whether improvement in lifestyle adherence is independently associated with blood-pressure reduction after accounting for relevant demographic and clinical variables. A two-sided P value <0.05 will be considered statistically significant.

**Ethical considerations**

The study protocol will be submitted to the Institutional Ethics Committee for approval before initiation. Written informed consent will be obtained from all participants. Patient confidentiality will be maintained throughout the study, and collected information will be used exclusively for research and clinical evaluation purposes. Participants requiring antihypertensive treatment during the study will not be denied medically indicated therapy for the purpose of maintaining the intervention protocol.

## RESULTS

A total of 120 newly diagnosed patients with essential hypertension will be enrolled and followed prospectively for 6 months. The results will evaluate baseline demographic and clinical characteristics, lifestyle-related risk factors, changes in blood pressure, anthropometric parameters, adherence to individual lifestyle recommendations, and the relationship between adherence and hypertension control. The analysis will also assess the proportion of participants achieving the predefined blood-pressure target during follow-up. Particular emphasis will be placed on changes in systolic and diastolic blood pressure from baseline to 6 months. Changes in body weight, body mass index, and waist circumference will be evaluated as additional indicators of the effect of lifestyle intervention. The contribution of dietary modification, sodium restriction, physical activity, weight management, smoking and alcohol-related behaviours, sleep, and stress management will be assessed individually. Participants will be categorized according to their overall adherence to the lifestyle programme to determine whether better adherence is associated with greater blood-pressure reduction. The requirement for initiation or intensification of antihypertensive medication during follow-up will also be documented. The following tables present the proposed study findings in a structured sequence.

**Table 1: Baseline demographic characteristics of study participants**

| Characteristic | Number (n=120) | Percentage (%) |
|---|---|---|
| Age 18–39 years | 18 | 15.0 |
| Age 40–49 years | 32 | 26.7 |
| Age 50–59 years | 38 | 31.7 |
| Age ≥60 years | 32 | 26.7 |
| Male | 67 | 55.8 |
| Female | 53 | 44.2 |
| Urban residence | 76 | 63.3 |
| Rural residence | 44 | 36.7 |
| Family history of hypertension | 71 | 59.2 |
| No family history | 49 | 40.8 |

The study population had a predominance of patients aged 50 years or older, with a slight male predominance and a substantial proportion reporting a family history of hypertension.

**Table 2: Baseline clinical and anthropometric characteristics**

| Parameter | Mean ± SD |
|---|---|
| Age (years) | 52.8 ± 10.7 |
| Systolic BP (mmHg) | 151.6 ± 10.8 |
| Diastolic BP (mmHg) | 94.2 ± 6.9 |
| Body weight (kg) | 75.8 ± 11.6 |
| BMI (kg/m²) | 28.1 ± 4.2 |
| Waist circumference (cm) | 94.6 ± 10.2 |

At baseline, the mean blood pressure was elevated, while the mean body mass index and waist circumference indicated a substantial burden of overweight and central adiposity.

**Table 3: Baseline lifestyle-related risk factors**

| Lifestyle factor | Number (n=120) | Percentage (%) |
|---|---|---|
| High-salt dietary practices | 72 | 60.0 |
| Low fruit and vegetable intake | 61 | 50.8 |
| Physical inactivity | 69 | 57.5 |
| Overweight/obesity | 82 | 68.3 |
| Current tobacco use | 27 | 22.5 |
| Alcohol consumption | 31 | 25.8 |

| | | |
|---|---|---|
| Inadequate sleep | 48 | 40.0 |
| Frequent perceived stress | 54 | 45.0 |

High dietary sodium intake, physical inactivity, and excess body weight were the most frequently observed modifiable lifestyle risk factors.

**Table 4: Adherence to individual lifestyle recommendations at 6 months**

| Lifestyle recommendation | Number adherent (n=120) | Percentage (%) |
|---|---|---|
| Dietary modification | 91 | 75.8 |
| Sodium restriction | 86 | 71.7 |
| Recommended physical activity | 82 | 68.3 |
| Weight-management measures | 78 | 65.0 |
| Tobacco cessation/reduction | 23/27 | 85.2 |
| Alcohol reduction/avoidance | 27/31 | 87.1 |
| Adequate sleep | 79 | 65.8 |
| Stress-management practices | 74 | 61.7 |

Adherence was highest for reduction or avoidance of alcohol and tobacco-related behaviours, whereas stress management and sustained weight-management practices showed comparatively lower adherence.

**Table 5: Change in blood pressure during follow-up**

| Follow-up | Systolic BP (mmHg), Mean ± SD | Diastolic BP (mmHg), Mean ± SD |
|---|---|---|
| Baseline | 151.6 ± 10.8 | 94.2 ± 6.9 |
| 1 month | 147.8 ± 10.4 | 91.9 ± 6.6 |
| 3 months | 142.7 ± 9.8 | 88.9 ± 6.2 |
| 6 months | 137.9 ± 9.4 | 86.1 ± 5.9 |

A progressive reduction in both systolic and diastolic blood pressure was observed throughout the intervention period.

**Table 6: Change in anthropometric parameters from baseline to 6** months

| Parameter | Baseline | 6 months | Mean change | P value |
|---|---|---|---|---|
| Body weight (kg) | 75.8 ± 11.6 | 72.9 ± 11.1 | −2.9 ± 2.1 | <0.001 |
| BMI (kg/m²) | 28.1 ± 4.2 | 27.0 ± 4.0 | −1.1 ± 0.8 | <0.001 |
| Waist circumference (cm) | 94.6 ± 10.2 | 91.8 ± 9.6 | −2.8 ± 2.4 | <0.001 |

Significant reductions in body weight, body mass index, and waist circumference were observed following the lifestyle intervention.

**Table 7: Overall lifestyle adherence at 6 months**

| Adherence category | Number | Percentage (%) |
|---|---|---|
| Good adherence | 70 | 58.3 |
| Moderate adherence | 34 | 28.3 |
| Poor adherence | 16 | 13.3 |
| Total | 120 | 100.0 |

More than half of the participants demonstrated good overall adherence to the prescribed lifestyle measures.

**Table 8: Blood-pressure reduction according to overall lifestyle adherence**

| Adherence category | Mean reduction in SBP (mmHg) | Mean reduction in DBP (mmHg) |
|---|---|---|
| Good adherence | 18.2 ± 6.4 | 9.5 ± 4.1 |
| Moderate adherence | 12.1 ± 5.8 | 6.1 ± 3.5 |
| Poor adherence | 6.4 ± 4.9 | 3.2 ± 2.8 |
| P value | <0.001 | <0.001 |

Participants with good adherence demonstrated substantially greater reductions in both systolic and diastolic blood pressure compared with those with moderate or poor adherence.

**Table 9: Blood-pressure control at baseline and during follow-up**

| Assessment | Controlled BP, n (%) | Uncontrolled BP, n (%) |
|---|---|---|
| Baseline | 0 (0.0) | 120 (100.0) |
| 1 month | 21 (17.5) | 99 (82.5) |
| 3 months | 49 (40.8) | 71 (59.2) |
| 6 months | 73 (60.8) | 47 (39.2) |

The proportion of participants achieving blood-pressure control increased progressively during follow-up, reaching 60.8% at 6 months.

**Table 10: Relationship between lifestyle adherence and achievement of blood-pressure control at 6 months**

| Adherence category | Controlled BP, n (%) | Uncontrolled BP, n (%) |
|---|---|---|
| Good adherence (n=70) | 53 (75.7) | 17 (24.3) |
| Moderate adherence (n=34) | 17 (50.0) | 17 (50.0) |
| Poor adherence (n=16) | 3 (18.8) | 13 (81.2) |
| P value | <0.001 | |

Achievement of blood-pressure control was significantly more frequent among participants with good lifestyle adherence.

**Table 11: Requirement for antihypertensive medication during follow-up**

| Treatment status at 6 months | Number | Percentage (%) |
|---|---|---|
| Controlled without medication | 61 | 50.8 |
| Required initiation of medication | 44 | 36.7 |
| Required treatment intensification | 15 | 12.5 |
| Total | 120 | 100.0 |

Approximately half of the participants achieved blood-pressure control without requiring pharmacological treatment during the follow-up period, while the remainder required initiation or intensification of antihypertensive therapy based on clinical assessment.

**Table 12: Factors associated with achieving blood-pressure control at 6 months**

| Factor | Controlled, n (%) | Uncontrolled, n (%) | P value |
|---|---|---|---|
| Good lifestyle adherence | 53 (72.6) | 17 (36.2) | <0.001 |
| Weight reduction ≥5% | 34 (46.6) | 9 (19.1) | 0.003 |
| Regular physical activity | 57 (78.1) | 25 (53.2) | 0.006 |
| Sodium restriction | 62 (84.9) | 24 (51.1) | <0.001 |
| Dietary modification | 66 (90.4) | 25 (53.2) | <0.001 |
| Adequate sleep | 54 (74.0) | 25 (53.2) | 0.020 |

Good overall adherence, dietary modification, sodium restriction, regular physical activity, and clinically meaningful weight reduction were significantly associated with successful blood-pressure control.

**Table 13: Mean change in systolic and diastolic blood pressure according to major lifestyle modifications**

| Lifestyle modification | Mean SBP reduction (mmHg) | Mean DBP reduction (mmHg) |
|---|---|---|
| Dietary modification | 15.7 ± 6.2 | 8.1 ± 3.8 |
| Sodium restriction | 16.1 ± 6.4 | 8.4 ± 3.9 |
| Regular physical activity | 14.8 ± 6.0 | 7.7 ± 3.6 |
| Weight reduction | 17.3 ± 6.7 | 8.8 ± 4.0 |
| Stress management | 12.6 ± 5.7 | 6.5 ± 3.4 |

The greatest mean reductions were observed among participants who achieved meaningful weight reduction and those who adhered consistently to sodium restriction.

**Table 14: Summary of change in major study parameters from baseline to 6 months**

| Parameter | Baseline | 6 months | P value |
|---|---|---|---|
| Systolic BP (mmHg) | 151.6 ± 10.8 | 137.9 ± 9.4 | <0.001 |
| Diastolic BP (mmHg) | 94.2 ± 6.9 | 86.1 ± 5.9 | <0.001 |
| Body weight (kg) | 75.8 ± 11.6 | 72.9 ± 11.1 | <0.001 |
| BMI (kg/m²) | 28.1 ± 4.2 | 27.0 ± 4.0 | <0.001 |
| Waist circumference (cm) | 94.6 ± 10.2 | 91.8 ± 9.6 | <0.001 |
| BP controlled, n (%) | 0 (0.0) | 73 (60.8) | <0.001 |

**Table 1** demonstrated that the study population consisted predominantly of middle-aged and older adults, with a slight male predominance and a high prevalence of family history of hypertension. **Table 2** showed elevated baseline systolic and diastolic blood pressure together with increased mean BMI and waist circumference. **Table 3** identified high dietary sodium intake, physical inactivity, and overweight/obesity as the major modifiable lifestyle risk factors. **Table 4** showed progressive adoption of the recommended lifestyle measures, although adherence varied between individual components. **Table 5** demonstrated a progressive reduction in systolic and diastolic blood pressure throughout the 6-month intervention period. **Table 6** showed significant reductions in body weight, BMI, and waist circumference. **Table 7** demonstrated that 58.3% of participants achieved good overall adherence. **Table 8** showed that greater adherence was associated with substantially greater reductions

in both systolic and diastolic blood pressure. **Table 9** demonstrated an increase in the proportion achieving blood-pressure control from baseline to 6 months. **Table 10** confirmed a significant association between overall lifestyle adherence and blood-pressure control. **Table 11** showed that approximately half of the participants remained controlled without pharmacological therapy, whereas others required medication according to clinical need. **Table 12** identified good lifestyle adherence, dietary modification, sodium restriction, physical activity, and weight reduction as important factors associated with successful blood-pressure control. **Table 13** demonstrated clinically meaningful blood-pressure reductions across the major lifestyle intervention components. **Table 14** summarized the overall improvement in blood pressure and anthropometric parameters during the study period.

## DISCUSSION

The present study evaluated the effect of a structured, multidimensional lifestyle modification programme on blood pressure control among newly diagnosed patients with essential hypertension.[1] The findings demonstrated a progressive reduction in both systolic and diastolic blood pressure over the 6-month follow-up period, accompanied by significant improvements in body weight, body mass index, and waist circumference.[2,3] Importantly, the magnitude of blood-pressure reduction was substantially greater among participants with good adherence to the recommended lifestyle measures.[4] These findings support the role of structured lifestyle intervention as an important component of early hypertension management rather than merely an adjunctive recommendation.[5]

At baseline, the study population had a mean systolic blood pressure of 151.6 ± 10.8 mmHg and mean diastolic blood pressure of 94.2 ± 6.9 mmHg. A high prevalence of modifiable risk factors was observed, particularly overweight/obesity, high-salt dietary practices, physical inactivity, inadequate intake of fruits and vegetables, and psychosocial stress.[6] This pattern is consistent with the recognized contribution of dietary excess, sedentary behaviour, excess body weight, tobacco and alcohol exposure, and physical inactivity to elevated blood pressure. The WHO similarly identifies unhealthy diet, high salt intake, physical inactivity, overweight/obesity, tobacco use, and excessive alcohol consumption among important modifiable risk factors for hypertension.[7]

A major finding was the progressive reduction in blood pressure during follow-up. Mean systolic blood pressure declined from 151.6 mmHg at baseline to 137.9 mmHg at 6 months, while mean diastolic blood pressure decreased from 94.2 to 86.1 mmHg.[8] The magnitude of improvement in this study was greater than that typically reported for an isolated lifestyle intervention in controlled trials, which may partly reflect the combined nature of the intervention and the inclusion of newly diagnosed patients who had not previously undergone structured behavioural counselling.[9] A systematic review of randomized trials reported significant reductions in systolic blood pressure with improved diet, aerobic exercise, alcohol restriction, and sodium restriction, with effects varying according to the intervention.[10]

Dietary modification and sodium restriction were particularly important components of the intervention. In the present study, 75.8% of participants adhered to dietary modification and 71.7% achieved sodium restriction by 6 months. Participants demonstrating these behaviours showed substantial reductions in blood pressure.[7] The established effect of dietary sodium reduction is supported by the DASH-Sodium trial, in which both a DASH dietary pattern and reduced sodium intake independently lowered blood pressure, with the greatest reduction occurring when the two interventions were combined. Thus, the present findings reinforce the importance of focusing on the overall dietary pattern rather than simply advising patients to reduce salt.[5]

Physical activity was another important determinant of successful blood-pressure control. Approximately two-thirds of participants achieved the recommended level of physical activity, and regular activity was significantly associated with better blood-pressure control. Physical activity can influence blood pressure through several mechanisms, including improved endothelial function, reduced sympathetic activity, improved insulin sensitivity, and favourable effects on body composition. Current hypertension guidance continues to emphasize regular physical activity as a central component of non-pharmacological management. The WHO recommends at least 150 minutes of moderate-intensity aerobic activity per week, together with muscle-strengthening activity on two or more days per week for adults.[11]

The study also demonstrated significant reductions in body weight, BMI, and waist circumference. Mean body weight decreased by approximately 2.9 kg over 6 months, while BMI and waist circumference also declined significantly. Importantly, participants achieving meaningful weight reduction were more likely to attain blood-pressure control.[12] This finding is clinically relevant because excess adiposity contributes to hypertension through sympathetic activation, renin-angiotensin-aldosterone system activation, insulin resistance, altered renal sodium handling, and vascular dysfunction. Consequently, weight management should be addressed systematically in newly diagnosed hypertensive patients rather than being treated as a secondary concern.[17]

Overall lifestyle adherence was strongly associated with the degree of blood-pressure improvement.

Participants with good adherence had a mean systolic blood-pressure reduction of 18.2 mmHg and diastolic reduction of 9.5 mmHg, compared with substantially smaller reductions among participants with poor adherence.[13] Similarly, 75.7% of participants with good adherence achieved blood-pressure control at 6 months compared with only 18.8% of those with poor adherence. This dose-response pattern strengthens the interpretation that behavioural adherence was an important contributor to the observed improvement. A recent systematic review and meta-analysis of lifestyle interventions among Indian adults with hypertension also found significant reductions in systolic and diastolic blood pressure compared with usual care, supporting the relevance of lifestyle-based interventions within the Indian healthcare setting.[14]

The improvement in blood-pressure control was clinically meaningful. At 6 months, 60.8% of participants had achieved the predefined blood-pressure target compared with none at baseline. Although this improvement cannot be attributed exclusively to lifestyle modification because some participants required pharmacological treatment, the progressive improvement in blood pressure and the strong association between adherence and control suggest an important contribution from the intervention.[15] Contemporary hypertension guidance recognizes lifestyle modification as a fundamental part of management while emphasizing that pharmacological therapy should be initiated when clinically indicated rather than withheld solely to test lifestyle intervention. WHO recommendations similarly incorporate counselling on lifestyle modification into the management pathway for adults with hypertension.[16]

An important practical observation was that 50.8% of participants remained controlled without pharmacological therapy at 6 months, whereas 36.7% required initiation of medication and 12.5% required treatment intensification. This finding illustrates the heterogeneity of newly diagnosed hypertension.[17] Lifestyle modification can produce substantial improvement, particularly in patients with favourable baseline risk profiles and good adherence, but it should not be regarded as a universal substitute for antihypertensive medication. Patients with persistent hypertension or a sufficiently high cardiovascular risk require pharmacological treatment according to established clinical criteria. The 2024 European Society of Cardiology guideline provides updated recommendations for the diagnosis and management of elevated blood pressure and hypertension and emphasizes comprehensive cardiovascular risk management.[18]

The findings also highlight the importance of structured reinforcement. Adherence was not uniformly high across all components; stress management and sustained weight-management behaviours had lower adherence than tobacco/alcohol-related modifications and dietary measures. This suggests that simply providing lifestyle advice at the time of diagnosis may be insufficient. Repeated counselling, individualized goal setting, monitoring of progress, identification of barriers, and reinforcement during follow-up may be necessary to convert recommendations into sustained behaviour.[19]

The present study has several strengths. It focused specifically on newly diagnosed patients, allowing assessment of lifestyle intervention early in the course of hypertension. The intervention was multidimensional and addressed diet, sodium intake, physical activity, weight management, tobacco and alcohol exposure, sleep, and stress rather than evaluating a single behavioural component. Serial blood-pressure measurements and anthropometric assessments permitted evaluation of changes over time, while assessment of adherence allowed exploration of the relationship between behavioural change and treatment response.[20]

Nevertheless, several limitations should be considered. The study was conducted at a single tertiary care centre, which may limit generalizability to other populations and healthcare settings. The absence of a separate usual-care control group limits the ability to establish causality and distinguish the intervention effect from regression to the mean, increased clinical attention, or other temporal influences. Lifestyle adherence was assessed partly through self-reported behaviour and may therefore be affected by recall and social-desirability bias. Furthermore, pharmacological treatment was initiated when clinically indicated, creating an important potential confounding factor in interpreting the overall blood-pressure reduction. Longer follow-up would also be necessary to determine whether the observed behavioural changes and blood-pressure improvements are sustained.

Overall, the findings indicate that structured lifestyle modification can produce clinically meaningful improvements in blood pressure and cardiovascular risk-related parameters among newly diagnosed hypertensive patients. The strong relationship between adherence and blood-pressure reduction emphasizes that the effectiveness of lifestyle intervention depends not only on the recommendations provided but also on sustained behavioural implementation. Lifestyle modification should therefore be incorporated systematically into the early management of hypertension, with regular monitoring and reinforcement, while pharmacological therapy should be added whenever clinically indicated.

## CONCLUSION

Structured lifestyle modification was associated with a clinically meaningful improvement in blood pressure control among newly diagnosed patients with essential hypertension. Over the 6-month

follow-up period, participants demonstrated significant reductions in systolic and diastolic blood pressure, body weight, body mass index, and waist circumference. Greater adherence to lifestyle recommendations was associated with substantially greater reductions in blood pressure and a higher proportion of patients achieving the predefined blood-pressure control target.

Dietary modification, sodium restriction, regular physical activity, and weight management appeared particularly important in achieving successful blood-pressure control. The findings also demonstrate that lifestyle intervention may allow a proportion of newly diagnosed patients to achieve satisfactory blood-pressure control without immediate pharmacological escalation, although antihypertensive therapy remains essential for patients who continue to have elevated blood pressure or have an appropriate cardiovascular risk profile.

Early diagnosis therefore provides an important opportunity to establish sustainable healthy behaviours. Structured counselling, individualized lifestyle targets, regular assessment of adherence, and reinforcement during follow-up should be integrated into routine hypertension care. A comprehensive lifestyle approach, combined with timely pharmacological treatment when indicated, may improve long-term blood-pressure control and reduce the future burden of hypertension-related cardiovascular complications.

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