

Hypertension Management Through Soya-Based Diet in Middle-Aged Women: Insights from Jhunjhunu, Rajasthan

Dr. Rachana

Abstract- Hypertension is a prevalent health issue among middle-aged women, significantly increasing the risk of cardiovascular diseases. Dietary interventions have been suggested as a sustainable approach to managing hypertension. This study explores the impact of a soya-based diet on hypertension among middle-aged women in Jhunjhunu, Rajasthan. A six-month prospective study was conducted, with 100 participants divided into an intervention group consuming a soya-based diet and a control group maintaining their regular diet. Findings indicate a significant reduction in systolic and diastolic blood pressure levels, improved lipid profiles, and overall cardiovascular benefits among those who incorporated soya-based foods. The study concludes that a soya-based diet is an effective non-pharmacological intervention for hypertension management and advocates for further research and dietary policy recommendations.

Keywords: Hypertension, Soya-Based Diet, Middle-Aged Women, Blood Pressure, Jhunjhunu, Rajasthan, Cardiovascular Health

1. INTRODUCTION

Hypertension, or high blood pressure, is a leading cause of morbidity and mortality worldwide, particularly affecting middle-aged women due to hormonal and metabolic changes. It is a major risk factor for cardiovascular diseases, strokes, and renal dysfunction. Traditional treatment approaches rely on pharmacological interventions, but dietary modifications offer a cost-effective and sustainable alternative.

The nutritional value of soya-based foods has been widely acknowledged, particularly their role in cardiovascular health. Soya contains bioactive compounds, including isoflavones and peptides, that influence blood pressure regulation. Previous research has shown that incorporating soya into daily diets can improve endothelial function, enhance lipid profiles, and reduce arterial stiffness.

Jhunjhunu, a district in Rajasthan, was selected as the study site due to its rising prevalence of hypertension and shifting dietary patterns. This study aims to evaluate the effectiveness of a soya-based diet in managing hypertension among middle-aged women in this region.

Dr. Rachana, 38/2, "Kalpdrum" New Colony North, Lane No. 2, Loharu Road, Pilani, Jhunjhunu, Rajasthan. Email ID: drrachananehradhaka@gmail.com

2. LITERATURE REVIEW

Several studies have examined the relationship between soya consumption and cardiovascular health. Research highlights that soya isoflavones function as phytoestrogens, which mimic estrogen's protective effects on blood vessels, leading to reduced blood pressure levels. The American Heart Association recognizes soya protein as a heart-healthy food. Additionally, randomized controlled trials have suggested that replacing animal protein with plant-based proteins, particularly soya, contributes to lower blood pressure levels.

Despite these findings, limited region-specific research exists on the benefits of soya consumption among Indian women, especially in Rajasthan. This study attempts to bridge this gap by analyzing the effects of a soya-based diet within the socio-cultural context of Jhunjhunu.

3. METHODOLOGY

3.1 Study Design

A prospective, randomized controlled trial was conducted over six months. Participants were recruited through local health centers and community outreach programs.

3.2 Participant Selection

The study involved 100 hypertensive women aged 40–60 years. Inclusion criteria included a diagnosis of stage 1 or 2 hypertension, willingness to participate, and no major chronic illnesses. Participants with a history of cardiovascular diseases, kidney disorders, or allergies to soya products were excluded.

3.3 Dietary Intervention

Participants were divided into two groups:

- **Intervention Group:** Consumed a soya-based diet, incorporating soya milk, tofu, soya flour-based chapatis, and other traditional meals modified to include soya protein.
- **Control Group:** Maintained their regular diet without any soya-based modifications.

Each participant in the intervention group consumed a minimum of 25 grams of soya protein daily. Weekly dietary adherence checks were conducted through food diaries and interviews.

3.4 Data Collection

Baseline and post-intervention data were collected, including:

- Blood Pressure Readings: Measured using a standard sphygmomanometer.
- Lipid Profile: Including HDL, LDL, and triglyceride levels.
- BMI and Body Weight: To assess weight management effects.
- Dietary Intake Logs: To ensure adherence.

3.5 Statistical Analysis

Data were analyzed using SPSS software. Paired t-tests and ANOVA were used to assess differences in blood pressure and lipid levels pre- and post-intervention. A p-value of <0.05 was considered statistically significant.

4. RESULTS

a) Demographic Profile of Participants

A total of 100 middle-aged women from Jhunjhunu, Rajasthan, participated in the study. The participants were divided into two groups:

- Intervention Group: 50 women who followed a soya-based diet for 12 weeks.
- Control Group: 50 women who continued their usual dietary habits without any change.

The demographic data of participants are as follows:

- Age Range: 40-60 years
- Average Age: 50.2 years
- Socioeconomic Status: A majority of participants (80%) belonged to lower-middle-income families, while the remaining 20% were from the middle-income group.
- Educational Level: 65% had received primary education, while 35% had no formal education.
- Health Status: All participants had a diagnosis of hypertension (systolic BP ≥ 140 mmHg or diastolic BP ≥ 90 mmHg) confirmed by medical records.

b) Baseline Blood Pressure Measurements

Before the intervention, baseline measurements of blood pressure were taken for both groups:

- Systolic Blood Pressure (SBP) Average for the Intervention Group: 145 mmHg
- Diastolic Blood Pressure (DBP) Average for the Intervention Group: 92 mmHg

- Systolic Blood Pressure (SBP) Average for the Control Group: 146 mmHg
- Diastolic Blood Pressure (DBP) Average for the Control Group: 93 mmHg

These baseline figures were similar across both groups, ensuring that the groups were comparable before the intervention.

c) Dietary Intervention

Participants in the intervention group were instructed to incorporate the following soya-based products into their daily diet:

- Soya Milk: 1 cup (approximately 200 ml) daily
- Soya Protein: 15-20 grams daily, either as soya-based snacks or meals
- Soya Tofu: 50 grams of tofu in salads or as part of main meals twice a week
- Soya Bean: 100 grams per week, in cooked form, added to dishes like curries or stews

The control group continued with their usual diet, which typically consisted of wheat-based meals, vegetables, and occasional meat products. Their diet did not include significant quantities of soy or other legumes.

d) Post-Intervention Blood Pressure Measurements

After 12 weeks, blood pressure measurements were taken again for both groups:

- Intervention Group:
 - Systolic Blood Pressure: 137 mmHg (Average decrease of 8 mmHg)
 - Diastolic Blood Pressure: 88 mmHg (Average decrease of 4 mmHg)
- Control Group:
 - Systolic Blood Pressure: 145 mmHg (No significant change)
 - Diastolic Blood Pressure: 92 mmHg (No significant change)

The intervention group showed a statistically significant reduction in both systolic and diastolic blood pressure compared to the control group ($p < 0.05$).

e) Cholesterol and Lipid Profile

Additionally, participants in the intervention group showed significant improvements in cholesterol levels:

- Total Cholesterol (Intervention Group): Decreased from 210 mg/dL to 190 mg/dL (Average decrease of 10%)
- LDL Cholesterol (Bad Cholesterol) (Intervention Group): Decreased from 130 mg/dL to 115 mg/dL (Average decrease of 12%)
- HDL Cholesterol (Good Cholesterol) (Intervention Group): Increased from 45 mg/dL to 50 mg/dL (Average increase of 11%)

In contrast, the control group did not experience significant changes in their cholesterol levels.

f) Body Mass Index (BMI) and Weight

BMI and weight were also measured:

- Intervention Group:
 - Average Weight Loss: 2.5 kg over 12 weeks
 - BMI: Decreased from 28.2 to 27.5 (Average decrease of 0.7)
- Control Group:
 - Average Weight Loss: None
 - BMI: No significant change

The weight loss in the intervention group can be attributed to the high-protein, low-calorie nature of the soya-based diet, which may have improved satiety and reduced overall calorie intake.

g) Adherence to the Soya-Based Diet

- High Adherence: 80% of the participants in the intervention group adhered to the prescribed soya-based diet regularly.
- Moderate Adherence: 15% of the participants occasionally incorporated soy-based products into their meals.
- Low Adherence: 5% of participants had difficulty incorporating soy products due to cultural preferences, lack of availability, or personal taste.

The high adherence rate suggests that soya-based diets are feasible for middle-aged women in rural areas, though challenges related to taste and availability still need addressing.

h) Overall Health Improvements

Apart from the improvements in blood pressure and cholesterol, the intervention group also reported:

- Improved Energy Levels: 70% of the participants reported feeling more energetic and less fatigued.

- Reduced Symptoms of Hypertension: 60% of the participants felt fewer symptoms like headaches and dizziness, which are commonly associated with high blood pressure.
- Better Sleep: 55% of participants reported improved sleep patterns after the intervention.

These qualitative improvements were reported through participant surveys and interviews conducted at the end of the study.

i) Statistical Analysis

Using a paired t-test, the changes in blood pressure and cholesterol levels were found to be statistically significant ($p < 0.05$), indicating that the soya-based diet had a positive effect on hypertension management. The control group showed no significant change in these measures, reinforcing the effectiveness of the dietary intervention.

5. DISCUSSION

Impact of Soya-Based Diet on Hypertension

The findings of this study provide compelling evidence for the beneficial effects of a soya-based diet in managing hypertension among middle-aged women in rural Rajasthan. The intervention group exhibited a significant reduction in both systolic and diastolic blood pressure (average decrease of 8 mmHg and 4 mmHg, respectively), while the control group showed no notable change. These results align with existing studies that have documented the antihypertensive effects of soy-based diets.

Numerous studies have supported the hypothesis that soy products can reduce blood pressure through various mechanisms. Soya contains bioactive peptides, isoflavones (like genistein), and essential amino acids, which are believed to exert a vasodilatory effect, enhance nitric oxide production, and improve endothelial function, thereby lowering blood pressure. In the case of middle-aged women, particularly those in rural areas who often face challenges in accessing sophisticated healthcare, diet-based interventions like soy consumption may offer a cost-effective and sustainable approach to managing hypertension without reliance on pharmaceuticals.

Furthermore, the observed reduction in both systolic and diastolic blood pressure is particularly significant, as this dual reduction is associated with a lower risk of cardiovascular events such as heart attacks and strokes. As hypertension is a leading risk factor for cardiovascular diseases in India, the results underscore the importance of addressing dietary habits as part of an integrated approach to preventing these health outcomes.

Improvements in Lipid Profile

In addition to reducing blood pressure, the soya-based diet in the intervention group also led to significant improvements in lipid profiles. A decrease in total cholesterol, low-density lipoprotein (LDL) cholesterol, and an increase in high-density lipoprotein (HDL) cholesterol

were noted, all of which are favorable changes for heart health. This outcome supports findings from other studies, such as those by Huang et al. (2021), which showed that soya consumption lowers LDL cholesterol levels and improves the ratio of total cholesterol to HDL cholesterol.

Soya proteins contain isoflavones, which have been shown to modulate lipid metabolism, leading to reduced cholesterol absorption and increased cholesterol excretion. Furthermore, soy products are rich in polyunsaturated fats, which replace unhealthy saturated fats in the diet, contributing to these improvements in lipid levels. Since high cholesterol levels, especially elevated LDL cholesterol, are known to exacerbate hypertension and increase the risk of atherosclerosis, this dual benefit of soy consumption (lowering both blood pressure and cholesterol) is particularly important in the prevention of cardiovascular diseases among middle-aged women.

Body Weight and BMI

The intervention group also experienced a modest weight loss (2.5 kg on average) and a slight reduction in Body Mass Index (BMI), which are additional health benefits of the soya-based diet. Although weight loss was not the primary objective of this study, it is noteworthy that the dietary shift toward soya-based foods contributed to a reduction in body fat. This outcome could be attributed to the high-protein content of soy, which has been shown to promote satiety, thereby reducing overall caloric intake.

Weight reduction is especially important for middle-aged women, as obesity is a major risk factor for the development and exacerbation of hypertension. Even a small reduction in body weight can have significant benefits for blood pressure control, as it decreases the strain on the heart and improves vascular function. Furthermore, soy's ability to promote weight loss can be beneficial in the long term for preventing the onset of other metabolic conditions, such as diabetes and metabolic syndrome, which often accompany hypertension in middle-aged populations.

Health Improvements and Quality of Life

A qualitative survey of the participants revealed improvements in energy levels, sleep quality, and a reduction in common hypertension symptoms, such as headaches and dizziness. These subjective reports are valuable, as they reflect the participants' perceived improvements in their overall health and quality of life. While these changes are not as quantifiable as blood pressure and cholesterol levels, they offer important insights into the broader benefits of dietary interventions.

One of the key strengths of this study is the emphasis on real-world outcomes. Hypertension often comes with debilitating symptoms that affect daily functioning, and the participants' reports of feeling more energetic and experiencing fewer symptoms of hypertension suggests that dietary modifications could lead to improved well-being, which is just as important as clinical measures of health.

Cultural and Socioeconomic Factors in Dietary Adherence

One of the major challenges in this study was ensuring adherence to the soya-based diet, especially in a rural setting where food habits are deeply entrenched in cultural practices. While 80% of participants in the intervention group adhered to the dietary plan, 5% had low adherence, primarily due to cultural preferences, the availability of soy products, and personal taste.

In rural Rajasthan, traditional diets are heavily centered around wheat, dairy, and vegetables, with little to no emphasis on soy or legumes like tofu and soya beans. The introduction of soya-based products, therefore, required a shift in participants' eating patterns, which could be difficult for some. Cultural resistance to new food items and lack of access to diverse sources of soy in rural markets may have limited full participation in the study. To address this challenge, future studies could explore ways to integrate soy into traditional Rajasthani meals, possibly by developing recipes that combine soy with locally familiar ingredients.

Another factor influencing adherence was socioeconomic status. While the soya-based diet was cost-effective, the availability of soy-based products in local markets and the affordability of fresh soybeans or soy milk could have been limiting factors for some participants, particularly those from lower-income households.

Limitations of the Study

While the results of this study are promising, several limitations should be noted:

- **Sample Size:** Although 100 participants were included, a larger sample size would provide more robust results and allow for subgroup analysis based on factors such as age, socioeconomic status, and severity of hypertension.
- **Duration of the Study:** The 12-week intervention period was relatively short. Longer-term studies would be beneficial to assess the sustained effects of a soya-based diet on hypertension and other health parameters.
- **Self-Reported Data:** Some of the health improvements, such as energy levels and sleep quality, were self-reported, which could be subject to bias. Objective measures of these outcomes would add greater validity to the findings.
- **Cultural Sensitivity:** The dietary intervention may need to be adapted further to accommodate regional food preferences and cooking practices, ensuring greater acceptance and adherence in rural populations.

Implications for Public Health

The findings of this study have significant implications for public health in rural India, where hypertension is a major health concern. The use of a soya-based diet as a dietary intervention offers an affordable, culturally adaptable strategy for managing hypertension without reliance on

expensive medications. Public health campaigns could focus on educating communities about the benefits of soy, promoting it as a heart-healthy alternative to more traditional diets high in salt and fat.

Moreover, healthcare providers could incorporate dietary counseling into their hypertension management programs, recommending soy-based foods as part of a comprehensive approach to controlling blood pressure. Future public health policies in Rajasthan and other similar regions could integrate soya-based diets into government-funded nutritional programs aimed at improving cardiovascular health.

2) 6. Conclusion

This study highlights the potential of a soya-based diet as an effective strategy for managing hypertension among middle-aged women in Jhunjhunu, Rajasthan. The significant reductions in blood pressure and improvements in lipid profiles suggest that dietary modifications can serve as a non-pharmacological intervention for hypertension management.

Further large-scale studies are recommended to explore the long-term benefits of soya-based diets in diverse populations. Healthcare policymakers should consider incorporating dietary interventions into hypertension management programs to promote cardiovascular health at the community level.

REFERENCES

1. Appel, Lawrence J., et al. "Effects of Dietary Patterns on Blood Pressure: Subgroup Analysis of a Randomized Trial." *Annals of Internal Medicine*, vol. 131, no. 6, 1999, pp. 439-446.
2. Chiang, Charles E., et al. "The Impact of Plant-Based Diets on Hypertension." *Journal of Human Hypertension*, vol. 27, no. 1, 2013, pp. 56-62.
3. Lichtenstein, Alice H., et al. "Soy Protein and Cardiovascular Disease: A Statement for Healthcare Professionals from the Nutrition Committee of the AHA." *Circulation*, vol. 113, no. 7, 2006, pp. 1034-1044.
4. Rivas, Mariana, et al. "Soy and Its Effects on Hypertension and Cardiovascular Disease." *American Journal of Clinical Nutrition*, vol. 79, no. 5, 2004, pp. 968-973.
5. Setchell, Kenneth D. R., et al. "Isoflavone Content of Soya Foods and Their Biological Effects on Human Health." *American Journal of Clinical Nutrition*, vol. 68, no. 6, 1998, pp. 1465S-1475S.