Original Article

# Efficacy of Garlic Pill Supplementation as Adjunctive Therapy for Managing Pre-hypertension in Working Professionals: An Experimental Study

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## ABSTRACT

**Introduction:** This study delves into the effectiveness of adjunctive therapy utilizing garlic pills (Allium Sativum) among hospital employees in the prehypertensive stage. It aims to address the heightened risk of prehypertension progressing to hypertension, cardiovascular diseases, and stroke. Moreover, this study aims to enhance public awareness regarding the potential use of garlic pills for blood pressure management, offering professional guidance and advocating for further exploration of adjunctive therapy.

**Methods:** Employing a pre-experimental one-group Pretest-Posttest design grounded in Von Bertalanffy's General System Theory, the research involves 100 prehypertensive hospital staff members aged 25 to 65, selected through convenience sampling. Over a period of six months, data collection includes baseline assessments and three months of daily intake of 500 mg garlic pills. Results: Significant mean differences in various clinical parameters are evident in the primary findings, affirming the efficacy of garlic pills in blood pressure regulation. Posttest scores are further examined in correlation with demographic variables such as gender, marital status, education level, and lifestyle characteristics. Overall, post-intervention data reveal promising results, with 47% of individuals with moderate hypertension and 52% of those with mild hypertension demonstrating positive outcomes.

**Conclusion:** Garlic pill adjunctive therapy emerges as a potentially effective approach for blood pressure reduction, with lifestyle modifications recommended as complementary measures for optimal prehypertension control.

**Keywords:** Garlic Pills, Prehypertension, Diet, Exercise, Blood Pressure, Adjuvant Therapy

## Introduction

Hypertension is emerging as a significant global public health challenge, with its prevalence projected to escalate, especially in urban centers[9,10,15]. Recognized as a pivotal and modifiable risk factor for cardiovascular disease, high blood pressure often remains asymptomatic until it precipitates a medical crisis, earning it the moniker of a "silent killer" disease[4]. Prehypertension, while not a distinct medical condition, heightens the risk of developing

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hypertension[20]. Hypertension is defined as a systolic BP of ≥ 140 mmHg and diastolic BP of ≥ 90 mmHg. The grey area falling between 120-39 mmHg systolic BP and 80-89 mmHg diastolic blood Pressure is defined as prehypertension[20]. According to the American Heart Association (2013), the Check, Change, Control program, designed to empower individuals in managing their cardiovascular health, represents a valuable initiative in hypertension control[15]. Prehypertension persists as a notable health concern worldwide, bridging the gap between normal blood pressure and clinical hypertension and substantially elevating the risk of heart diseases[15,20]. A study by the Indian Council of Medical Research (ICMR) stated that approximately 33.7% of adults aged from 18 to 54 suffering from prehypertension[24]. The prevalence varies between various districts ranging from 15.6 to 63.4% with higher rates observed in high income people sand among individuals who are overweight or obese . Patients with prehypertension (blood pressure ranging from 120-139 mm Hg systolic and 80-89 mm Hg diastolic) face a significantly heightened risk of cardiovascular morbidity and mortality compared to those with normal blood pressure (<120/80 mm Hg)[12].

India, in particular, grapples with hypertension as a pertinent risk factor for chronic diseases, with studies reporting a high prevalence across various regions[7,10]. Globally, approximately 26% of the population, totaling 972 million individuals, are affected by hypertension, a figure expected to rise to 29% by 2025[9]. Hypertension contributes to an estimated 7.5 million deaths annually, comprising 12.8% of all deaths worldwide (Global Health Observatory data, WHO). Notably, Africa exhibits the highest prevalence of hypertension across the WHO regions, surpassing 40% for both genders, while the lowest prevalence is observed in the Americas, with rates of 39% for men and 33% for women[9,10]. Prehypertension serves as an early indicator of impending sustained high blood pressure, escalating the risk of heart attacks, strokes, and other cardiovascular complications[20]. According to the WHO 2022 report as blood pressure readings range from 120/80 mm Hg to 139/89 mm Hg, prehypertension typically presents without symptoms, necessitating regular blood pressure monitoring for detection. Guidelines outlined in the 7th report from the Joint National Committee provide stratified recommendations for preventing, detecting, assessing, and managing blood pressure across adulthood, starting from age 18. These guidelines delineate thresholds for systolic and diastolic pressure indicative of hypertension, guiding preventive, and therapeutic interventions for optimal cardiovascular health throughout the adult lifespan[7].

| blood pressure Tier | Systolic blood pressure (Mm of Hg) | Diastolic blood pressure (Mm of Hg) |
|---|---|---|
| Normal | <120 | <80 |
| Prehypertension | 121-139 | 81-89 |
| Stage I-HT | 140-159 | 90-99 |
| Stage II-HT | ≥160 | ≥100 |

Hypertension prevalence in India ranges from 21% to 42% in urban areas and 13% to 18% in rural regions, with one in three Indian adults diagnosed with high blood pressure, as per WHO Health Statistics 2018[22]. By 2023, India's hypertension prevalence is projected to reach 159.46 per 1000 population, contributing significantly to the disease burden. Hypertension-related deaths in India surged from 0.78 million in 1990 to 1.63 million in 2016, with Disability Adjusted Life Years (DALYs) increasing from 21 million to 39 million during the same period[8]. In Kerala, rapid epidemiological transition has led to a notable prevalence of non-communicable diseases (NCDs) like hypertension and diabetes mellitus[16]. Despite effective NCD control programs, hypertension affects .4% of women and 38.6% of men in Kerala. Risk factors associated with hypertension in Kerala include age, gender, central obesity, smoking, sedentary lifestyle, and high salt intake[5].

The high prevalence of prehypertension is concerning, with only one-third of diagnosed cases under control. Non-communicable disease control programs need to prioritize prehypertension management through health education, lifestyle modifications, and regular blood pressure monitoring to prevent the progression of hypertension[6]. Garlic (Allium Sativum) has gained attention for its antibacterial and antioxidant properties, particularly

allicin's role in lowering blood pressure[18]. Recent studies have documented garlic's efficacy in hypertension treatment, highlighting its potential in combination therapies with adequate allicin doses. Therefore, healthcare providers should focus on optimizing blood pressure control through comprehensive treatment strategies rather than solely relying on medications[17]. Prehypertension is frequently disregarded since it usually shows no symptoms, yet it raises the chance of developing into hypertension and its associated problems, including heart disease, stroke, and renal failure. Although a lot of study has been done on hypertension, little is known about its early phases, particularly in certain areas or groups where local data is limited. Prehypertensive status is still unknown to many people, and less is known about lifestyle determinants, awareness levels, and how well preventive measures work in these groups. Looking out the prevalence of prehypertension, rise in public awareness, and offering evidence-based recommendations for early therapies that can lessen the strain on healthcare systems and long-term health consequences are all made possible by this study.

## Materials and Methods

The research methodology involved six months of data collection at Chitra Multispecialty Hospital and Lifeline Multispecialty Hospital in Pathanamthitta District, Kerala, after obtaining formal written permission from the respective medical superintendents. The study was introduced to the hospital employees, and informed consent was individually obtained from prehypertensive individuals. Screening for prehypertensive individuals involved checking blood pressure levels over 10 days, with a minimum of three readings considered. Data collection occurred on all days of the week during daytime hours. Convenience sampling was used to select participants, and a pre-experimental one-group pretest-posttest design was employed.The total sample size was limited to 100 since the sample size is focused on hospital employees and which is ease in knowing about the health status of the patient. Participants with blood pressure levels ranging from 121-139 mm Hg (systolic) to 81-89 mm Hg (diastolic) were classified as prehypertensive. Screening of hospital employees to identify the prehypertensive employees by checking the blood pressure level with in a duration of 10 days and a minimum of 3 readings are considered. All the enrolled participants underwent baseline screening for relevant comorbidities. Researchers obtained medical histories through structured interviews and review of medical records, and measured key vital signs, including blood pressure. These data were used to determine eligibility based on predefined inclusion and exclusion criteria, as well as to adjust analyses for relevant covariates. A priori power analysis was conducted to ensure adequate statistical power to detect meaningful effects, thereby enhancing the validity and interpretability of the findings. The classic two-sample means formula was applied for sample size estimation.

$$t = (\bar{x}_1 - \bar{x}_2) / SE = (\bar{x}_1 - \bar{x}_2)$$

### Inclusion Criteria

- Hospital Employees who were available during the time of data collection.
- Hospital employees who are willing to participate in the study.
- Hospital Employees those who were age above 25 yrs and below 65 yrs.
- A hospital employee whose blood pressure level was between 121-139 mm Hg of (Systolic BP) to 81-89 mm Hg of (diastolic BP).
- Hospital Employees who were regularly working in the setting.
- Hospital Employees who were able to read and write English and Malayalam.

### Exclusion Criteria:

- Prehypertensive hospital employees who refused to participate in this study.
- Hospital Employees with complications like Hormonal disorder and seriously having Gastric trouble towards Garlic.
- Employees who were pregnant and lactating mothers.

The total sample size was limited to 100 since the sample size is focused on hospital employees and which is ease in knowing about the health status of the patient.

Participants with blood pressure levels ranging from 121-139 mm Hg (systolic) to 81-89 mm Hg (diastolic) were classified as prehypertensive. Screening of hospital employees to identify the prehypertensive employees by checking the blood pressure level with in a duration of 10 days and a minimum of 3 readings are considered. They were instructed to take garlic pills with water every morning before breakfast for three months. Recent research has highlighted the potential cardiovascular benefits of garlic supplementation. Varshney and Budoff (2016) conducted a PubMed-based literature review to evaluate its effects on hypertension, hypercholesterolemia, C-reactive protein (CRP), pulse wave velocity (PWV), and coronary artery calcium (CAC). The search included all human studies indexed with Medical Subject Headings (MeSH) up to May 30, 2013, as well as relevant review papers and original research. Only randomized, controlled, double-blind trials and meta-analyses of such trials were considered eligible. The review identified four meta-analyses and two original trials, which collectively demonstrated that garlic supplementation reduced systolic blood pressure by 7–16 mmHg and diastolic blood pressure by 5–9 mmHg. The authors concluded that garlic supplementation may protect the cardiovascular system by lowering risk factors such as total cholesterol and hypertension, while also improving surrogate markers of atherosclerosis[23].

At the conclusion of the intervention, a Cholesterol Analyzer Test (CAT) was performed to assess clinical parameters, which yielded statistically significant results. Data collection was carried out throughout the intervention period, and post-intervention blood pressure levels were evaluated using standardized clinical measures.Ethical approval was obtained from the institutional human ethics committee (project no. CCON 11/002/2018, 23/10/2018).

## Statistical analysis

Statistical analysis was performed using Statistical Package for Social Science (SPSS)/PC, Version 20. The data analysis plan comprised descriptive analysis, where frequency and percentage distributions were computed to examine demographic variables. Mean and standard deviation calculations were employed to analyze the pre- and post-test levels of mental health characteristics. Significance levels were set at $p < .001$ for high significance and $p < 0.01$ for significance. Inferential statistics utilized a paired t-test to compare pre- and post-levels of prehypertension. An unpaired t-test was applied to evaluate prehypertension levels between the control and intervention groups. Additionally, a post-hoc Scheffe test was conducted for multiple comparisons of clinical variables in the intervention group post-test, with statistical significance set at $p < 0.01$.

## Results

**Sample characteristics.**

**Table 1: Frequency and percentage distribution of sample characteristics N = 100**

| Sample characteristics | Frequency | Percentage |
|---|---|---|
| Age Group (Years) | | |
| a) 25–35 | 34 | 34 |
| b) 36–45 | 46 | 46 |
| c) 46–55 | 7 | 7 |
| d) 56–65 | 3 | 3 |
| Gender | | |
| a) Male | 67 | 67 |
| b) Female | 33 | 33 |
| Marital status | | |
| a) Married | 65 | 65 |
| b) Unmarried | 14 | 14 |
| c) Widow/widower | 18 | 18 |
| d) Separated | 3 | 3 |
| Religion | | |
| a) Hinduism | 48 | 48 |
| b) Muslim | 34 | 34 |
| c) Christian | 18 | 18 |
| Type of family | | |
| a) Nuclear family | 35 | 35 |
| b) Joint family | 60 | 60 |
| c) Extended family | 05 | 05 |
| Educational background | | |
| a) Up to primary | 07 | 07 |
| b) Up to secondary | 22 | 22 |
| c) Class 12 | 36 | 36 |
| d) Collegiate and above | 35 | 35 |

Table 1 illustrates the demographic composition of participants. Within the age group, 46% fall between 45-65 years old, while 67% are female. Additionally, 48% of clients identify as Hindu, with the majority (65%) being married. A significant portion (60%) of participants come from joint family, while 36% have attained education up to the higher secondary level.

## Effectiveness garlic pills as adjuvant therapy

**Table 2: Effectiveness of garlic pills supplementation as adjuvant therapy on pre hypertensive working professionals**

| Clinical Profiles | Pre-test | | Post-test | | t-value | p-value |
|---|---|---|---|---|---|---|
| | Mean | SD | Mean | SD | | |
| Systolic Pressure | 128.90 | 0.5 | 115.21 | 0.4 | 22.96 | <0.05 |
| Diastolic Pressure | 84.98 | 0.2 | 74.02 | 0.4 | 26.62 | <0.05 |
| Pulse Pressure | 43.94 | 0.4 | 41.20 | 0.4 | 5.21 | <0.05 |
| Neck Circumference | 48.91 | 0.7 | 45.32 | 0.6 | 4.00 | <0.05 |
| Waist Circumference | 97.54 | 1.4 | 90.78 | 1.2 | 3.64 | <0.05 |
| **Lipid Profile** | | | | | | |
| HDL | 31.44 | 0.6 | 48.29 | 0.6 | 19.58 | <0.05 |
| LDL | 153.60 | 1.6 | 133.11 | 1.3 | 10.11 | <0.05 |
| VLDL | 46.49 | 1.2 | 28.85 | 0.5 | 13.78 | <0.05 |
| Triglycerides | 187.16 | 15.8 | 147.93 | 1.6 | 2.46 | <0.05 |

Table 2 displays the pre-test and post-test mean values of clinical parameters related to blood pressure among prehypertensive hospital employees. The table reveals a decrease in mean values across all clinical profiles following the administration of garlic pills. Specifically, there is a mean reduction in systolic blood pressure by 14 units, diastolic pressure by 10.96 units, pulse pressure by 2.74 units, neck circumference by 3.59 units, waist circumference by 6.76 units, LDL by 20.49 units, VLDL by 17.64 units, and triglycerides by 39.23 units, with an overall mean difference increasing by 16.85 units. Statistical analysis demonstrates significant differences at a confidence level of $p < 0.05$. These findings suggest that the use of garlic pills resulted in a noteworthy decrease in clinical parameters, confirming the research hypothesis.

## Association

**Table 3: Association between level of blood pressure and gender N = 100**

| Gender | Systolic blood pressure | | | Chi-Square | df | p-value |
|---|---|---|---|---|---|---|
| | ≤ 125 mm of hg | 126-130 mm of hg | >130 Mm of hg | | | |
| Male | 12 | 11 | 34 | 8.92 | 2 | .012 |
| Female | 13 | 17 | 13 | | | |

| Gender | Diastolic blood pressure | | Chi-Square | df | p-value |
|---|---|---|---|---|---|
| | ≤ 85mm/hg | > 85 mm/hg | | | |
| Male | 28 | 29 | 5.35 | 1 | .017 |
| Female | 31 | 12 | | | |

Table 3 illustrates the pretest data on gender and systolic blood pressure among prehypertensive hospital employees. Among the samples, 25 (25%) had systolic blood pressure ≤ 125 mmHg, 28 (28%) had systolic blood pressure ranging from 126-130 mmHg, and 47 (47%) had systolic blood pressure > 130 mmHg. The calculated Chi-Square value of 8.92 is significant at $p < .012$, indicating a notable correlation between gender and systolic blood pressure. Additionally, the pretest data on gender and diastolic blood pressure reveal that 59 (59%) samples had diastolic blood pressure ≤ 85 mmHg, while 41 (41%) had diastolic blood pressure > 85 mmHg. The obtained Chi-Square value of 5.35 is significant at $p < .017$, suggesting a substantial association between gender and diastolic blood pressure among prehypertensive hospital employees.

## Discussion

Hypertension is emerging as a critical public health issue in India, with a steady increase observed over recent decades[9,10]. Prehypertension often precedes hypertension in the current landscape, with hypertension contributing to 57% of stroke deaths and 26% of deaths due to coronary artery disease in India[4]. Projections indicate a rise in prehypertension prevalence among adults, with a subsequent increase in clinical hypertension over the next two decades, particularly affecting individuals aged 40 to 65, primarily in developing countries[13]. Clinical parameters such as systolic and diastolic blood pressure, pulse pressure, waist circumference, neck circumference, and lipid profiles including HDL, LDL, VLDL, and triglycerides were assessed through blood tests and sphygmomanometer readings[10].

Results revealed that among the prehypertensive samples, 52% exhibited mild hypertension and 47% moderate hypertension[19]. Systolic pressure was elevated in 28%, while diastolic pressure was elevated in 41%. Notably, the study observed significant reductions in clinical parameters above normal levels post-garlic pill administration, including systolic and diastolic blood pressure, neck and waist circumference, LDL, VLDL, and triglyceride levels[21]. Further analysis showed a significant relationship in post-test between demographic variables such as gender, marital status, education, type of work, working hours per day, height, weight, BMI, dietary patterns, salt intake, lifestyle practices, exercise, and leisure time activity among prehypertensive hospital employees, confirming the study hypothesis[3]. This finding aligns with prior research indicating a link between lifestyle factors and hypertension risk, as demonstrated by Sunil Kumar Jena and Kanhu Charan Purohit in a case-control study among MBBS male students[2].Their study revealed elevated blood pressure among smokers compared to nonsmokers, emphasizing the impact of smoking on hypertension risk[2,9,10].

In summary, study found that in the post-test analysis, 52% of the samples had mild hypertension and 47% had moderate hypertension. Significant reductions were observed in systolic blood pressure (13.69 mmHg), diastolic pressure (10.96 mmHg), pulse pressure (2.74 mmHg), neck circumference (3.59 cm), waist circumference (6.76 cm), LDL (20.49 mg/dl), VLDL (17.64 mg/dl), and triglycerides (39.23 mg/dl). The overall mean difference increased by 16.85 units, with a statistically significant difference ($P < 0.05$) (Tan & Thakur, 2024). Moreover, the study revealed a correlation between post-test scores and various demographic and lifestyle variables, including gender, marital status, education, occupation, working hours, height, weight, BMI, dietary habits, salt intake, lifestyle practices, exercise, and leisure time activity. Participants reported feeling more relaxed and satisfied after the administration of garlic pills, often sharing their positive experiences with family

and others and recommending similar interventions[1]. These findings highlight the importance of addressing prehypertension as a precursor to hypertension and highlight the potential benefits of interventions such as garlic pill supplementation in managing hypertension risk factors[14].

## Conclusion

The daily intake of 500 mg of garlic pills proved effective in reducing clinical profiles related to blood pressure among prehypertensive hospital employees. This intervention holds promise for decreasing the morbidity and mortality rates associated with high blood pressure, contributing to a healthier lifestyle for employees. The limitations of the study are it is limited to a sample size of 100 and moreover the study is limited to the subjects with prehypertension who are working in the selected hospital setting. The future research can be a baseline for the future studies to motivate the investigators to conduct further studies in a larger setting. The study can be also formulating new methods to maintain the blood pressure.

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