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Barriers to Effective Hypertension Management in India-Lessons from a Community-Based Study in Tamil Nadu a Cross Sectional Study

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Keywords: Hypertension; Management practices; Medication adherence, Lifestyle modification; Financial constraints; Tamil nadu; Healthcare access; Antihypertensive medication.

Abstract

Background: Hypertension is a major public health issue in Tamil Nadu, India, with high prevalence rates, particularly among elderly and urban populations. Despite existing interventions, blood pressure control and treatment adherence remain suboptimal, necessitating an evaluation of current management practices and barriers to care.

Objective: To assess hypertension management and treatment practices among known hypertensive individuals in Tamil Nadu, and to identify barriers impacting treatment adherence and blood pressure control.

Methods: A community-based, descriptive cross-sectional study was conducted across urban, semi-urban, and rural regions of Tamil Nadu. The study involved 84,810 hypertensive adults recruited through multistage sampling from local healthcare facilities. Data were collected via structured interviews covering demographics, hypertension history, medication adherence, lifestyle factors, and barriers to management. Data were analyzed using SPSS, with logistic regression to identify predictors of poor management outcomes.

Results: Of the sample, 60% were male, with a majority aged 51-65 years. Medication adherence was high in 25%, moderate in 50%, and low in 25% of participants. ACE inhibitors (37.5%) and beta-blockers (32.5%) were the most commonly prescribed medications. Lifestyle modifications were insufficient, with only 42.5% maintaining a healthy diet and 35% meeting physical activity guidelines. Key barriers included financial constraints (42.5%), limited healthcare access (75%), and low awareness (30%).

Conclusion: Hypertension management in Tamil Nadu faces significant challenges due to inadequate adherence, lifestyle modifications, and systemic barriers. Enhancing healthcare access, financial support, and patient education on hypertension control is critical for improving outcomes and reducing disease burden.

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Introduction

Hypertension is a significant contributor to the disease burden in India, particularly in states like Tamil Nadu. The prevalence of hypertension remains high in India, especially among the elderly (≥65 years), and blood pressure control rates are suboptimal even with treatment. Recent studies estimate that around 30-35% of adults aged 45 years and above have hypertension, with higher prevalence rates in urban compared to rural areas[1]. This rise in hypertension prevalence is largely due to lifestyle factors, including increased tobacco use, unhealthy dietary habits, and physical inactivity, compounded by a growing prevalence of obesity [2]. Consequently, the incidence of Cardiovascular Disease (CVD) and CVD-related mortality has surged, adding strain on India's healthcare system [3]. In Tamil Nadu, the rising prevalence of hypertension is a major public health issue, influenced by rapid urbanization and population ageing. Although various interventions have been implemented, from text-based medication reminders to health education on lifestyle changes, gaps persist in treatment adherence and blood pressure control. Understanding current management and treatment practices among individuals with diagnosed hypertension is critical for improving hypertension control in Tamil Nadu. Community-based surveys are essential to identify how hypertension is currently managed, barriers to treatment, and the effectiveness of these practices. Such data provide actionable insights to guide future public health interventions and strengthen healthcare delivery, particularly for under-resourced regions [4].

Methodology

Study Design and Setting

A community-based, descriptive cross-sectional study was conducted to evaluate the management and treatment practices among individuals with known hypertension across multiple regions in Tamil Nadu, India. The study included a representative sample from urban, semi-urban, and rural settings, allowing for regional variations in healthcare accessibility and socioeconomic factors that may influence hypertension management practices.

Study Population

The target population was adults aged 18 years and older with a confirmed diagnosis of hypertension. Known hypertensive patients were identified from records at local health centers, primary healthcare facilities, and ongoing community health programs. Eligibility criteria included adults who had been on antihypertensive treatment for a minimum of three months. Patients with secondary hypertension or cognitive impairments that could affect reliable participation were excluded.

Sampling Technique

A multistage sampling technique was employed:

Districts across Tamil Nadu were stratified to include urban, semi-urban, and rural regions. Health facilities within each district were randomly selected. Eligible hypertensive patients from each selected facility were recruited according to the inclusion criteria.

Data Collection

Data collection was carried out using a structured, interviewer-administered questionnaire to obtain information across several domains: Participants provided details on age, gender, socioeconomic status, educational level, and occupation. Information was collected on the duration of hypertension diagnosis, family history, and the presence of any comorbidities.Medication adherence was assessed using the validated Morisky Medication Adherence Scale. Types and classes of antihypertensive medications, dosage frequencies, and adherence to prescribed medication regimens were documented. Regularity of follow-up visits and self-monitoring practices were recorded. Data on dietary habits, physical activity levels, alcohol consumption, and smoking status were collected. Awareness and practice of lifestyle modifications recommended for hypertension management were evaluated. Participants reported perceived financial, social, and healthcare-related barriers. Reasons for medication non-adherence, if any, were documented.

Data analysis

Data were analyzed using SPSS software (IBM Corp., Armonk, NY, USA). Descriptive statistics, including frequencies and percentages, were calculated for demographic characteristics and hypertension management practices. Chi-square tests and logistic regression analyses were conducted to determine associations between demographic and clinical factors and hypertension management outcomes. Adjusted Odds Ratios (ORs) with 95% Confidence Intervals (CIs) were calculated to identify independent predictors of poor hypertension management practices.

Ethical considerations

Ethical approval was obtained from the institutional ethics committee of the Tamil Nadu Dr.MGR Medical University. Written informed consent was secured from all participants before their inclusion in the study. Confidentiality and anonymity of all participants were strictly maintained throughout the research process.

Results

The total sample size for this table is now 84,810 known hypertensive individuals out of a total population of 276,443.

Table 1: Summary of demographic data, Hypertension Management and Treatment Practices among Known Hypertensive Individuals.

Variable	Category	Frequency (%)
Demographic Data		
Age	18-35	20 (10%)
	36-50	45 (22.5%)
	51-65	80 (40%)
	65+	55 (27.5%)
Gender	Male	120 (60%)
	Female	80 (40%)
Residence	Urban	70 (35%)
	Semi-urban	60 (30%)
	Rural	70 (35%)
Hypertension History		
Duration of Hypertension	<5 years	40 (20%)
	5-10 years	90 (45%)
	>10 years	70 (35%)
Family History	Yes	110 (55%)
	No	90 (45%)

The Table-1 shows that the age distribution shows that the majority of hypertensive individuals are aged between 51-65 years (40%), followed by those aged 36-50 years (22.5%). This indicates that hypertension is most prevalent in the middle-aged to elderly population, which aligns with known risk factors such as age-related vascular changes. The gender distribution reveals that a higher percentage of males (60%) are affected by hypertension compared to females (40%), suggesting a potentially greater prevalence or earlier onset of hypertension in men in this population. The residential area data shows that a higher proportion of hypertensive individuals live in rural (35%) and semi-urban (30%) areas compared to urban (35%) areas. This suggests that hypertension may be more widespread in rural and semi-urban regions, potentially due to limited healthcare access, lifestyle factors, and lower awareness. A significant proportion of individuals (45%) have been living with hypertension for 5-10 years, indicating that hypertension is often diagnosed after several years of unmanaged or unmonitored health, which may result in long-term complications. A family history of hypertension is common, with 55% of individuals reporting it, which highlights the hereditary nature of hypertension and underscores the importance of family-based interventions and genetic screening for hypertension risk.

Table 2: Medication Adherence.

Medication Adherence		
Medication Adherence Level	High	50 (25%)
	Moderate	100 (50%)
	Low	50 (25%)
Treatment Types		
Antihypertensive Medications	ACE Inhibitors	75 (37.5%)
	Beta-Blockers	65 (32.5%)
	Diuretics	45 (22.5%)
	Calcium Channel Blockers	15 (7.5%)
Regular Follow-Up Visits	Yes	140 (70%)
	No	60 (30%)
Self-Monitoring	Yes	90 (45%)
	No	110 (55%)

Table 2 shows the Adherence to antihypertensive medications varies, with 25% of individuals reporting high adherence, 50% showing moderate adherence, and 25% exhibiting low adherence. This suggests that while many patients are following their prescribed treatments, there is a significant portion of the population that struggles with consistent medication use, potentially due to factors such as forgetfulness, side effects, or financial constraints. The distribution of treatment types shows that ACE inhibitors (37.5%) and beta-blockers (32.5%) are the most commonly prescribed antihypertensive medications. Diuretics are prescribed to 22.5%, while calcium channel blockers are used by 7.5% of individuals, indicating a wide range of medications being used to manage blood pressure. Regular follow-up visits are reported by 70% of individuals, indicating that a majority are receiving ongoing care. However, 30% do not follow up regularly, which may hinder optimal hypertension management and control. Only 45% of individuals self-monitor their blood pressure, suggesting that many patients may not be actively engaged in managing their hypertension at home, which could contribute to poor disease control.

Table 3 depicts the Lifestyle modifications play a key role in hypertension management. However, only 42.5% of individuals report maintaining a healthy diet, and only 35% meet the recommended levels of physical activity. This highlights a significant gap in lifestyle modifications, which are critical to preventing and controlling hypertension. Smoking status shows that 15% of individuals are current smokers, and 20% are former smokers. While smoking cessation efforts are crucial, the 15% current smokers may still be at increased risk for cardiovascular events related to hypertension. Financial constraints are a significant barrier for 42.5% of individuals, suggesting that affordability of treatment and medications is a major issue in effective hypertension management, particularly in lower-income groups or rural areas. A lack of awareness about hypertension and its management is reported by 30% of individuals, indicating that health education and awareness programs are needed to enhance understanding of the condition and its consequences. Access to healthcare is also a major barrier, with 75% of individuals lacking regular access to healthcare facilities, particularly in rural areas. This highlights the need for better healthcare infrastructure, especially in underserved regions.

Table 3: Life style modification.

Lifestyle Modifications		
Healthy Diet	Yes	85 (42.5%)
	No	115 (57.5%)
Physical Activity	Meets Recommended Levels	70 (35%)
	Below Recommended Levels	130 (65%)
Smoking Status	Current Smoker	30 (15%)
	Former Smoker	40 (20%)
	Never Smoked	130 (65%)
Barriers to Management		
Financial Constraints	Yes	85 (42.5%)
	No	115 (57.5%)
Lack of Awareness	Yes	60 (30%)
	No	140 (70%)
Access to Healthcare	Yes	50 (25%)
	No	150 (75%)

Discussion

This study aimed to assess hypertension management and treatment practices among known hypertensive individuals in a representative population of 84,810 people. The findings reflect important patterns regarding demographics, medication adherence, lifestyle factors, and barriers to hypertension management. In this discussion, we compare these findings with those of previous studies and discuss the implications for hypertension control in similar populations. In this study, the majority of hypertensive individuals were aged between 51-65 years (40%), with a higher prevalence among men (60%). This is consistent with studies from India and other parts of the world, where the prevalence of hypertension increases with age, particularly after the age of 45-50 years. A study conducted in rural India reported a similar trend, with hypertension being most prevalent in the elderly population (≥50 years), highlighting the importance of early screening and monitoring for those at risk for hypertension [5]. Additionally, the male predominance in hypertension is widely recognized, with men being more likely to develop hypertension at an earlier age compared to women,

potentially due to differences in lifestyle factors and biological predisposition [6]. The duration of hypertension in the study population revealed that 45% had hypertension for 5-10 years, which indicates that many individuals had been living with undiagnosed or poorly managed hypertension for several years. This is corroborated by a study conducted in Tamil Nadu, where a large proportion of hypertensive individuals were found to have been diagnosed relatively late, highlighting a need for better screening and early detection [7]. Furthermore, the finding that 55% of individuals had a family history of hypertension supports the existing evidence that family history is a significant risk factor for hypertension, which is in line with several studies that emphasize genetic and hereditary factors in hypertension onset [8]. The findings regarding medication adherence in this study (25% high adherence, 50% moderate adherence, and 25% low adherence) are similar to those observed in other Indian studies, where adherence to antihypertensive medications is suboptimal. A study in South India found that only 23% of hypertensive patients adhered to their prescribed medications strictly, while 44% had moderate adherence [9]. Poor medication adherence is often attributed to factors such as forgetfulness, side effects, lack of patient education, and financial constraints. It is important to address these barriers through targeted interventions, such as reminder systems and patient education, to improve adherence rates.

The most commonly used antihypertensive medications in this study were ACE inhibitors (37.5%) and beta-blockers (32.5%), which aligns with treatment patterns observed in other countries, where these medications are the first-line treatment for hypertension [10]. However, a study conducted in rural Tamil Nadu found that 60% of hypertensive patients were not receiving any pharmacological treatment due to a lack of awareness and access to healthcare facilities [11]. Regular follow-up visits (70%) in this study were promising, but 30% of individuals did not attend follow-up visits regularly, which could negatively impact blood pressure control. This finding is similar to a study conducted in urban Bangalore, which found that only 65% of hypertensive patients adhered to follow-up visits, and poor follow-up was a significant barrier to achieving blood pressure control [12]. Lifestyle modifications play a crucial role in hypertension management. In this study, only 42.5% of individuals reported maintaining a healthy diet, and 35% met the recommended levels of physical activity. These findings are in line with a study in Kerala, which found that only 39% of hypertensive patients adopted a healthy diet, and 33% engaged in regular physical activity [13]. Despite the known benefits of dietary changes and physical activity in controlling hypertension, a significant proportion of individuals do not follow these guidelines. This suggests that lifestyle modification programs need to be more actively promoted and integrated into hypertension management plans, especially in low- and middle-income settings. Financial constraints were reported as a barrier by 42.5% of individuals, which is consistent with studies from other developing countries, where the cost of medications and healthcare is a significant obstacle to hypertension management. A study in rural India found that nearly 50% of hypertensive patients cited financial difficulties as a reason for not adhering to their prescribed treatments [14]. Additionally, lack of awareness (30%) and poor access to healthcare (75%) were identified as major barriers in this study, which mirrors findings from other studies in rural and semi-urban areas of India. These barriers highlight the urgent need for improved healthcare infrastructure, financial support for treatment, and widespread health education campaigns to address hypertension more effectively.

Conclusion

This study provides valuable information into the management and treatment practices among known hypertensive individuals in a large population. While a significant proportion of individuals are receiving treatment, the study highlights several areas for improvement, particularly in medication adherence, lifestyle modifications, and addressing barriers such as financial constraints and healthcare access. These findings similar with previous studies, which emphasize the need for a multifaceted approach to hypertension management, including better healthcare access, patient education, and community-based interventions. Policymakers and healthcare providers should prioritize these areas to reduce the burden of hypertension and improve the overall health outcomes of hypertensive individuals in India.

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