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Awareness, Treatment, and Control (ATC) of Hypertension among Adults in South India: Evidence from National Family Health Survey (NFHS-5), 2019-21

by

Dr. Priyanka Shivsamb Chanale

PG/21/076

Under the guidance of

Dr. Pijush Kanti Khan

Post-Graduate Diploma in Management (Hospital and Health)

2021-2023

IIHMR DELHI

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Evidence from National Family Health Survey (NFHS), 2019-21

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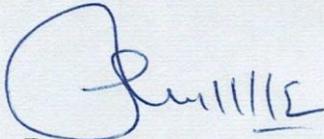
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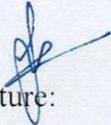
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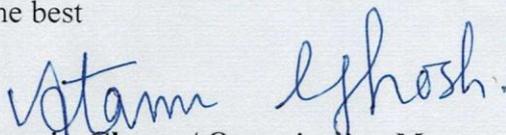
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TABLE OF CONTENTS

LIST OF GRAPHS

LIST OF TABLES

Abstract:

In a nation the size of India, knowledge of the stages of the hypertension care process at which people lose access to care, as well as how this changes among states and demographic groups, is crucial for developing targeted medications and tracking outcomes. To our knowledge, no study has yet been done that examines the proportion of adults in South India who finish every stage of the hypertension management procedure on a nationwide scale. The purpose of this study was to ascertain (i) the proportion of hypertensive patients who have had screening, are aware of their diagnosis, are taking antihypertensive medication, and have achieved control, and (ii) the variation in these care characteristics between states and sociodemographic groups.

Between 2019 and 2021, a nationally representative household survey of people in India's Southern States who are between the ages of 15 and 49 was conducted. For those who had hypertension at the time of the survey, the stages of care were (i) ever having had their blood pressure (BP) measured before the survey ("screened"), (ii) being diagnosed ("aware"), (iii) taking BP-lowering medication at the time of the survey ("treated"), and (iv) reporting receiving treatment and not having a raised BP ("controlled"). Based on state, domicile type (rural vs. urban), age, BMI, smoking behaviours, family wealth quintile, education, and marital status, we divided these stages into groups.

Hypertension prevalence ranged from 29.4 to 30.1. 35.5% (CI 34.8% to 36.1%) of those with hypertension had received therapy, 18.7% (CI 18.2% to 19.1%) had their condition under control, and 46.4% (CI 45.5% to 47.2%) had ever had their blood pressure taken. Male sex, living in a distant place, having less money in the household, and not being married at every stage of the care process were all associated with greater losses. The main shortcoming of this study is that its conclusions cannot be generalised to those over the age of 50, which is a group where hypertension is most common.

Although hypertension is very common in worldwide, very few people with the condition are aware of their diagnosis, receive treatment, and successfully manage it. Even after taking into consideration economic progress, there are significant differences between states in the efficiency of the health systems in managing hypertension. It is necessary to increase access

to hypertension diagnosis and treatment, particularly for men, rural residents, and those with lower household incomes.

Introduction

India is developing and most populous country in the world. With rapid urbanization, people are prone to have non-communicable diseases, encompassing acquired and non-acquired risk factors, such as changing lifestyle, consumption of tobacco, changing age-sex structure, and type of residence. Hypertension is the largest contributor to premature deaths and diseases in India and can be avoidable with early detection and medication. It is one of the leading risk factors for CVDs which accounts for 23% of deaths and 32% of adult deaths in 2010-2013. India's Sustainable Development Goal (SGDs) is to reduce one-third of its premature mortality due to NCDs by 2030. Early detection and control can reduce the burden of disease and can be the key to a better quality of life.

As per the NFHS 5 report it shows that hypertension in southern India prevalence of hypertension rural and urban south India is 21.1% and 31.8% respectively. The chronic medical disease known as hypertension, or high blood pressure, is characterised by raised blood pressure readings. It poses a serious threat to public health everywhere, particularly in Southern India. Heart attacks, strokes, and renal disease are among cardiovascular disorders that are greatly influenced by hypertension. To lessen the burden of these related health problems, hypertension must be effectively recognised, treated, and controlled. Area in southern India recognised for its varied people and rich cultural heritage. The prevalence of hypertension in this area has, however, alarmingly increased due to rapid urbanisation, sedentary lifestyles, and dietary changes. The increase in the prevalence of hypertension has been attributed to the transition to a more Westernised lifestyle, which is characterised by a high intake of processed foods, sedentary employment, and less physical activity.

Even if some states perform noticeably better than others and may therefore provide helpful policy lessons, the majority of hypertensive people in India between the ages of 15 and 49 do not successfully proceed through the various stages of the treatment cascade. These demographic groups may be the focus of efforts to enhance hypertension management because they were more likely to lose patients at each stage of the cascade of care. Men,

those who live in rural areas, and those with poor family incomes are some of these categories.

An all-encompassing strategy comprising awareness, treatment, and control is necessary to address the problems caused by hypertension. It is essential to raise public knowledge of the dangers and effects of hypertension so that people may take the appropriate precautions and seek treatment when they need it. Information regarding hypertension, its causes, symptoms, and preventive strategies can be widely disseminated through educational programmes and community-based projects.

In addition, ensuring access to high-quality medical care is crucial for the efficient management and treatment of hypertension. Having access to medical facilities, knowledgeable medical staff, and reasonably priced medicine are important aspects of managing hypertension. It is crucial to address these inequalities and offer equitable access to healthcare services in Southern India, where the healthcare infrastructure is diverse and resources may be scarce in some locations.

Additionally, altering one's way of life is quite important for treating hypertension. Important tactics for controlling blood pressure levels include encouraging regular physical exercise, promoting a healthy diet rich in fruits, vegetables, and whole grains, and avoiding cigarette and alcohol use. Individuals can adopt healthier lives with the aid of community-based interventions, such as the creation of wellness programmes, support groups, and alliances with neighbourhood organisations.

In this context, this essay will explore the various aspects related to the awareness, treatment, and control of hypertension in Southern India. By understanding the challenges specific to this region and proposing suitable strategies, we can contribute to the development of effective public health interventions that address the burden of hypertension and improve the overall well-being of the population.

Literature Review:

India is the world's most populated and developing nation. People are more likely to develop non-communicable illnesses as a result of acquired and non-acquired risk factors such as changing lifestyles, cigarette use, shifting age-sex demographics, and type of housing as a result of industrialisation and fast urbanisation. With early detection and treatment, hypertension can be prevented from being the leading cause of diseases and premature deaths in India (WHO 2022). It is one of the main causes of CVDs, which caused 23% of overall fatalities and 32% of deaths among adults between 2010 and 2013. By 2030, India's Sustainable Development Goals (SDGs) call for a reduction of one-third in premature mortality attributable to NCDs. Early diagnosis and treatment can lessen disease burden and improve quality of life (Thakre et al. 2022).

According to the hypertension "rule of halves," half of people with high blood pressure (BP) are undiagnosed, half of those who are identified are untreated, and half of those who are receiving treatment are not having their BP under control. The poor care cascade for hypertension from the moment of screening, diagnosis, starting medicine, and achieving ideal BP control raises public health issues. Particularly in circumstances with few resources, this is true. Due to this, only 14% of adult hypertensive patients have their blood pressure controlled to a systolic/diastolic blood pressure (SBP/DBP) of less than 140/90 mmHg. Despite the fact that there are safe, well-tolerated, and inexpensive BP-lowering medications out there.

In 2019, CVD was one of the major causes of non-communicable diseases, which were responsible for 44% of the 42 million deaths worldwide. studies conducted in the past from India and Other LMICs discovered that people who belong to higher socioeconomic classes than lower ones have greater prevalences of hypertension, diabetes, and unhealthy weight (Ghosh and Kumar 2019). For instance, people in the quintile with the highest household wealth had an obesity prevalence of 18%, compared to just 17% for people in the quintile with the lowest wealth. Similar to that, in 2015–16, urban regions had a 16–1% prevalence of hypertension while rural areas had a 13–4% prevalence (Corsi et al. 2019). Such evidence of CVD risk as an urban and upper-class phenomenon has led to requests to give CVD care funding priority over maternity and child health programmes.

Particularly in low- and middle-income (LMIC) nations, hypertension is a substantial contributor to cardiovascular disease and fatalities globally. Hypertension is predicted to impact 1.28 billion persons globally in 2019 between the ages of 30 and 79, with prevalence rates of 32% for women and 34% for men. According to estimations for the global burden of illnesses for 2019 that take into consideration all ages and sexes, hypertensive heart disease accounts for 0.85% of all Disability Adjusted Life Years (DALYs) globally and has been on the rise. Population ageing and greater exposure to lifestyle risk factors like poor diets (high salt and low potassium intake) and inactivity are two factors contributing to the rise. Additionally, the estimated number of

High blood pressure, or hypertension, is a major cause of morbidity and mortality around the world, including India. This review of the literature intends to investigate the present awareness, management, and control of hypertension in India. In order to comprehend the prevalence of hypertension, population awareness levels, the availability and efficacy of treatment choices, and the overall control of hypertension in the nation, it analyses pertinent studies and research carried out in India over the previous ten years. The results show the difficulties and possibilities for enhancing hypertension therapy in India.

Overview of high blood pressure and its effects on public health. Studying hypertension awareness, treatment, and control is important in India Hypertension prevalence and burden in India. Epidemiological evidence of the prevalence of hypertension. Variations in the prevalence of hypertension by age, gender, and region. Indian co-morbidities linked to hypertension. Awareness of Hypertension studies evaluating the degree of awareness among Indians. Socioeconomic, cultural, and educational aspects that affect hypertension awareness differences in awareness between various demographic groupings. Treatment for hypertension Overview of available medical and non-medical treatments. Antihypertensive drugs are available and accessible in India. Compliance with treatment plans among hypertensive people healthcare professionals' responsibilities in managing hypertension. Hypertension Management Analysing India's hypertension control rates Identifying the obstacles to attaining the best blood pressure management Modifying one's lifestyle can help regulate hypertension. Interventions and Strategies Governmental initiatives and programmes to better hypertension control, treatment, and awareness Community-based initiatives and their effects on the control of hypertension. Technology's help of efforts to reduce

hypertension. Opportunities and Challenges Identifying the difficulties in managing hypertension in India. Possibilities for enhancing understanding, treatment, and management lessons from other countries' successful interventions. Summary of major conclusions future research and intervention suggestions. An extensive overview of hypertension awareness, treatment, and management in India is provided by this review of the literature. It combines existing knowledge and highlights research gaps that require more investigation. The results can help public health professionals, healthcare professionals, and policymakers create effective measures to deal with the rising prevalence of hypertension in India.

Need for the Study:

Cardiovascular illness, which affects nearly half of adults between the ages of 40 and 69, is responsible for 27% of deaths in India that are caused by non-communicable diseases (WHO link: https://www.who.int/india/health-topics/hypertension). High blood pressure is one of the most important risk factors for CVDs. Inadequate primary care, inadequate follow-up, and limited awareness of hypertension all contribute to its continued poor control. Only 12% of Indians who have hypertension, however, get their blood pressure under control. Recent data indicate that southern regions have a much higher prevalence of hypertension than other regions. No research have been conducted looking at these characteristics in adults in the southern states of India, despite the fact that few studies in India indicate the prevalence and levels of awareness, treatment, and control of hypertension in some populations. In terms of the human development index, the majority of the southern Indian states are advanced; nonetheless, the ATC of hypertension affects a population that is less evolved than that of any other developed nation at the same level of development. The primary goal of this study is to evaluate the prevalence, awareness, treatment, and control of hypertension in southern Indian states and districts in order to fill a research gap in the literature.

Objectives:

Estimating the age-sex adjusted prevalence, the study's major goal is to better understand, treat, and control hypertension in the southern Indian states. The study makes an effort to look into the correlates or factors that affect the prevalence, awareness, management, and treatment of hypertension in this specific region. By employing age- and sex-specific standardisation techniques, the study can provide more accurate estimates of the prevalence of hypertension in the southern Indian states. The findings of this study contribute significant new knowledge regarding the factors affecting the prevalence, knowledge, treatment, and management of hypertension in the southern Indian states.

Methodology:

Data Source and Method

The 2019–2021 National Family Health Survey (NFHS–5), a household survey that included all 28 Indian states and 9 union territories, provided the data for this study. The International Institute for Population Sciences (IIPS), Mumbai, oversaw the administration of the NFHS-5, which was carried out under the direction of the Indian Ministry of Health and Family Welfare. ICF International helped with the technical aspects. The US Agency for International Development provided financial support for the survey, and both the national level and the levels of the states and union territories are represented by the Ministry of Health and Family Welfare of India.

The NFHS-5 sample's district-level self-weighting. The major sampling units (village in rural regions and census enumeration block in urban areas) were chosen in a two-stage cluster random sampling technique with a probability proportional to choosing the same number of households in each main sampling unit. Following thorough mapping and naming of each household, households were chosen using systematic random sampling (i.e., choosing every nth family). If no one was home or no eligible household member was present during the initial visit, the data collection team could make up to three more visits.

It contains in-depth information on crucial topics connected to population, health, and family welfare, including demography, family planning, infant and child mortality, maternal and child health, anaemia and nutrition, morbidity and healthcare, and women's empowerment. It also covers related topics like anaemia and nutrition.

In comparison to the earlier round of the survey (NFHS-4), the scope of NFHS-5 is expanded by adding new dimensions like death registration, pre-school education, expanded child immunisation domains, components of micronutrients for children, menstrual hygiene, frequency of alcohol and tobacco use, additional components of Non-Communicable Diseases (NCDs), and an expanded age range for measuring hypertension and diabetes among all aged 15 years and above.

In order to help citizens, track the nation's progress towards the Sustainable Development Goals (SDGs), NFHS-5 offers information on key indicators.

The national report also contains data on socioeconomic standing and other background elements, information that is useful for creating policies and successfully implementing initiatives. The NFHS-5 National Report tracks the change from NFHS-4 (2015–16) to NFHS-5 (2019–21). According to the rule of halves for hypertension, half of people with high blood pressure (BP) are undiagnosed, half of people who are aware of their condition go untreated, and half of people who receive treatment have uncontrolled BP. The poor treatment cascade of hypertension from the moment of screening, diagnosis, starting medicine, and reaching ideal BP control raises a public health risk. Even though there are safe, well-tolerated, and reasonably priced BP-lowering therapies available, only 14% of individuals with hypertension have their blood pressure under control to a systolic blood pressure (SBP)/diastolic blood pressure (DBP) of less than 140/90 mmHg.

The stages of care were: (i) ever having their blood pressure (BP) measured before the survey ("screened"), (ii) being diagnosed ("aware"), (iii) taking BP-lowering medication at the time of the survey ("treated"), and (iv) reporting receiving treatment and not having a raised BP ("controlled"). We divided these stages into groups based on state, residency in rural or urban areas, sex, age, BMI, cigarette usage, family wealth quintile, education, and marital status. The analysis included 2,90,094 people in total.The prevalence of hypertension, awareness, therapy, and control were determined with age and sex adjustments. The percentage of people with hypertension is known as age-adjusted prevalence, taking the population's age distribution into account.

The significance determinants of hypertension prevalence, awareness, therapy, and control were examined using logistic regression models. The significant predictors of hypertension prevalence, awareness, treatment, and control were examined using logistic regression, a statistical technique for modelling the relationship between a binary dependent variable (in this case, hypertension prevalence, awareness, treatment, and control) and one or more independent variables (predictors). The objective of logistic regression models is to ascertain the association between the variables and the likelihood of getting hypertension, being aware of it, obtaining therapy, or achieving control. The models estimate the odds ratios, which display how the probabilities of the outcome variable vary based on the predictor factors. Numerous parameters were examined in the analysis to establish their significance in relation to the prevalence, knowledge, therapy, and management of hypertension. These predictors

included lifestyle factors like smoking, exercise, and diet as well as demographic factors like age, gender, and ethnicity. The logistic regression models help researchers understand the factors that influence these outcomes by offering insights into the main predictors of hypertension prevalence, awareness, therapy, and control

Result:

Figure 1 State pattern of prevalence of hypertension among individuals (15+) in Southern India, 2019–21.

Prevalence

State	Prevalence
Telangana	31.6
Andaman & Nicobar	31.1
Tamil nadu	29.9
South India	29.7
Kerala	29.5
Karnataka	29.4
Andhra Pradesh	28.9
Puducherry	27.8
Lakshadw	26.0
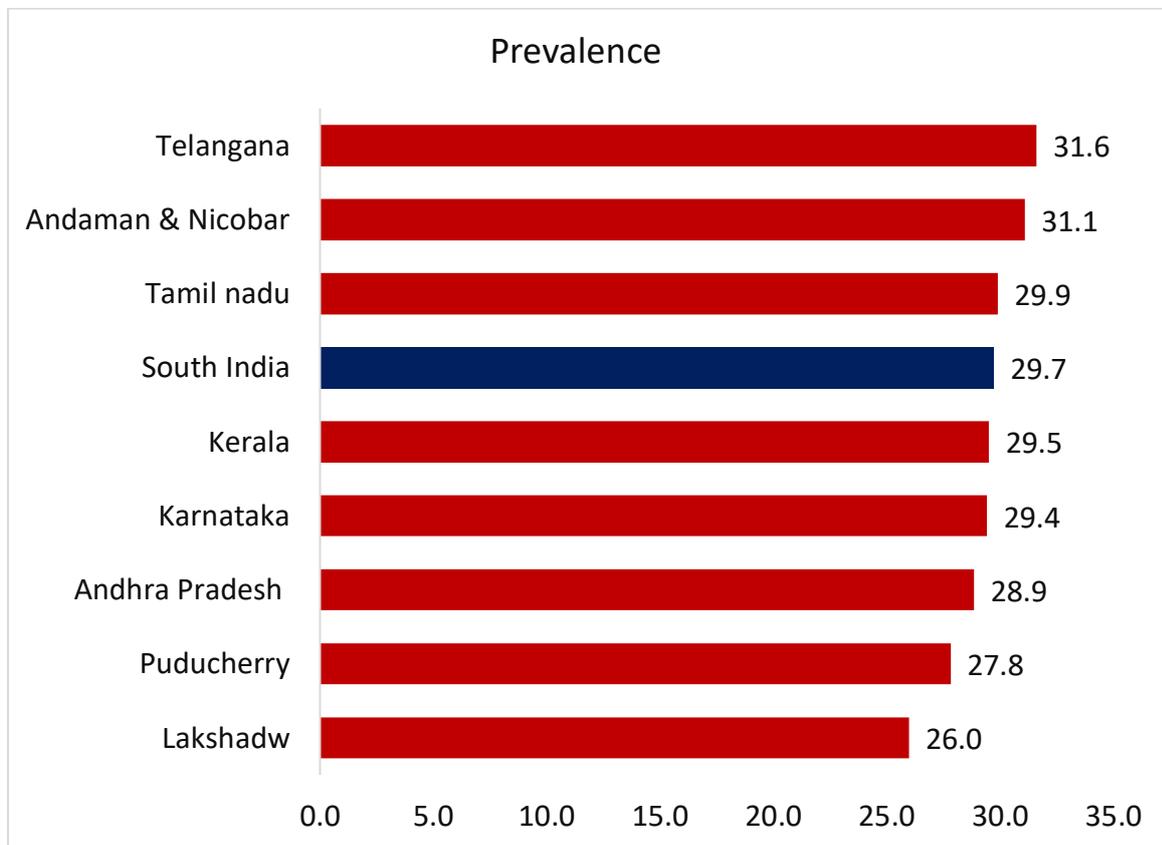
The prevalence of hypertension in different states of southern India shows significant variations. The highest prevalence of hypertension is observed in Telangana that is 31.6, followed by Tamil Nadu that is 29.9. while the lowest prevalence is reported in the Union Territory of Lakshadweep that is 26, with Andaman and Nicobar Islands having the highest prevalence that is 31.1 among the Union Territories. Additionally, the overall prevalence of hypertension in South India is reported to be 29.7.

Figure 2 State pattern of ATC among those with hypertension among individuals (15+) in Southern India, 2019–21.
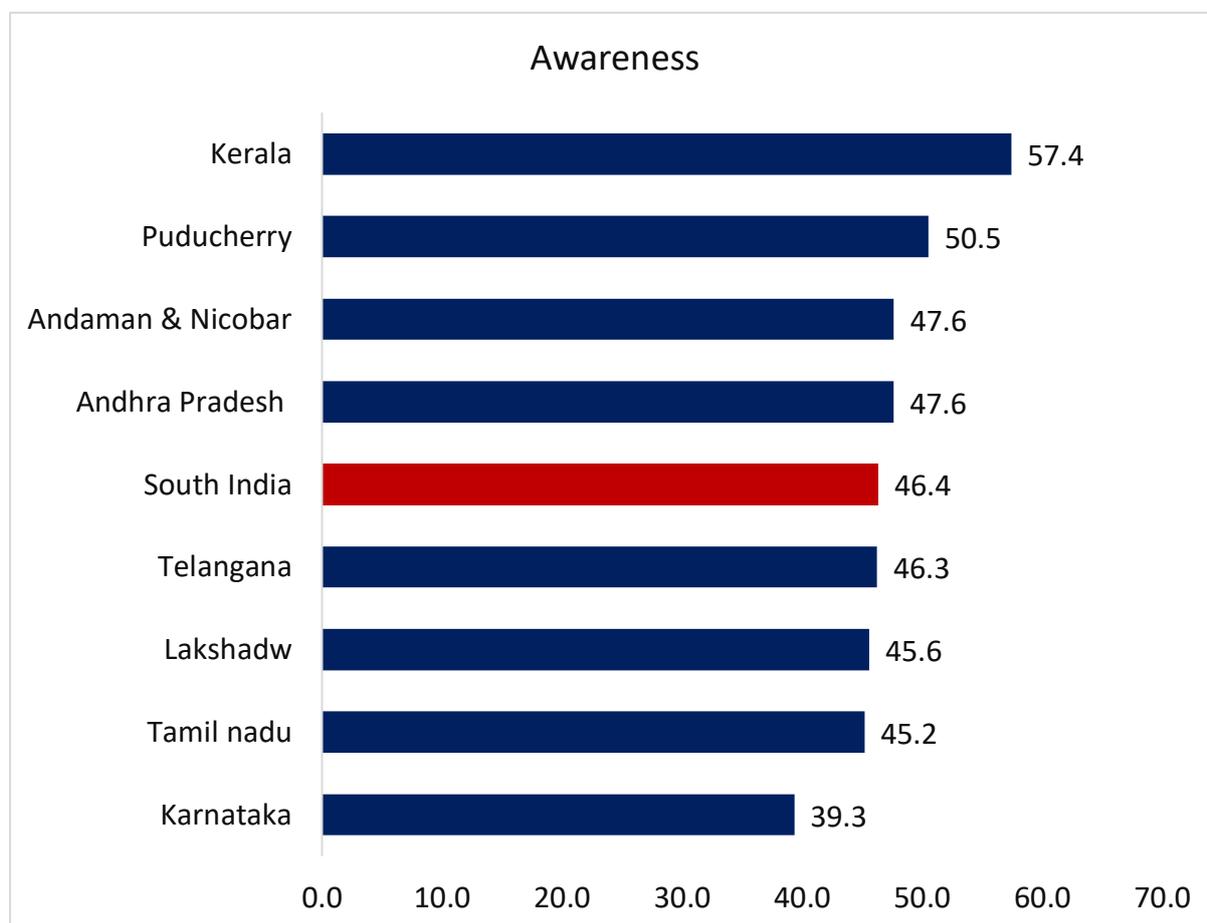
According to the above graph, there are differences in the degree to which South Indian regions are aware of hypertension. Kerala is said to have the highest awareness levels that is 57.4, with Karnataka reporting the lowest awareness levels that is 39.3. Puducherry and Lakshadweep are the two Union Territories with the highest and lowest levels that is 50.5 and 25.6 of awareness, respectively. Additionally, 46.4% of South Indians are said to be generally aware of hypertension.

Treatment

Region	Value
Kerala	45.3
Puducherry	41.2
Andaman & Nicobar	39.4
Telangana	39.0
Andhra Pradesh	38.6
Lakshadw	37.8
South India	35.5
Karnataka	31.4
Tamil nadu	30.1
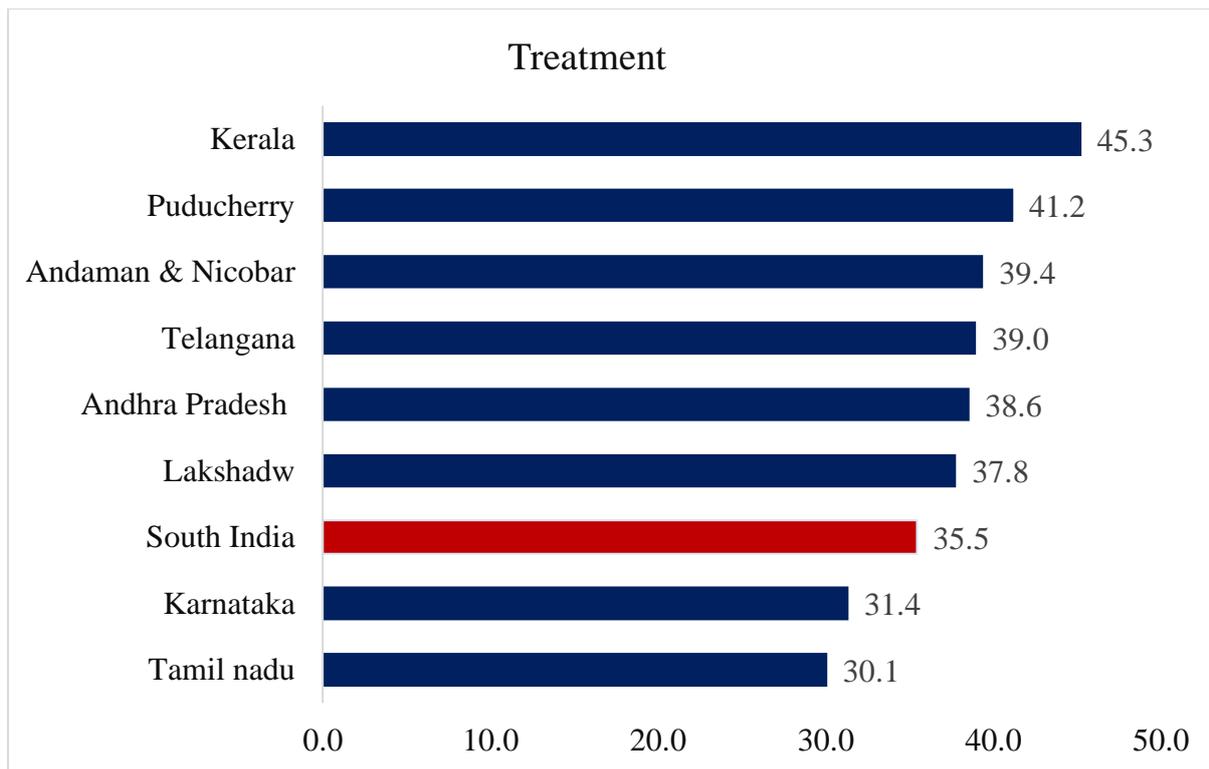
Based on the above graph, the analysis of hypertension treatment in Southern India reveals variations across different regions. Kerala reports higher treatment rates that is 45.3, followed by lower rates in Tamil Nadu that is 30.1. Among the Union Territories, Puducherry has higher that is 41.2 treatment rates, while Lakshadweep has lower rates that is 37.8. Additionally, the overall treatment rate of hypertension in South India is reported to be 35.5%.

Control

Region	Value
Andaman & Nicobar	23.2
Lakshadw	22.7
Kerala	22.2
Andhra Pradesh	19.4
Telangana	19.3
Puducherry	19.3
South India	18.7
Karnataka	17.7
Tamil nadu	16.9
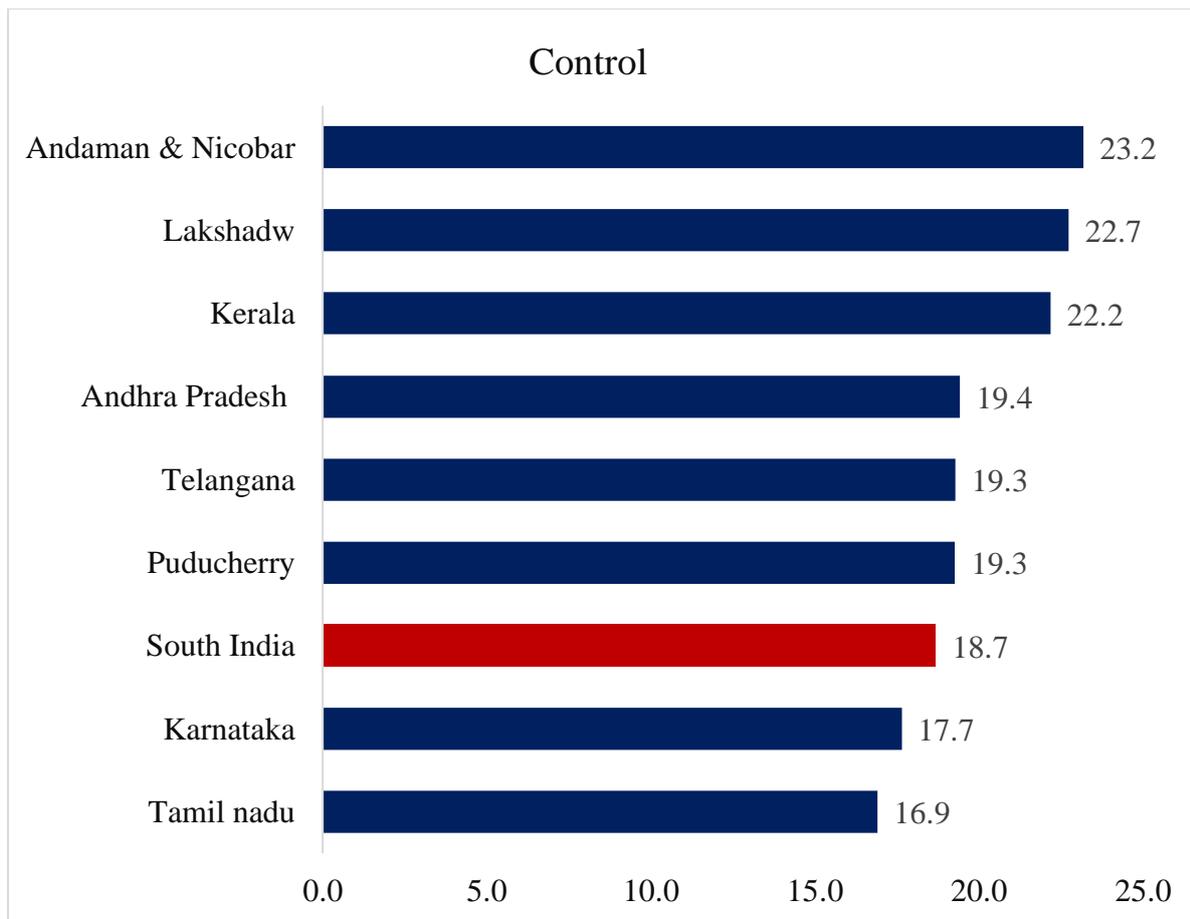
Southern India's hypertension control shows regional variances based on the most recent data. Tamil Nadu has lower control that is 16.9 rates after Kerala that is 22.2, which reports higher rates. Andaman and Nicobar Islands have higher control that is 23.2 rates than Puducherry that is 19.3 have among the Union Territories. Furthermore, 18.7% is claimed to be the overall control rate for hypertension in South India.

Table 1. Participant characteristics and the adjusted hypertension prevalence among individuals (15+) in South India, 2019–21.

Socio economic variables	Sample Size		Prevalence	
	N	**%**	**%**	**Confidence interval (CI)**
Age group				
15-29	83071	28.4	8.5	[8.2, 8.9]
30-44	82273	28.4	22.5	[22, 23]
45-59	69993	24.3	41.5	[40.9, 42.1]
60-74	44527	15.4	56.0	[55.3, 56.7]
75+	10230	3.49	62.2	[61, 63.4]
Sex				
Male	132584	45.7	31.0	[30.6, 31.5]
Female	157510	54.3	28.6	[28.2, 29]
Marital status				
Unmarried	55428	18.9	24.3	[23.4, 25.2]
Married	202420	70	30.0	[29.6, 30.4]
Others	32246	11.1	32.3	[31.6, 33]
Religion				
Hindu	242081	83.5	29.4	[29, 29.8]
Muslim	28903	9.28	32.0	[31.2, 32.9]
Christian	18610	6.99	31.1	[30.1, 32.1]
Others	500	0.226	29.0	[24.1, 33.9]
Residence				
Urban	98980	39.9	31.9	[31.3, 32.5]
Rural	191114	60.1	28.3	[27.9, 28.7]
Caste				
SC	60304	21.8	29.3	[28.5, 30]
ST	21945	5.32	29.4	[28, 30.8]
OBC	166911	58.1	29.6	[29.2, 30.1]
Others	40934	14.8	30.8	[30.2, 31.5]

Education

No education	71764	22.6	27.2	[26.7, 27.8]
Primary	39283	14.2	30.7	[30.1, 31.3]
Secondary	133731	46.4	30.7	[30.2, 31.1]
Higher secondary and above	45316	16.7	31.0	[30.2, 31.7]

Wealth Quintile

Poorest	16839	4.98	25.3	[24.4, 26.3]
Poorer	50169	15.6	26.9	[26.3, 27.5]
Middle	83145	27.3	28.6	[28.1, 29.1]
Richer	83694	29.7	30.9	[30.4, 31.4]
Richest	56247	22.4	32.5	[31.8, 33.2]

Household size

<3	97930	34.3	31.0	[30.5, 31.5]
4-7	157590	54.7	29.2	[28.8, 29.6]
7+	34574	11	27.6	[26.9, 28.3]

Drink Alcohol

No	249121	88	29.4	[29.1, 29.8]
Yes	40973	12	31.4	[30.8, 32.1]

Tobacco use

No	245763	86.6	30.2	[29.8, 30.5]
Yes	44331	13.4	27.6	[27, 28.2]

States

Andhra Pradesh	28862	19.6	28.9	[28.1, 29.6]
Karnataka	71867	23.4	29.4	[28.7, 30.2]
Lakshadweep	3171	0.0297	26.0	[23.1, 28.9]
Kerala	32317	13.7	29.5	[28.9, 30.1]
Tamil Nadu	70992	31.2	29.9	[29.1, 30.7]
Puducherry	10026	0.49	27.8	[26.1, 29.5]
Andaman & Nicobar	6616	0.146	31.1	[29, 33.2]
Telangana	66243	11.5	31.6	[31, 32.2]
South India	**2,90,094**	**100**	**29.7**	**[29.4, 30.1]**

Table 2 Adjusted percentage awared, treated and controlled (ATC) among those with hypertension among individuals (15+) in South India, 2019–21

Socio economic variables	Awareness		Treatment		Control	
	%	Confidence interval (CI)	%	Confidence interval (CI)	%	Confidence interval (CI)
Age group						
15-29	34.1	[31.8, 36.3]	11.3	[10.3, 12.4]	1.3	[1, 1.6]
30-44	31.3	[30, 32.6]	16.1	[15.3, 16.8]	7.0	[6.6, 7.5]
45-59	44.7	[43.7, 45.8]	34.7	[33.9, 35.6]	18.5	[17.8, 19.2]
60-74	58.6	[57.6, 59.5]	51.7	[50.7, 52.6]	28.6	[27.8, 29.5]
75+	62.8	[61.1, 64.6]	57.0	[55.2, 58.8]	32.8	[31.2, 34.4]
Sex						
Male	39.8	[38.9, 40.7]	31.1	[30.4, 31.9]	17.1	[16.6, 17.7]
Female	52.3	[51.4, 53.3]	39.3	[38.5, 40]	20.0	[19.5, 20.6]
Marital status						
Unmarried	43.7	[41.1, 46.3]	33.8	[31.2, 36.4]	17.9	[15.6, 20.1]
Married	46.8	[45.9, 47.7]	35.8	[35.2, 36.5]	18.7	[18.2, 19.2]
Others	45.4	[44.1, 46.6]	34.5	[33.4, 35.5]	18.9	[18.2, 19.7]
Religion						
Hindu	45.0	[44.1, 45.9]	34.1	[33.5, 34.8]	18.1	[17.6, 18.6]
Muslim	52.7	[50.8, 54.6]	42.9	[41.3, 44.4]	23.0	[21.7, 24.2]
Christian	53.5	[51.3, 55.7]	40.9	[39, 42.8]	20.4	[19, 21.8]
Others	36.4	[28, 44.7]	32.8	[24.6, 41]	17.7	[11, 24.4]
Residence						
Urban	50.5	[49.2, 51.9]	40.2	[39.2, 41.1]	21.3	[20.5, 22]
Rural	43.3	[42.2, 44.3]	32.0	[31.3, 32.7]	16.9	[16.4, 17.3]
Caste						
SC	42.2	[40.5, 43.9]	30.4	[29.3, 31.6]	16.5	[15.7, 17.4]
ST	35.3	[32.6, 38.1]	27.0	[24.8, 29.2]	16.5	[14.6, 18.3]

OBC	46.9	[46, 47.9]	35.6	[34.9, 36.3]	19.0 [18.5, 19.6]
Others	52.4	[51, 53.7]	42.9	[41.7, 44]	20.6 [19.6, 21.5]
Education					
No education	38.1	[37, 39.1]	28.9	[28.1, 29.7]	16.2 [15.7, 16.8]
Primary	47.7	[46.4, 48.9]	36.0	[35, 37]	19.1 [18.3, 19.9]
Secondary	50.3	[49.3, 51.3]	39.4	[38.6, 40.3]	20.5 [19.8, 21.2]
Higher secondary and above	54.1	[52.2, 55.9]	43.2	[41.5, 44.9]	22.1 [20.6, 23.6]
Wealth Quintile					
Poorest	32.6	[30.4, 34.8]	21.9	[20.2, 23.5]	12.0 [10.7, 13.2]
Poorer	38.5	[37, 40]	26.8	[25.7, 27.9]	14.6 [13.9, 15.4]
Middle	43.6	[42.5, 44.7]	32.7	[31.8, 33.6]	18.0 [17.3, 18.6]
Richer	48.4	[47.3, 49.5]	37.6	[36.7, 38.4]	19.9 [19.2, 20.6]
Richest	54.0	[52.5, 55.5]	43.6	[42.5, 44.8]	22.0 [21.1, 22.9]
Household size					
<3	46.1	[45, 47.1]	35.2	[34.4, 36]	18.7 [18.1, 19.3]
4-7	46.8	[45.8, 47.8]	35.8	[35.1, 36.6]	18.8 [18.2, 19.5]
7+	45.4	[43.8, 47]	35.2	[33.7, 36.6]	18.2 [17.1, 19.3]
Drink Alcohol					
No	47.3	[46.4, 48.2]	36.5	[35.9, 37.2]	19.2 [18.7, 19.6]
Yes	40.6	[39.3, 41.9]	29.0	[27.8, 30.1]	16.1 [15.2, 17]
Tobacco use					
No	48.2	[47.4, 49.1]	37.4	[36.7, 38.1]	19.6 [19.1, 20.1]
Yes	36.9	[35.5, 38.4]	26.2	[25, 27.3]	14.7 [13.9, 15.5]
States					
Andhra Pradesh	47.6	[45.9, 49.3]	38.6	[37.1, 40]	19.4 [18.4, 20.5]
Karnataka	39.3	[37.7, 41]	31.4	[30.1, 32.6]	17.7 [16.6, 18.7]
Lakshadweep	45.6	[40.4, 50.7]	37.8	[34, 41.7]	22.7 [19.9, 25.6]
Kerala	57.4	[56, 58.8]	45.3	[44.1, 46.5]	22.2 [21.4, 23]
Tamil Nadu	45.2	[43.3, 47.1]	30.1	[29.1, 31.1]	16.9 [16.2, 17.7]
Puducherry	50.5	[45.9, 55.1]	41.2	[37.3, 45.1]	19.3 [16.9, 21.7]
Andaman & Nicobar	47.6	[44.1, 51.2]	39.4	[35.8, 43]	23.2 [20.5, 25.9]

Telangana	46.3	[45.1, 47.4]	39.0	[37.9, 40.1]	19.3	[18.5, 20.1]
South India	**46.4**	**[45.5, 47.2]**	**35.5**	**[34.8, 36.1]**	**18.7**	**[18.2, 19.1]**

Figure 3 Socio-economic differentials of prevalence of hypertension and ATC among those with hypertension among individuals (15+) in South India, 2019–21.

Variation By Age-groups
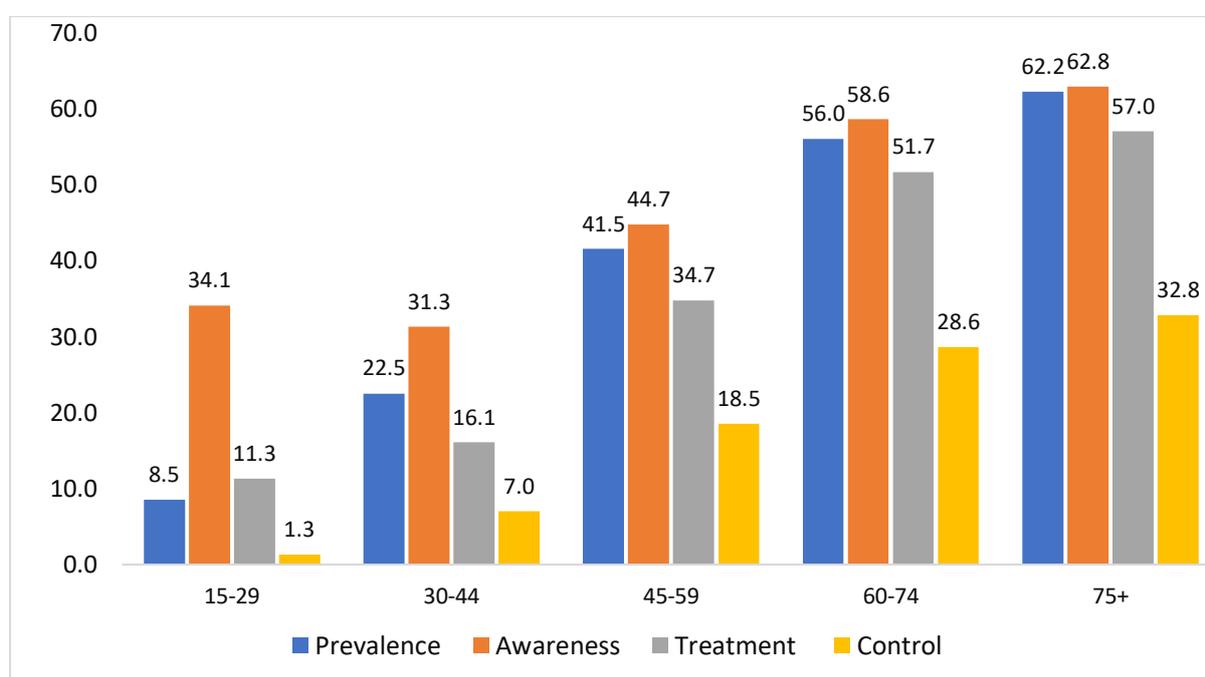
Variation By Place of Residence
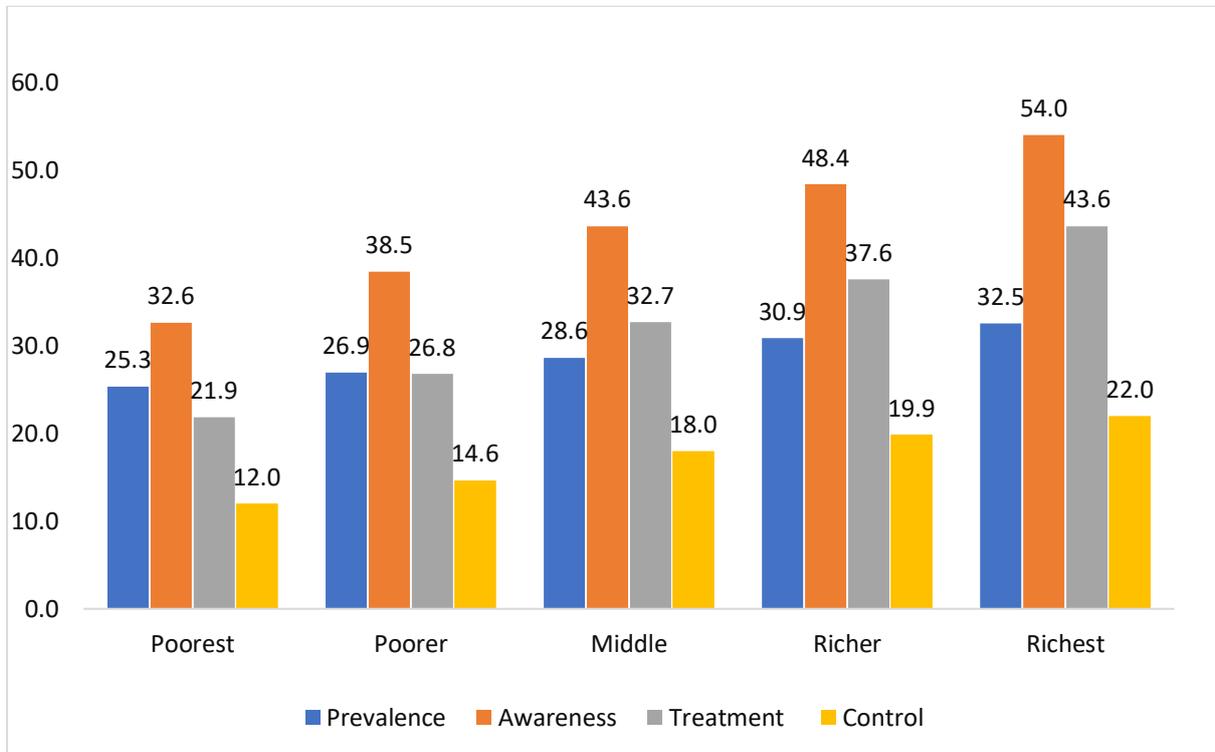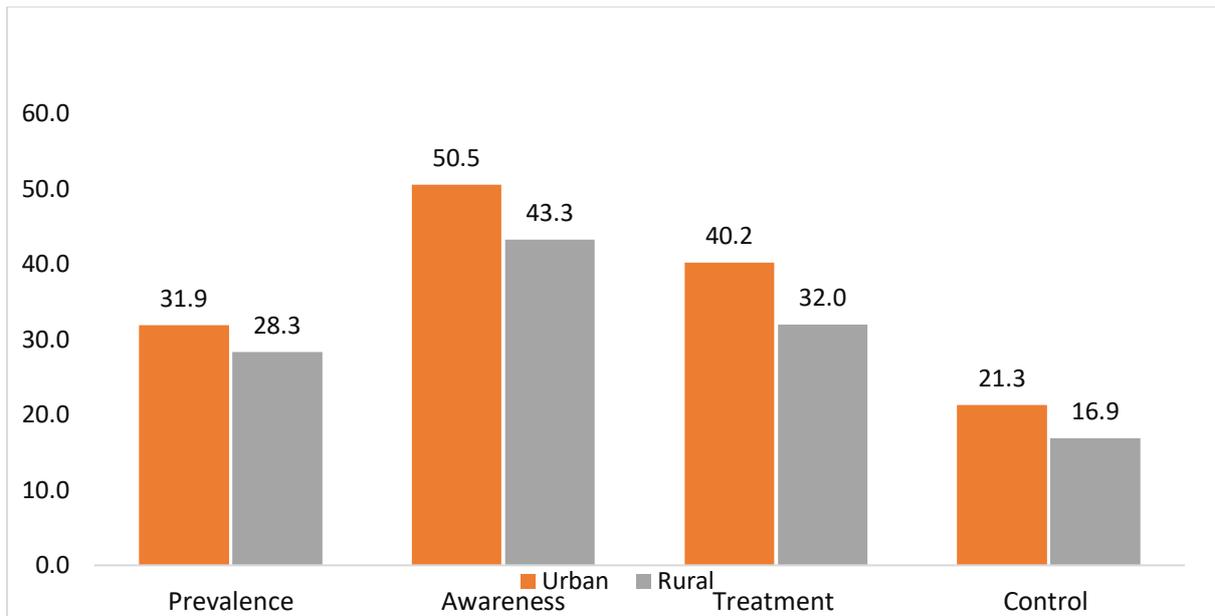
Variation By Wealth Quintile

Variation by Education

	No education	Primary	Secondary	Higher secondary and above
Prevalence				
Awareness	38.1	47.7	50.3	54.1
Treatment	28.9	36.0	39.4	43.2
Control				

Legend: Prevalence, Awareness, Treatment, Control
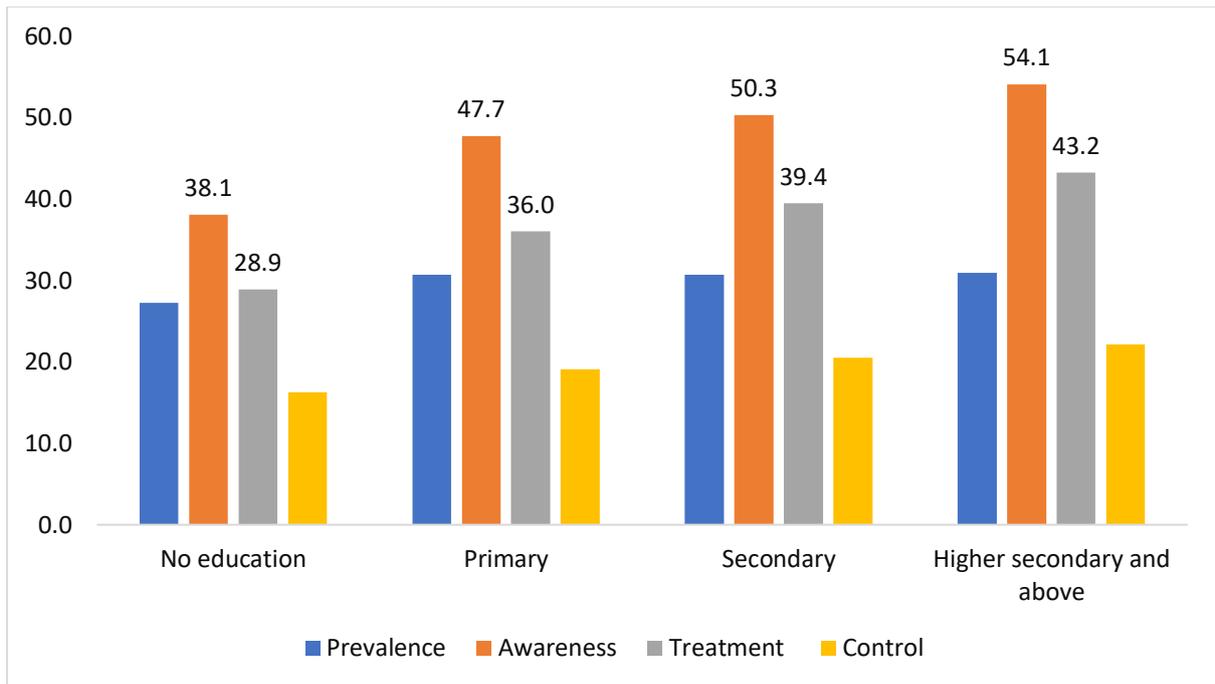
Table 3: **Predictors of having prevalence, awareness, treatment and control of hypertension among adults with hypertension.**

Socio economic variables	Prevalence		Awareness		Treatment		Control	
	Odds ratio	Confidence Interval	Odds ratio	Confidence Interval	Odds ratio	Confidence Interval	Odds ratio	Confidence Interval
Age group								
15-29 ®								
30-44	2.69***	[2.56, 2.83]	0.79***	[0.72, 0.87]	1.38***	[1.21, 1.56]	5.33***	[4.03, 7.07]
45-59	6.33***	[5.99, 6.7]	1.46***	[1.32, 1.63]	3.88***	[3.42, 4.4]	15.71***	[11.88, 20.77]
60-74	11.23***	[10.57, 11.94]	2.75***	[2.45, 3.08]	8.23***	[7.21, 9.39]	27.91***	[21.06, 36.99]
75+	13.92***	[12.89, 15.02]	3.36***	[2.95, 3.84]	10.2***	[8.83, 11.78]	33.33***	[24.95, 44.52]
Sex								
Male ®								
Female	0.84***	[0.82, 0.87]	1.7***	[1.63, 1.78]	1.42***	[1.35, 1.48]	1.15***	[1.08, 1.21]
Marital status								
Unmarried ®								
Married	1.24***	[1.18, 1.31]	1.35***	[1.22, 1.49]	1.25***	[1.11, 1.41]	1.18**	[1, 1.39]
Others	1.64***	[1.54, 1.74]	1.35***	[1.21, 1.51]	1.34***	[1.18, 1.53]	1.34***	[1.13, 1.59]
Religion								
Hindu ®								
Muslim	1.13***	[1.07, 1.19]	1.22***	[1.12, 1.33]	1.27***	[1.17, 1.37]	1.23***	[1.13, 1.34]
Christian	1.05*	[0.99, 1.12]	1.29***	[1.16, 1.43]	1.21***	[1.1, 1.33]	1.11**	[1, 1.22]
Others	1.01	[0.76, 1.33]	0.63**	[0.44, 0.91]	0.88	[0.6, 1.29]	1.01	[0.62, 1.64]
Residence								
Urban ®								
Rural	0.9***	[0.86, 0.94]	0.91**	[0.84, 0.98]	0.86***	[0.81, 0.91]	0.85***	[0.8, 0.91]
Caste								
SC®								
ST	1.06	[0.97, 1.15]	0.79***	[0.68, 0.91]	0.87*	[0.76, 1]	1.03	[0.89, 1.19]
OBC	0.95**	[0.91, 1]	1.07*	[0.99, 1.16]	1.1***	[1.03, 1.17]	1.07*	[1, 1.15]
Others	0.98	[0.92, 1.03]	1.22***	[1.12, 1.34]	1.41***	[1.3, 1.53]	1.13***	[1.03, 1.23]
Education								
No education ®								
Primary	1.12***	[1.07, 1.16]	1.37***	[1.29, 1.45]	1.2***	[1.14, 1.28]	1.08**	[1, 1.16]

Secondary	1.05***	[1.02, 1.09]	1.34***	[1.27, 1.42]	1.17***	[1.11, 1.25]	1.05	[0.98, 1.12]
Higher secondary and above	1.01	[0.96, 1.07]	1.36***	[1.24, 1.49]	1.14***	[1.04, 1.26]	1.02	[0.91, 1.15]
Wealth Quintile								
Poorest®								
Poorer	1.1***	[1.04, 1.17]	1.23***	[1.1, 1.37]	1.27***	[1.14, 1.43]	1.25***	[1.09, 1.44]
Middle	1.21***	[1.14, 1.29]	1.41***	[1.26, 1.57]	1.6***	[1.43, 1.8]	1.55***	[1.36, 1.77]
Richer	1.35***	[1.26, 1.44]	1.55***	[1.39, 1.74]	1.82***	[1.62, 2.05]	1.66***	[1.45, 1.9]
Richest	1.44***	[1.34, 1.55]	1.82***	[1.6, 2.06]	2.23***	[1.96, 2.53]	1.8***	[1.55, 2.08]
Household size								
<3®								
4-7	0.88***	[0.86, 0.91]	0.96*	[0.92, 1.01]	0.93***	[0.89, 0.97]	0.93***	[0.88, 0.98]
7+	0.82***	[0.78, 0.86]	0.95	[0.88, 1.03]	0.95	[0.88, 1.02]	0.9**	[0.83, 0.99]
Drink Alcohol								
No®								
Yes	1.24***	[1.19, 1.28]	0.92***	[0.87, 0.98]	0.87***	[0.82, 0.93]	0.94	[0.87, 1.02]
Tobacco use								0***	[0, 0]
No®								
Yes	0.85***	[0.82, 0.88]	0.77***	[0.72, 0.82]	0.72***	[0.68, 0.77]	0.81***	[0.75, 0.87]

According to the findings of a logistic regression analysis, (i) women were more likely than males to finish each step of the cascade, including awareness, treatment, and control. (ii) Age groups showed a positive correlation with being "screened," "treated," and "controlled," indicating that as people get older, awareness, treatment, and control increase as well. Being in a higher household wealth quintile was positively correlated with completing each level of the cascade (iii); being "screened" and succeeding were both positively correlated with education; and (iv) urban areas outperformed rural areas for all steps of the cascade. Whether the patient was a "control" or a "treated" phase, the likelihood of moving through the care cascade was frequently not noticeably different. A nearly linear positive association exists between each stage of the cascade and the household wealth index.

Discussion:

According to the NFHS 5 report, hypertension is more common in Southern India, with a prevalence of 21.1% in rural and 31.8% in urban areas. In order to assess the prevalence of awareness, therapy, and control, I thus used the logistic regression method to evaluate the NFHS 5 data.

The provided material emphasises the prevalence, knowledge, treatment, and control of hypertension in southern India, with considerable variations between states and socioeconomic groups.

Prevalence of hypertension: In southern India, 30% of adults 15 years of age and over had hypertension. This implies that hypertension has been detected in about 30% of the local population.

Differences in Prevalence, Awareness, Treatment, and Control: States and socioeconomic categories varied significantly in the prevalence, awareness, treatment, and control of hypertension among those who had the condition. This demonstrates that socioeconomic status and location may affect how hypertension is treated.

Awareness: In southern India, 47% of people were aware that they had high blood pressure. This indicates that roughly half of the hypertensive patients were aware of their illness.

Treatment: About 35% of all people with hypertension sought treatment. This suggests that many people with hypertension in southern India did not obtain treatment for their illness.

Control: Only 19% of those who had hypertension had it under control. This suggests that a tiny percentage of people with hypertension were effective in managing and controlling their blood pressure within normal ranges.

State variation: Compared to the other main southern states, Kerala, an economically developed state in India, has greater levels of awareness, management, and treatment of hypertension. Contrarily, Telangana in southern India has the highest prevalence of hypertension, indicating that the ailment is more common there.

Socioeconomic Variation: In southern India, socioeconomic factors had an impact on the awareness, treatment, and control (ATC) of hypertension. According to the study, only 33%

of those in the lowest quintile knew they had hypertension, compared to 54% of those in the top quintile. Similar to this, only 22% of those in the lowest quartile received treatment, compared to 44% of those in the highest quintile. This demonstrates a socioeconomic divide in the treatment of hypertension, with lower ATC rates among those from lower socioeconomic backgrounds.

Urban-Rural Disparity: The multivariate analysis's findings revealed that those who live in rural locations are less likely than those who live in urban areas to have ATC of hypertension. This indicates that less healthcare facilities and educational opportunities may be available in rural locations, which would lead to lower rates of diagnosis, treatment, and control.

Alcohol Use: The study also discovered that those who drank alcohol had a higher likelihood of having hypertension. However, compared to those who did not drink alcohol, their incidence of ATC was lower. This emphasises the requirement for focused interventions and instruction regarding the effects of alcohol on the control of hypertension.

In conclusion, the data emphasise the occurrence of hypertension, its awareness, treatment, and management in southern India, with variations seen among states and socioeconomic classes. In order to improve the management of hypertension in the area, the study emphasises the significance of tackling socioeconomic disparities, enhancing awareness campaigns, and assuring access to healthcare facilities.

Health Education: As people get older, they tend to become more knowledgeable and aware of a variety of health issues, including hypertension. They gradually get more familiarity with the symptoms, risks, and indicators of hypertension, which raises their level of awareness.

Utilisation of healthcare services: older people are more likely to visit doctors frequently and seek routine medical examinations. During these appointments, medical professionals frequently check patients for hypertension and instruct them on how to manage it. Regular use of healthcare promotes improved knowledge and comprehension of hypertension.

Data in Southern India show that urban regions generally have higher levels of awareness, treatment, and management of hypertension than rural ones. Healthcare Infrastructure is one of several factors. Urban locations frequently have a more established healthcare infrastructure, which includes hospitals, clinics, and specialty healthcare facilities. Access to

healthcare services, such as screenings, diagnoses, and hypertension treatment options, is improved thanks to this infrastructure. Contrarily, rural communities frequently struggle with a lack of medical facilities and medical personnel, which affects access to and awareness of hypertension therapy. Health Education and Awareness Programmes: Governmental agencies, non-governmental organisations, and healthcare facilities typically run more extensive health education and awareness programmes in urban areas. These programmes concentrate on spreading knowledge about hypertension, its risk factors, the value of routine check-ups, and lifestyle changes. On the other side, access to these programmes may be restricted in rural areas, which lowers awareness levels. Infrastructure for healthcare: Urban regions frequently have a more established infrastructure for healthcare, which includes hospitals, clinics, and specialised healthcare facilities. This infrastructure improves access to healthcare services like screenings, diagnostics, and hypertension treatment alternatives. On the other hand, rural areas usually deal with a lack of medical resources and staff, which limits access to and knowledge of hypertension treatment. Programmes for Health Education and Awareness: In urban regions, government organisations, non-governmental groups, and medical institutions often run more extensive programmes for health education and awareness. These projects focus on educating the public about hypertension, its risk factors, the importance of regular checkups, and lifestyle modifications. However, access to these courses could be limited in rural areas, which lowers awareness level.

According to the wealth quintile, people from wealthier homes in Southern India have greater rates of hypertension knowledge, treatment, and management than people from poorer households. This gap can be ascribed to several socioeconomic and healthcare access-related factors, including Health Knowledge and Awareness. People from affluent families frequently have easier access to educational and informational resources, which can help to raise their levels of health knowledge and awareness. They might be exposed to more health initiatives, medical literature, and conversations with medical professionals, which would raise their knowledge about hypertension and how to treat it. Access to Healthcare: People from affluent families frequently have easier access to healthcare facilities, including routine check-ups, screenings, and consultations with healthcare professionals. They might be financially able to pay for high-quality healthcare services or have private health insurance, which makes early hypertension detection, diagnosis, and treatment possible. Health-seeking Due to their

financial capabilities, more affluent people may be more likely to follow prescribed treatment programmes and seek timely medical assistance. They could be better able to manage their hypertension since they can afford drugs, lifestyle changes, and frequent checkups. Socioeconomic status might affect lifestyle factors that have an impact on hypertension. People from affluent families may have access to healthier dietary options, participate in regular physical activity, and experience less stress, all of which can help reduce hypertension.

Conclusion:

There is still significant variation in the prevalence and ATC (awareness, treatment, and control) of hypertension among the southern Indian states even after accounting for age and sex, which raises concerns about how effectively the healthcare systems in these regions handle the problem. This implies that some regions may have healthcare infrastructure, resources, and policies in place that are better suited to tackling hypertension than others.

In order to improve the management of hypertension, attention must be paid to expanding access to diagnosis and treatment, particularly among specific demographic categories. According to the data, it is crucial to focus on these areas in particular for men, those who live in rural areas, and people who have less money in their households.

Among men: The data emphasises the need to prioritise initiatives to improve men's access to hypertension diagnosis and care. Men's health-specific awareness efforts, focused screening programmes, and guaranteeing the availability of affordable and accessible healthcare services are a few examples of possible activities.

According to the data, there are fewer ATC cases of hypertension in rural areas. Improved healthcare infrastructure, increased access to medical facilities, and the implementation of community-based outreach programmes with an emphasis on hypertension prevention, detection, and management in rural communities are all necessary steps to overcome this imbalance.

People from lower socioeconomic origins sometimes encounter hurdles to getting healthcare services in areas with lower household wealth. Strategies should focus on increasing accessibility, lowering financial obstacles, and offering targeted support, such as subsidised or inexpensive hypertension drugs and health insurance coverage for hypertension management, in order to lower ATC rates among this population.

Overall, the findings highlight the significance of addressing inequities in the functioning of the health system throughout southern Indian states and of customising treatments to certain demographic groups. It is possible to enhance hypertension management and lessen the

burden of the condition in the area by improving access to hypertension diagnosis and treatment, particularly for men, rural populations, and those with lower family wealth**.**

Limitation:

Since the study is cross sectional so that the causal inference can be drawn.

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