

A Cross-Sectional Study on Hypertension and Its Determinants among Adult Women in the Urban Primary Health Centre Area of Puliyanthope, Chennai

Sathya P.¹, Caroline Priya Kumar², Samyakkhan C.³

¹Tutor, Department of Community Medicine, Government Karur Medical College, Tamil Nadu, India

²Professor, Institute of Community Medicine, Madras Medical College, Tamil Nadu, India

³Senior Assistant Professor, Institute of Community Medicine, Madras Medical College, Tamil Nadu, India

Received: 01-04-2026 / Revised: 15-05-2026 / Accepted: 21-06-2026

Corresponding author: Dr. Sathya P.

Conflict of interest: Nil

Abstract

Introduction: Non-communicable diseases (NCDs) are the leading global cause of death, with cardiovascular diseases (CVDs) being the most significant contributors. Hypertension is a major modifiable risk factor for CVDs and contributes to increased morbidity and premature mortality. In India, CVD deaths related to high systolic blood pressure are higher among women than men. Continuous assessment of these risk factors is crucial for implementing appropriate control measures for NCDs.

Objectives: To estimate the prevalence of hypertension and assess its determinants among adult women in the Urban Primary Health Center area of Puliyanthope, Chennai, Tamil Nadu.

Methods: A community based cross-sectional study was conducted from July 2023 to July 2024 among 308 randomly selected adult women. Data were collected using a pre-validated, semi-structured questionnaire based on the WHO STEPs approach. Statistical analysis was performed using SPSS version 25.0 and Epi Info™ version 7.2.

Results: The mean age was 43.7 ± 11.7 years. Hypertension prevalence was 36% (95% CI: 30.7%–41.7%), with 38.7% newly diagnosed cases. The prevalence of obesity was 61.4% and overweight was 18.8%. Among the study participants, 12.7% were current users of smokeless tobacco products. Only 5.8% consumed the WHO-recommended five servings of fruits and vegetables daily, while 78 (25.3%) participants perceived their salt intake to be excessive. A majority (74.4%) engaged in insufficient physical activity, expending less than 600 METs of energy per week. Hypertension was significantly associated with advancing age (44 years and above), lower socio-economic status, high salt intake, insufficient physical activity (<600 METs per week), overweight and obesity and increased waist-hip ratio.

Conclusion: Hypertension prevalence was high among urban women and was significantly associated with by modifiable lifestyle factors such as advancing age, lower socioeconomic status, high salt intake, insufficient physical activity, overweight/obesity and Increased waist-hip ratio. Strengthening community based screening, promoting healthy lifestyle practices and implementing effective tobacco control and dietary interventions are essential to reduce the burden of hypertension.

Keywords: Hypertension, Women, Determinants, Risk factors, Non-Communicable Diseases.

DOI: 10.25258/ijcpr.18.7.133

This is an Open Access article that uses a funding model which does not charge readers or their institutions for access and distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>) and the Budapest Open Access Initiative (<http://www.budapestopenaccessinitiative.org/read>), which permit unrestricted use, distribution, and reproduction in any medium, provided original work is properly credited.

Introduction:

Non-communicable diseases (NCDs) are the major cause of mortality worldwide, accounting for 41 million deaths annually (71% of all deaths). [1] Cardiovascular diseases (CVDs) are the leading contributor to NCD-related mortality and Hypertension remains one of the most important modifiable risk factors, resulting in significant morbidity and premature mortality. [2,3] Hypertension affects an estimated 1.28 billion

adults globally and remains a major public health challenge due to its high prevalence. [3] In India, an estimated 220 million individuals have hypertension. It is largely associated with modifiable risk factors such as unhealthy diet, physical inactivity, tobacco use, harmful alcohol consumption, overweight and obesity. [4,5,6] Recent national data indicate a rising trend in hypertension, particularly among women.

According to the National Family Health Survey (NFHS), the prevalence of hypertension among women increased from 8.8% in NFHS-4 (2015–2016) to 21.3% in NFHS-5 (2019–2021). A similar trend was observed in Tamil Nadu, where the prevalence increased from 8.3% to 24.8% during the same period [7,8]. In 2019, a higher proportion of cardiovascular disease deaths attributable to elevated systolic blood pressure was observed among women (54%) compared to men (51%). Hypertension remains a major risk factor for CVDs and is often underdiagnosed in women. Urbanization further contributes to this burden through lifestyle changes that increase the risk of hypertension.[3,9] Given the increasing burden of hypertension among women, its preventable nature, and the need for local evidence, the present study was undertaken to assess the prevalence and determinants of hypertension among urban adult women in the Urban Primary Health Centre area of Puliyanthope, Chennai.

Objectives:

1. To estimate the prevalence of Hypertension among adult women aged 18 years and above in the Urban Primary Health Centre area of Puliyanthope Chennai.
2. To determine the association between socio-demographic and behavioral risk factors and Hypertension among the study population.

Materials and Methods

This community based cross-sectional study was conducted among adult women aged 18 years and above residing in the Urban Primary Health Centre (UPHC) area of Puliyanthope, Chennai, and Tamil Nadu. The study was carried out from July 2023 to July 2024. Ethical approval was obtained from the Institutional Ethics Committee, Madras Medical College (No: 20102022).

A sample size of 308 was calculated based on a previously reported prevalence of hypertension of 23.7%, [10] with 95% confidence level, 5% absolute precision, and 10% allowance for non-response. The study population was selected using a multistage sampling technique from the five sectors of the Urban Primary Health Centre area. A line listing of eligible women was obtained from the family registers of the UPHC and Participants were selected by simple random sampling using computer-generated random numbers.

Women aged 18 years and above who had been residing in the study area for more than one year and who provided informed written consent were included in the study. Pregnant women, bedridden

individuals, and those who were unavailable despite three visits on three different occasions were excluded from the study.

Data were collected through house-to-house visits using an interviewer-administered, pre-validated, semi-structured questionnaire based on the WHO STEP wise approach for non-communicable disease risk factor surveillance.

The questionnaire included details on socio-demographic characteristics, behavioral risk factors and medical history.

Physical measurements including height, weight, waist circumference, hip circumference and blood pressure were measured following standard WHO STEPS protocols. All questions were explained in the local language (Tamil) after establishing rapport with the participants. The data were entered into MS Excel and analyzed using IBM SPSS version 25.0 and Epi Info™ version 7.2. The prevalence of hypertension was expressed as a proportion. Descriptive statistics were presented as mean and standard deviation for continuous variables and frequencies and percentages for categorical variables.

The Chi-square test was applied to determine statistical significance between hypertension and associated factors, with a p-value of <0.05 considered statistically significant. Odds ratios were calculated to assess the strength of association between hypertension and its risk factors.

Binary Logistic regression analysis was performed to identify independent predictors of hypertension after adjusting for potential confounders. The Chi-square test for trend was used to assess linear relationships between selected risk factors and hypertension.

Results

The mean age of the study participants was 43.7 ± 11.7 years, with 141 (45.8%) women belonging to the 35–49 years age group. Most participants 218(70.8%) had an educational status of middle school and below and 250 (81.2%) were homemakers.

Among the employed women, 77.5% were engaged in unskilled occupations. Based on the Modified Kuppuswamy Socioeconomic Scale 2024,[11] 184 (59.7%) participants belonged to the upper-lower socioeconomic class (IV). The majority were married (82.1%) and living in nuclear families (71.4%). (Table 1)

Table 1: Socio-demographic characteristics of the participants:

Characteristics	Category	Frequency (%)
Age (years)	20-34 years	65 (21.1%)
	35-49 years	141 (45.8%)
	50-64 years	89 (28.9%)
	65-75 years	13 (4.2%)
Educational status	Middle school and below	218 (70.8%)
	Above Middle school	90 (29.2%)
Working status	Home Maker	250 (81.2%)
	Working	58 (18.8%)
Marital status	Married	253 (82.1%)
	Widow/Separated/Divorced/Single	55 (17.9%)
Type of family	Nuclear	220 (71.4%)
	Three generation	88 (28.6%)
Socioeconomic status (Modified Kuppaswamy Socioeconomic Scale - 2024)	Upper middle (II)	2 (0.65%)
	Lower middle (III)	122 (39.6%)
	Upper lower (IV)	184 (59.7%)

Menstrual Status and Family History of Hypertension: Among the 308 study participants, 83 (26.9%) had attained menopause. The mean age at menopause was 50.6 ± 1.4 years. A family history of hypertension was reported by 37 (12.0%) participants

Behavioral Risk Factors: Among the 308 study participants, 39 (12.7%; 95% CI: 9.2%–16.9%) were current users of smokeless tobacco products with a mean duration of use of 33.69 ± 8.9 years. Among smokeless tobacco users, snuff by the nose was the most commonly used form, reported by 19 (48.7%) participants, followed by chewing tobacco in 11 (28.2%) and betel quid in 9 (23.1%) participants. None of the study participants had ever consumed alcohol.

Regarding dietary practices, 205 (67.0%) participants reported consuming fruits, while all participants consumed vegetables daily, with a mean vegetable intake of two servings per day. Only 18 (5.8%) participants met the WHO recommendation of consuming at least five servings of fruits and vegetables per day. Regarding salt intake the mean daily salt consumption was 8.26 ± 1.55 grams. Only 7 (2.3%) participants met the WHO recommendation of consuming less than 5 grams of salt per day while 78 (25.3%) participants perceived their salt intake to be excessive.

All study participants were engaged in work-related moderate-intensity physical activity. The median duration of total physical activity was 85 minutes per week (IQR: 105 minutes), ranging from 25 to 360 minutes per week. Based on metabolic equivalent tasks (METs), 79 (25.6%) participants achieved a physical activity level of ≥ 600 MET-minutes per week. The median total physical activity was 340 MET-minutes per week (IQR: 420).

Anthropometric Measurements: Among the study participants, 61 (19.8%) had a normal BMI, 58 (18.8%) were overweight and 189 (61.4%) were obese. Overall, 247 (80.2%) participants belonged to the overweight or obese category. The mean BMI was 26.46 ± 3.9 kg/m². A raised waist circumference (>80 cm) was observed in 232 (75.3%) participants, while 76 (24.7%) had a waist circumference of ≤ 80 cm.

Blood Pressure Measurements: The mean systolic blood pressure of all study participants was 123.97 ± 18.01 mm of Hg and mean diastolic blood pressure was 78.32 ± 10.91 mm of Hg. Among the study participants, 111 (36%) were diagnosed to be hypertensives and 15.2% were pre-hypertensives. Among those with hypertension, 43 (38.7%) were newly diagnosed and 68 (61.3%) were known cases. The overall prevalence of hypertension was 36% with a 95% CI of (30.7%– 41.7%). (Table 2)

Table 2: Classification of participants based on blood pressure level

Blood Pressure classification	Frequency (n-308)	Percentage%
Normal BP	150	48.7%
Prehypertension	47	15.2%
Known Hypertensives	68	22.1%
New Hypertensives	43	14%
Total	308	100%

Binary logistic regression between risk factors and hypertension

Table 3: Binary logistic regression between risk factors and hypertension

Risk factors	Category	Hypertension		p value	aOR	95%CI for aOR
		Yes	No			
Age in years (Mean age 44years)	≥Mean age	96 (60.8%)	62 (39.2%)	0.021*	3.44	1.20- 9.825
	<Mean Age	15 (10%)	135 (90%)			
Education	<high school	102 (46.8%)	116 (53.2%)	0.225	2.47	0.57- 10.66
	≥High school	9 (10%)	81 (90%)			
Relationship status	Married	79 (31.2%)	174 (68.8%)	0.119	0.42	0.143-1.247
	Others	32 (58.2%)	23 (41.8%)			
Socio-Economic status	Upper Lower	83 (45.1%)	101 (54.9%)	0.036*	2.58	1.062-6.287
	Middle class	28 (22.6%)	96 (77.4%)			
Type of Family	Three generation	51 (58%)	37 (42%)	0.369	1.56	0.589-4.15
	Nuclear family	60 (27.3%)	160 (72.7%)			
Smokeless Tobacco usage	Yes	28 (71.8%)	11 (28.2%)	0.128	2.32	0.784-6.902
	No	83 (30.9%)	186 (69.1%)			
High salt intake	Yes	67 (85.9%)	11 (14.1%)	<0.001*	19.44	7.91-47.78
	No	44 (19.1%)	186 (80.9%)			
Insufficient Physical activity	Yes	91 (39.7%)	138 (60.3%)	0.022*	3.45	1.19-10.009
	No	20 (25.3%)	59 (74.7%)			
Family history	Yes	6 (16.2%)	31 (83.8%)	0.196	3.02	0.56 -16.20
	No	105 (38.7%)	166 (61.3%)			
Attained Menopause	Yes	61 (73.5%)	22 (53.1%)	0.058	2.61	0.968-7.067
	No	50 (22.2%)	175 (77.8%)			
Overweight& Obesity	Yes	106 (42.9%)	141(57.1%)	0.032*	5.11	1.152-22.69
	No	5 (8.2%)	56 (91.8%)			
Waist-Hip ratio	Increased	81 (58.7%)	57 (41.3%)	0.009*	2.92	1.3009-6.55
	Normal	30 (17.6%)	140 (82.4%)			

After adjusting for various independent variables, it was found that participants in the age group of 44 years and above had 3.44 times higher odds of developing hypertension (aOR: 3.44; 95% CI: 1.20-9.825). Those belonging to the upper-lower class socioeconomic status had a 2.58 times higher risk of developing hypertension compared to the middle class (aOR: 2.58; 95% CI: 1.062-6.287). Participants who reported high salt intake had a 19.44 times higher risk of developing hypertension (aOR: 19.44; 95% CI: 7.91-47.78). Participants with insufficient physical activity (<600METs per week) (aOR: 3.45; 95% CI: 1.19-10.01), overweight/obesity (aOR: 5.11; 95% CI: 1.15-22.69) and Increased waist-hip ratio (aOR: 2.92;

95% CI: 1.30-6.55) were also independently associated with hypertension (Table 3). The Chi-square test for linear trend demonstrated a statistically significant increase in the prevalence of hypertension with increasing age (χ^2 trend = 81.259, $p < 0.001^*$). The prevalence of hypertension increased from 1.5% among participants aged 20-34 years to 76.9% among those aged 65-75 years. Similarly, a statistically significant increasing trend was observed between BMI and hypertension (χ^2 trend = 65.7, $p < 0.001^*$). The prevalence of hypertension increased from 8.2% among participants with normal BMI to 72.0% among those with a BMI ≥ 30 kg/m². (Figure 1 and Figure 2)

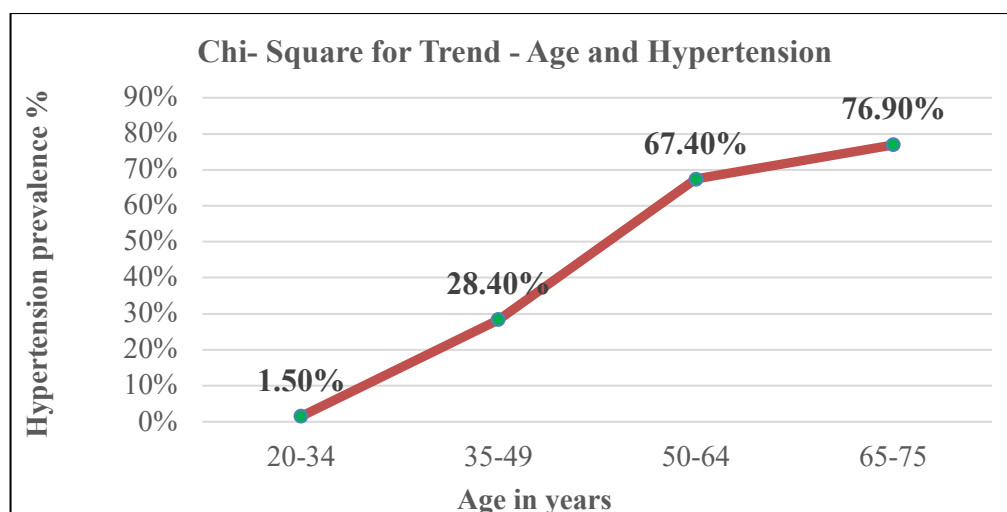


Figure 1: Chi-Square for Trend - Age and Hypertension

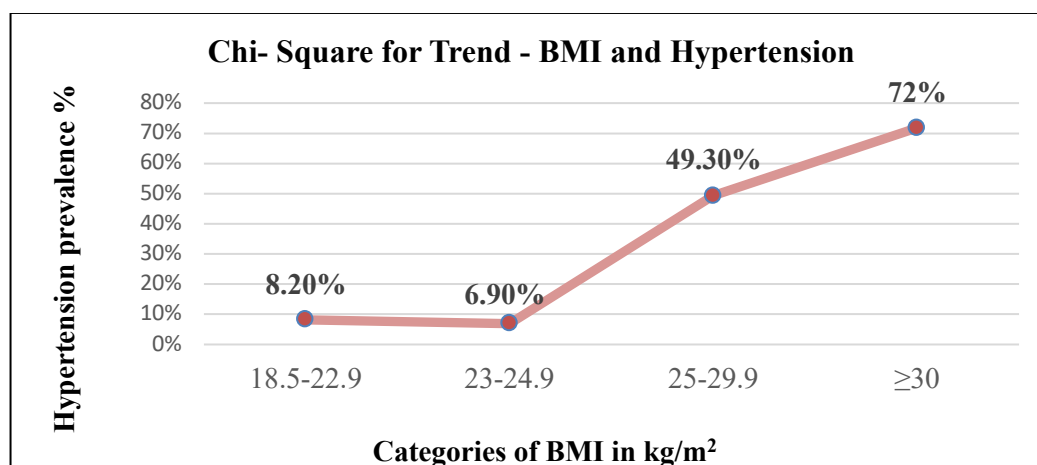


Figure 2: Chi-Square for Trend - BMI and Hypertension

Discussion:

This community based cross-sectional study was conducted among 308 adult women aged 18 years and above in the Urban Primary Health Center area of Puliyanthope, Chennai, Tamil Nadu. The present study reported a hypertension prevalence of 36% (95% CI: 30.7%–41.7%) among urban adult women. Of the total participants, 22.1% were previously diagnosed, 14% were newly diagnosed and 15.3% were prehypertensive, highlighting a considerable proportion of undiagnosed and at-risk individuals. The observed prevalence is higher than the national (21.3%) and Tamil Nadu state (24.8%) estimates reported in NFHS-5 (2019–2021), [8] indicating a high burden of hypertension among urban women.

Comparable findings have been reported in several studies. Selvavinayagam et al.[12] (2020) documented a prevalence of 28.9% among women in Tamil Nadu, while the ICMR-INDIAB [13] study reported 32.6%, with a higher prevalence in urban areas (40.7%) than rural areas (33%). Similarly, Vanishree Shriram et al. [14] (2018)

reported a prevalence of 41.8% among tribal women in Vellore, and Sanjay K. Mohanty et al. [15] (2018) observed a prevalence of 43.7% among women at the national level.

In contrast, earlier studies conducted in Chennai [16] (2007), Vellore [17] (2012), and Coimbatore [18] (2016) reported comparatively lower prevalence rates ranging from 16.1% to 28%. This increase in prevalence over time may be attributable to rapid urbanization, lifestyle transitions, and dietary changes, differences in study settings, population characteristics and inclusion of exclusively urban participants. These findings reinforce the growing concern of hypertension among women in India and the need for targeted screening and early intervention strategies. In the present study, hypertension was more prevalent among participants aged 44 years and above, those belonging to the upper lower socioeconomic class, individuals with high salt consumption, insufficient physical activity, overweight and obesity and those with a raised waist-hip ratio. There is a statistically significant relationship between age and hypertension, as well

as between BMI and hypertension, as evidenced by the chi-square for the linear trend test, indicating that hypertension increases with age and BMI.

These findings are consistent with previous studies. Vanishree Shriram et al. [14] demonstrated significant association of hypertension with increasing age and obesity. Similarly, Rumana J Khan et al. [19] reported significant associations with increasing age and lower socioeconomic status among Nepali women. Shyambhatee Behera et al. [20] found a higher prevalence among women aged >45 years and those with lower educational status, while Murarkar et al. [21] identified associations with occupation, tobacco use, alcohol consumption, and obesity.

Other studies across India further support these observations. Bhagyalaxmi Sidenur et al. [22] reported associations with sedentary lifestyle, high salt intake and obesity in North Karnataka, while Indrapal Meshram et al. [23] observed higher prevalence among women with high salt intake and overweight in northeastern states and Anu Mary Oommen et al. in Vellore highlighted the roles of age, obesity, physical inactivity and central obesity as key determinants of hypertension.

No statistically significant association was found between hypertension and family history in our study. Similar findings were reported by Vijna et al. [24] in Uttar Pradesh. However, this contrasts with studies conducted in Vellore, [17] North Karnataka, [22] and Puducherry, [25] which reported a significant association. The lack of association in this study could be due to recall bias or lack of awareness among participants regarding family members' hypertension status. Hypertension is a multifactorial condition, influenced not only by genetic predisposition but also by modifiable lifestyle factors such as diet, physical inactivity, stress and substance use. These findings highlight the importance of focusing on comprehensive lifestyle interventions alongside genetic risk assessment.

Conclusion

This study showed a high prevalence of hypertension (36%) among urban adult women in Puliyanthope, Chennai, indicating an important and growing public health concern.

Hypertension was significantly associated with increasing age, lower socioeconomic status, high salt intake, insufficient physical activity, and overweight/obesity and raised waist-hip ratio. The strong association with modifiable risk factors highlights the critical role of lifestyle factors in the development of hypertension.

This study recommends strengthening community based screening and treatment services through

existing initiatives such as the National Programme for Non-Communicable Diseases (NP-NCD) and Makkalai Thedi Maruthuvam (MTM) to facilitate early detection and timely management of hypertension among women. Targeted health education campaigns should focus on the harmful effects of smokeless tobacco use, excessive salt consumption, unhealthy dietary practices and physical inactivity.

Policies aimed at reducing the availability of smokeless tobacco products and regulating sodium content in processed foods need to be reinforced. Community-based interventions promoting fruit and vegetable consumption and the development of safe spaces for physical activity should be encouraged.

Behavior change communication strategies, including peer support, endorsement by influential community figures and interactive workshops, should be utilized to increase awareness regarding the importance of regular physical activity and maintaining an ideal body weight. Regular follow-up, patient support mechanisms, and measures to improve treatment adherence are also necessary to achieve optimal blood pressure control and prevent cardiovascular complications.

Acknowledgement: The authors express their sincere gratitude to all the study participants for their valuable time and cooperation. We also acknowledge the support of the Additional Commissioner (Health) and the City Health Officer of the Greater Chennai Corporation, the Medical Officer and staff of Puliyanthope Urban Primary Health Centre, Chennai, for their assistance and cooperation during the conduct of the study. Their support and contribution played a crucial role in the successful completion of this research.

References

1. World Health Organization EMRO | The epidemiological transition | Volume 2, issue 1 | EMHJ volume 2, 1996 [Internet]. [cited 2024 Feb 25]. Available from: <https://www.emro.who.int/emhj-volume-2-1996/volume-2-issue-1/article2.html>
2. World Health Organization, Non communicable diseases country profiles-2018. [Internet]. [cited 2024 Feb 25]. Available from: <https://www.who.int/publications-detail-redirect/9789241514620>
3. World Health Organization. Global report on Hypertension- The Race Against Silent Killer. 2023.
4. Prenissl J, Manne-Goehler J, Jaacks LM, Prabhakaran D, Awasthi A, Bischops AC, et al. Hypertension screening, awareness, treatment, and control in India: A nationally representative cross-sectional study among

- individuals aged 15 to 49 years. PLoS Med. 2019 May;16(5):e1002801. doi:10.1371/journal.pmed.1002801 PubMed PMID: 31050680; PubMed Central PMCID: PMC6499417.
5. Google Docs [Internet]. [cited 2024 Jul 12]. Indian Hypertension Control Initiative (IHCI) Progress report- 2022. Available from: https://drive.google.com/file/d/1-IE3mprFWWpv-5J28JIMjSd6DL8FQRSW/view?usp=embed_facebook
 6. Law MR, Morris JK, Wald NJ. Use of blood pressure lowering drugs in the prevention of cardiovascular disease: meta-analysis of 147 randomised trials in the context of expectations from prospective epidemiological studies. BMJ. 2009 May 19;338:b1665. doi:10.1136/bmj.b1665 PubMed PMID: 19454737; PubMed Central PMCID: PMC2684577.
 7. Ministry of Health and Family Welfare, Government of India, National Family Health Survey- 4 (2015-2016). [Internet]. [cited 2024 Jun 23]. Available from: <https://rchiips.org/nfhs/NFHS-4Reports/India.pdf>
 8. Ministry of Health and Family Welfare, Government of India, National Family Health Survey- 5, (2019-2021) [Internet]. [cited 2024 Feb 26]. Available from: https://main.mohfw.gov.in/sites/default/files/NFHS-5_Phase-II_0.pdf
 9. Gudmundsdottir H, Høiegggen A, Stenehjem A, Waldum B, Os I. Hypertension in women: latest findings and clinical implications. Ther Adv Chronic Dis. 2012 May;3(3):137–46. doi:10.1177/2040622312438935 PubMed PMID: 23251774; PubMed Central PMCID: PMC3513905.
 10. Ramakrishnan S, Zachariah G, Gupta K, Shivkumar Rao J, Mohanan PP, Venugopal K, et al. Prevalence of hypertension among Indian adults: Results from the great India blood pressure survey. Indian Heart J. 2019 Jul 1;71(4):309–13. doi:10.1016/j.ihj.2019.09.012
 11. Irena Mandal, Samar Raesa Hossain. Update of modified Kuppaswamy scale for the year 2024. doi:<https://dx.doi.org/10.18203/2394-6040.ijcmph20241863>
 12. Selvavinayagam TS, Viswanathan V, Ramalingam A, Kangusamy B, Joseph B, Subramaniam S, et al. Prevalence of Noncommunicable Disease (NCDs) risk factors in Tamil Nadu: Tamil Nadu STEPS Survey (TN STEPS), 2020. PloS One. 2024; 19(5):e0298340. doi:10.1371/journal.pone.0298340 PubMed PMID: 38718057; PubMed Central PMCID: PMC11078398.
 13. Anjana RM, Unnikrishnan R, Deepa M, Pradeepa R, Tandon N, Das AK, et al. Metabolic non-communicable disease health report of India: the ICMR-INDIAB national cross-sectional study (ICMR-INDIAB-17). Lancet Diabetes Endocrinol. 2023 Jul 1;11(7):474–89. doi:10.1016/S2213-8587(23)00119-5 PubMed PMID: 37301218.
 14. Shriraam V, Mahadevan S, Arumugam P. Prevalence and Risk Factors of Diabetes, Hypertension and Other Non-Communicable Diseases in a Tribal Population in South India. Indian J Endocrinol Metab. 2021 Aug;25(4): 313. doi:10.4103/ijem.ijem_298_21 PubMed PMID: 35136738.
 15. Mohanty SK, Pedgaonkar SP, Upadhyay AK, Kämpfen F, Shekhar P, Mishra RS, et al. Awareness, treatment, and control of hypertension in adults aged 45 years and over and their spouses in India: A nationally representative cross-sectional study. PLOS Med. 2021 Aug 24;18(8):e1003740. doi:10.1371/journal.pmed.1003740
 16. Mohan V, Deepa M, Farooq S, Datta M, Deepa R. Prevalence, awareness and control of hypertension in Chennai--The Chennai Urban Rural Epidemiology Study (CURES-52). J Assoc Physicians India. 2007 May;55:326–32. PubMed PMID: 17844691.
 17. Oommen AM, Abraham VJ, George K, Jose VJ. Prevalence of risk factors for non-communicable diseases in rural & urban Tamil Nadu. Indian J Med Res. 2016 Sep;144(3):460–71. doi:10.4103/0971-5916.198668 PubMed PMID: 28139545; PubMed Central PMCID: PMC5320852.
 18. Sunderasan M, Swaminathan K, Ganesan V, Alexander T, Palaniswami N. Prevalence of hypertension and associated risk factors in Suburban Tamil Nadu. Apollo Med. 2019 Jan 1;16:216. doi:10.4103/am.am_68_19
 19. Khan RJ, Stewart CP, Christian P, Schulze KJ, Wu L, LeClerq SC, et al. A cross-sectional study of the prevalence and risk factors for hypertension in rural Nepali women. BMC Public Health. 2013 Dec;13(1):1. doi:10.1186/1471-2458-13-55
 20. Behera S, Chhabra P, Rajoura OP. Prevalence and Predictors of Risk Factors for Noncommunicable Diseases among women in an Urbanized Village of India. Indian J Community Med Off Publ Indian Assoc Prev Soc Med. 2022;47(2):266–71. doi:10.4103/ijcm.ijcm_603_21 PubMed PMID: 36034254; PubMed Central PMCID: PMC9400354.
 21. Murarkar S, Pokale A, Gothankar J, Deshmukh R, Gupta V. Prevalence of hypertension and associated risk factors in urban slums: A community based cross sectional study in India. Indian J Public Health. 2023;67(3):474–6. doi:10.4103/ijph.ijph_1636_22 PubMed PMID: 37929395.
 22. Sidenur B, Shankar G. A Cross-Sectional Study of Hypertension among 20–40 Years Old Residing in an Urban Area of Bagalkot

- City, North Karnataka. Indian J Community Med Off Publ Indian Assoc Prev Soc Med. 2023;48(1):98–102. doi:10.4103/ijcm.ijcm_255_22 PubMed PMID: 37082399; PubMed Central PMCID: PMC10112762.
23. Meshram I, Boiroju NK, Longvah T. Prevalence of overweight/obesity, hypertension and its associated factors among women from Northeast India. Indian Heart J. 2022;74(1):56–62. doi:10.1016/j.ihj.2021.12.009 PubMed PMID: 34954135; PubMed Central PMCID: PMC8891027.
24. Vijna, Mishra CP. Prevalence and predictors of hypertension: Evidence from a study of rural India. J Fam Med Prim Care. 2022 Mar;11(3):1047–54. doi:10.4103/jfmpe.jfmpe_967_21 PubMed PMID: 35495805; PubMed Central PMCID: PMC9051678.
25. Paul PJ, Samson R, William A, Akila B, Purty AJ, Bazroy J. Prevalence and factors associated with hypertension: a community based cross-sectional study among adults in an urban area of Puducherry, South India. Int J Community Med Public Health. 2017 Apr 24;4(5):1620. doi:10.18203/2394-6040.ijcmph20171774.