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Original Research Article

PREVALENCE OF PRE-HYPERTENSION AND HYPERTENSION AND ASSOCIATED FACTORS AMONG ADULTS IN A RURAL AREA OF KANYAKUMARI DISTRICT, TAMIL NADU: A COMMUNITY-BASED CROSS-SECTIONAL STUDY

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ABSTRACT

Background: Hypertension is a major modifiable risk factor for cardiovascular disease and contributes to morbidity and premature mortality in India. Rural populations are increasingly affected because of demographic transition. Early identification of pre-hypertension provides an opportunity for prevention. This study aimed to estimate the prevalence of pre-hypertension and hypertension and identify associated risk factors among adults in a rural area of Kanyakumari district, Tamil Nadu.

Materials and Methods: A community-based cross-sectional study was conducted among adults aged ≥18 years residing in five village panchayats of Thiruvattar block, Kanyakumari district. A multistage random sampling technique was used to recruit 435 participants. Data were collected using a pretested questionnaire. Blood pressure was measured using a mercury sphygmomanometer. Descriptive statistics estimated prevalence, and Chi-square test assessed associations between risk factors and blood pressure status.

Results: The prevalence of pre-hypertension and hypertension was 32.4% and 24.1%, respectively, while 43.4% had normal blood pressure. Increasing age, male gender, lower socioeconomic status, smoking, alcohol consumption, physical inactivity, family history of hypertension, high salt intake, low fruit and vegetable consumption, and higher body mass index were significantly associated with elevated blood pressure ($p<0.05$).

Interpretation & conclusion: Majority of the study population had elevated blood pressure. The prevalence of pre-hypertension indicates a population at risk of progressing to hypertension. Targeted interventions addressing modifiable lifestyle factors may help reduce the burden of hypertension and cardiovascular disease communities.

Keywords: Hypertension, Pre-hypertension, Rural Health, Blood pressure, Risk Factors, Lifestyle Factors.

INTRODUCTION

Non-communicable diseases (NCDs) are the leading cause of mortality worldwide, accounting for approximately 43 million deaths annually, which represents nearly 74–75% of all global deaths.[1] A disproportionate burden is borne by low- and middle-income countries, contributing to nearly three-quarters of NCD-related deaths. Importantly, around 18 million deaths occur prematurely before the age of 70 years, with over 80% of these premature deaths occurring in these regions.[1]
This highlights the growing public health challenge posed by NCDs in resource-constrained settings.

Cardiovascular diseases (CVDs) are the largest contributor to NCD mortality, responsible for nearly 17.9 million deaths annually, with hypertension being the most significant modifiable risk factor.[1,2] Globally, hypertension affects approximately 1.28 billion adults aged 30–79 years, of whom nearly two-thirds reside in low- and middle-income countries.[2] Despite its high prevalence, awareness, treatment, and control rates remain suboptimal, particularly in developing regions.

In India, hypertension has emerged as a major public health concern, with recent national estimates suggesting a prevalence of approximately 28–30% among adults.[3] Findings from large-scale studies such as the ICMR-INDIAB study indicate that the prevalence may be as high as 30–35%, reflecting a substantial and increasing burden.[4] Rural populations are no longer relatively protected, with recent data indicating prevalence rates of around 20–25%, underscoring the epidemiological transition in these areas.[3,5] However, awareness and control remain poor, with only a small proportion of hypertensive individuals achieving optimal blood pressure control.

The concept of "prehypertension" by the Seventh Joint National Committee (JNC-7) identifies individuals at increased risk of progression to hypertension and cardiovascular disease. Early identification of such individuals provides a critical opportunity for preventive interventions.

Given the rising burden, low awareness, and inadequate control of hypertension in rural India, there is a need for region-specific epidemiological data. The present study aims to estimate the prevalence of prehypertension and hypertension and identify associated risk factors among adults in a rural population, thereby informing targeted prevention and control strategies.

MATERIALS AND METHODS

Study design and setting

A community based cross-sectional study was conducted in the Thiruvattar Block of Kanyakumari district, Tamil Nadu, India, which comprises several rural village panchayats under its administrative jurisdiction.

Study population

The study population included adult residents aged 18 years and above residing in the rural Thiruvattar block, reflecting the rural demographic profile relevant for assessing hypertension prevalence and associated risk factors.

Sample size calculation

The sample size was calculated based on the estimated prevalence of prehypertension reported by Prashanth Kokiwar et al,[6] which was 18.8%. Using the standard formula for sample size estimation in prevalence studies, $n = 4pq/d^2$, where p represents the prevalence, $q = 100 - p$, and d denotes the allowable error, the required sample size was derived.

Substituting the values, $p = 18.8\%$ and $q = 81.2\%$. The relative precision (d) was taken as 20% of the prevalence, i.e., $(18.8 \times 20/100) = 3.76$. Thus, $d^2 = (3.76)^2$. On applying these values to the formula, the calculated minimum sample size was $n = 432$. This sample size was considered adequate to estimate the prevalence of prehypertension and hypertension with acceptable precision in the study population.

A multistage random sampling technique was employed for the selection of study participants. In the first stage, Thiruvattar Block of Kanyakumari district was selected by simple random sampling from the list of blocks. The total population of Thiruvattar Block is 177,725.

In the second stage, a list of all village panchayats within the block was obtained from the Block Development Office, and five village panchayats—Aruvikkarai, Kannanur, Kattathurai, Pechiparai, and Yettacode—were selected using simple random sampling. The population of these selected panchayats varied, with Aruvikkarai having 5,203, Kannanur 5,992, Kattathurai 14,685, Pechiparai 6,784, and Yettacode 62,226 residents. Despite this variation in population size across the selected clusters, an equal number of participants were recruited from each village to ensure uniform representation and operational feasibility.

In the third stage, all streets and roads within each selected village were enumerated and assigned serial numbers. From each village, four streets or roads were selected by simple random sampling using the lottery method. A house-to-house survey was then conducted in the selected streets. Starting from the first household, all eligible adults present at the time of visit were invited to participate in the study. A fixed number of 22 participants were recruited from each selected street or road. If the required number of participants was not achieved within a selected street, data collection was continued in the adjacent street until the desired sample size was reached.

Operational definitions

For the purpose of this study, hypertension was defined in accordance with the criteria recommended by the World Health Organization (WHO) and the Seventh Report of the Joint National Committee (JNC 7). An individual was classified as hypertensive if the systolic blood pressure (SBP) was ≥140 mmHg and/or the diastolic blood pressure (DBP) was ≥90 mmHg at the time of assessment. An individual was classified as having prehypertension if the systolic blood pressure (SBP) ranged between 120–139 mmHg and/or the diastolic blood pressure (DBP) ranged between 80–89 mmHg at the time of assessment.

Ethical considerations

The study was approved by the Institutional Human Ethics Committee of Sree Mookambika Institute of Medical Sciences. Written informed consent was obtained from the study participants before participation.

Data Collection

Data were collected using a pretested semi-structured interview schedule administered by the investigator. The questionnaire included sections on sociodemographic characteristics and relevant risk factors. The content validity of the questionnaire was ensured through review by subject experts in Community Medicine and Public Health. Necessary modifications were made based on their suggestions to improve clarity, relevance, and comprehensiveness. The tool was pretested in a population similar to the study setting, and appropriate revisions were carried out prior to the final data collection. Reliability of the questionnaire was assessed during the pilot study by evaluating internal consistency. The tool demonstrated acceptable reliability, and standardized procedures were followed during data collection to minimize interviewer bias and ensure consistency.

Parameters Studied

The parameters assessed included blood pressure, height, weight, and body mass index (BMI).

Anthropometric Measurements

Height was measured using a portable stadiometer. Participants were asked to remove footwear and headgear and stand erect with feet together, heels against the vertical board, and head positioned in the Frankfurt plane. The measuring arm was lowered gently to rest on the vertex of the head, and height was recorded in centimeters.

Weight was measured using a calibrated portable weighing scale placed on a firm, flat surface. The scale was set to zero before each measurement. Participants were asked to remove footwear and stand still at the center of the scale with arms at their sides. Weight was recorded in kilograms.

Body mass index (BMI) was calculated using the formula weight (kg)/height (m^2) and categorized according to the World Health Organization (WHO) classification.

Blood Pressure Measurement

Blood pressure was measured using a standard mercury sphygmomanometer following recommended guidelines. Participants were seated comfortably and allowed to rest for at least 15 minutes prior to measurement. The measurement was taken in the sitting position with the arm supported at heart level.

An appropriately sized cuff was applied to the left upper arm after removing or loosening clothing. The radial or brachial pulse was palpated, and the cuff was inflated until the pulse disappeared, followed by an additional 30 mmHg inflation. The stethoscope bell was placed over the cubital fossa, and the cuff was deflated slowly. The systolic blood pressure (SBP) was recorded at the first appearance of Korotkoff sounds, and the diastolic blood pressure (DBP) at the disappearance of sounds.

Three readings were obtained at intervals of at least three minutes. The mean of the second and third readings was considered for analysis.

Statistical Analysis

Data collected from the field were checked daily for completeness and consistency by the investigator. The data were coded and entered into Microsoft Excel. Double entry verification was performed for a subset of questionnaires to minimize data entry errors. Data cleaning was carried out prior to analysis to identify and rectify inconsistencies, missing values, and outliers.

The cleaned dataset was then exported to SPSS for analysis. Descriptive statistics were used to summarize the study variables. Continuous variables such as age, systolic blood pressure, diastolic blood pressure, height, weight, and body mass index were expressed as mean and standard deviation (SD) or median with interquartile range (IQR), depending on the distribution. Categorical variables such as gender, socioeconomic status, and blood pressure categories (Normal, prehypertension, and hypertension) were presented as frequencies and percentages.

Normality of continuous variables was assessed using appropriate statistical tests and graphical methods. Based on distribution, suitable parametric or non-parametric tests were applied where required. Inferential statistics were used to examine the association between independent variables (sociodemographic factors, BMI, and other risk factors) and outcome variables (prehypertension and hypertension). The Chi-square test (or Fisher's exact test, where applicable) was used to assess associations between categorical variables. A p-value of <0.001 was considered statistically significant. Where relevant, measures of association such as odds ratios (OR) with 95% confidence intervals (CI) were calculated to quantify the strength of associations.

RESULTS

A total of 435 adults aged 18 years and above participated in the study.

Table 1 shows the sociodemographic and lifestyle characteristics of the study participants. Of the 435 participants, 143 (32.9%) were aged <30 years, 99 (22.8%) were aged 30–39 years, 76 (17.5%) were aged 40–49 years, 58 (13.3%) were aged 50–59 years, and 59 (13.6%) were aged ≥60 years. Females constituted 246 (56.6%) participants, while males accounted for 189 (43.4%). Most participants belonged to socioeconomic class II [242 (55.6%)], were married [324 (74.5%)], and belonged to nuclear families [246 (56.6%)]. Secondary school education was the most common educational status [157 (36.1%)]. Regarding employment, 166 (38.2%) participants were employed, 129 (29.7%) were homemakers, 56 (12.9%) were unemployed, 52 (12.0%) were students, and 32 (7.4%) were retired. Overweight and obesity were observed among 104 (23.9%) and 21 (4.8%) participants, respectively. Current smoking and alcohol consumption were

reported by 75 (17.2%) and 68 (15.6%) participants, respectively. Inadequate physical activity was reported by 248 (57.0%) participants, while 156 (35.9%) reported a family history of hypertension.

Table 2 shows the distribution of participants according to blood pressure status. Of the 435 participants, 189 (43.4%) had normal blood pressure, 141 (32.4%) had pre-hypertension, and 105 (24.1%) had hypertension. Overall, 246 (56.5%) participants had elevated blood pressure in the form of either pre-hypertension or hypertension.

Table 3 shows the association between selected factors and blood pressure status. Age was significantly associated with blood pressure status (χ^2=120.833, p<0.001). The prevalence of hypertension increased from 12 (8.4%) among participants aged <30 years to 39 (66.1%) among those aged ≥60 years. The highest proportion of pre-hypertension was observed among participants aged 40–49 years [34 (44.7%)].

Gender was significantly associated with blood pressure status (χ^2=24.778, p<0.001). Among males, 79 (41.8%) had pre-hypertension and 53 (28.0%) had hypertension, compared to 62 (25.2%) and 52 (21.1%) among females, respectively. Socioeconomic status was also significantly associated with blood pressure status (p<0.001), with hypertension being more prevalent among participants belonging to lower socioeconomic classes.

Lifestyle-related factors showed significant associations with elevated blood pressure. Smokers had a higher prevalence of pre-hypertension [37 (49.3%)] and hypertension [27 (36.0%)] compared to non-smokers. Similarly, alcohol consumers had higher proportions of pre-hypertension [36 (52.9%)] and hypertension [24 (35.3%)] compared to non-alcohol consumers (p<0.001). Hypertension was more common among participants with inadequate physical activity than among physically active participants [71 (28.6%) vs. 34 (18.2%); p=0.031]. Family history of hypertension was significantly associated with elevated blood pressure (p<0.001).

Dietary factors including low fruit and vegetable intake, consumption of >5 g salt/day, and addition of extra salt to food were significantly associated with pre-hypertension and hypertension (p<0.001). The Body mass index status was (χ^2=16.957, p=0.009), with obese participants showing the highest prevalence of pre-hypertension [11 (52.4%)] and hypertension [7 (33.3%)].

Table 1: Socio-demographic and Clinical Characteristics of the Study Population (n = 435)

S. No	Characteristics	Category	Frequency (n)	Percentage (%)
1	Age	<30 years	143	32.9
		30–39 years	99	22.7
		40–49 years	76	17.5
		50–59 years	58	13.3
		≥60 years	59	13.6
2	Gender	Male	189	43.4
		Female	246	56.6
3	Religion	Hindu	230	52.9
		Christian	183	42.1
		Muslim	22	5
4	Marital Status	Married	324	74.5
		Single	85	19.5
		Widowed	26	6.0
5	Family Type	Nuclear	246	56.6
		Joint	164	37.7
		Three-generation	25	5.7
6	Education	Illiterate	43	9.9
		Primary school	99	22.7
		Secondary school	157	36.1
		Literate	69	15.9
		Graduate	67	15.4
7	Employment Status	Employed	166	38.1
		Housewife	129	29.6
		Unemployed	56	12.9
		Student	52	12.0
		Retired	32	7.4
8	BMI	Underweight	53	12.2
		Normal	257	59.1
		Overweight	104	23.9
		Obese	21	4.8
9	Smoking Status	Non-smoker	360	82.8
		Smoker	75	17.2
10	Alcohol Intake	Non-alcoholic	367	84.4
		Alcoholic	68	15.6
11	Type of Tobacco	Beedi	26	33.8
		Cigarette	38	49.4
		Smokeless Tobacco	13	16.9
12	Physical Activity	Inadequate	248	57.0
		Adequate	187	43.0

13	Family History of Hypertension	Present	156	35.9
		Absent	279	64.1
14	Fruit & Vegetable Intake	<5/day	322	74.0
		≥5/day	113	26.0
15	Daily salt Intake	>5 g/day	219	50.3
		≤5 g/day	216	49.7
16	Extra salt Intake	Yes	111	25.5
		No	324	74.5
17	Blood Pressure Status	Normal	189	43.4
		Prehypertension	141	32.4
		Hypertension	105	24.1
18	Socioeconomic Status	Class I	114	26.2
		Class II	242	55.6
		Class III	56	12.9
		Class IV	23	5.3

Table 2: Prevalence of Blood Pressure Categories among Study Participants (n= 435)

S. No	Blood pressure category	Frequency (n)	Percentage (%)
1	Normal	189	43.5
2	Pre-hypertension	141	32.4
3	Hypertension	105	24.1
	Total	435	100

Table 3: Factors Associated with Pre-hypertension and Hypertension

S. No	Characteristic	Category	Normal n(%)	Pre-HTN n(%)	HTN n(%)	Total n (435)	χ^2	p-value
1	Age	<30 years	90 (62.9)	41 (28.7)	12 (8.4)	143	120.833	<0.001
		30–39 years	53 (53.5)	35 (35.4)	11 (11.1)	99		
		40–49 years	24 (31.6)	34 (44.7)	18 (23.7)	76		
		50–59 years	9 (15.5)	24 (41.4)	25 (43.1)	58		
		≥60 years	13 (22.0)	7 (11.9)	39 (66.1)	59		
2	Gender	Male	57 (30.2)	79 (41.8)	53 (28.0)	189	24.778	<0.001
		Female	132 (53.7)	62 (25.2)	52 (21.1)	246		
3	Religion	Hindu	109 (47.4)	63 (27.4)	58 (25.2)	230	8.480	0.075
		Christian	69 (37.7)	69 (37.7)	45 (24.6)	183		
		Muslim	11 (50.0)	9 (40.9)	2 (9.1)	22		
4	Marital status	Single	58 (68.2)	21 (24.7)	6 (7.1)	85	32.686	<0.001
		Married	123 (38.0)	113 (34.9)	88 (27.2)	324		
		Widowed	8 (30.8)	7 (26.9)	11 (42.3)	26		
5	Family type	Nuclear	114 (46.3)	90 (36.6)	42 (17.1)	246	36.707	<0.001
		Joint	64 (39.0)	37 (22.6)	63 (38.4)	164		
		Third generation	11 (44.0)	14 (56.0)	0 (0)	25		
6	Education	Illiterate	5 (11.6)	17 (39.5)	21 (48.8)	43	42.061	<0.001
		Literate	35 (50.7)	16 (23.2)	18 (26.1)	69		
		Primary school	32 (32.3)	44 (44.4)	23 (23.2)	99		
		Secondary school	76 (48.4)	49 (31.2)	32 (20.4)	157		
		Graduate	41 (61.2)	15 (22.4)	11 (16.4)	67		
7	Employment status	Employed	64 (38.6)	69 (41.6)	33 (19.9)	166	52.426	<0.001
		Unemployed	21 (37.5)	21 (37.5)	14 (25.0)	56		
		Student	37 (71.2)	11 (21.2)	4 (7.7)	52		
		Housewife	61 (47.3)	34 (26.4)	34 (26.4)	129		
		Retired	6 (18.8)	6 (18.8)	20 (62.5)	32		
8	Smoking Status	Yes	11 (14.7)	37 (49.3)	27 (36.0)	75	30.565	<0.001
		No	178 (49.4)	104 (28.9)	78 (21.7)	360		
9	Type of Tobacco	Beedi	4 (15.4)	13 (50)	9 (34.6)	26	2.697	0.610
		Cigarette	5 (13.2)	18 (47.4)	15 (39.5)	38		
		Smokeless Tobacco	4 (30.8)	4 (30.8)	5 (38.5)	13		
10	Alcohol intake	Yes	8 (11.8)	36 (52.9)	24 (35.3)	68	33.256	<0.001
		No	181 (49.3)	105 (28.6)	81 (22.1)	367		
11	Physical activity	Adequate	91 (48.7)	62 (33.2)	34 (18.2)	187	6.929	<0.031
		Inadequate	98 (39.5)	79 (31.9)	71 (28.6)	248		
12	HTN status	Yes	2 (2.4)	10 (11.8)	73 (85.9)	85	221.813	<0.001
		No	187 (53.4)	131 (37.4)	32 (9.1)	350		
13	Family history of HTN	Yes	41 (26.3)	54 (34.6)	61 (39.1)	156	39.425	<0.001
		No	148 (53.0)	87 (31.2)	44 (15.8)	279		

14	Fruit & Vegetable intake	<5 times/week	108 (33.5)	121 (37.6)	93 (28.9)	322	49.761	<0.001
		≥5 times/week	81 (71.7)	20 (17.7)	12 (10.6)	113		
15	Daily Salt intake	<5 g/day	41 (18.7)	105 (47.9)	73 (33.3)	219	101.337	<0.001
		≥5 g/day	148 (68.5)	36 (16.7)	32 (14.8)	216		
16	Extra salt intake	Yes	23 (20.7)	40 (36.0)	48 (43.2)	111	40.857	<0.001
		No	166 (51.2)	101 (31.2)	57 (17.6)	324		
17	BMI	Underweight	31 (58.5)	11 (20.8)	11 (20.8)	53	16.957	0.009
		Normal	109 (42.4)	92 (35.8)	56 (21.8)	257		
		Overweight	46 (44.2)	27 (26.0)	31 (29.8)	104		
		Obese	3 (14.3)	11 (52.4)	7 (33.3)	21		
18	SES	Class I	51 (44.7)	49 (43.0)	14 (12.3)	114	62.314	<0.001
		Class II	112 (46.3)	71 (29.3)	59 (24.4)	242		
		Class III	26 (46.4)	18 (32.1)	12 (21.4)	56		
		Class IV	0 (0)	3 (13.0)	20 (87.0)	23		

DISCUSSION

The present community-based cross-sectional study was conducted among 435 adults residing in rural areas of Thiruvattar block, Kanyakumari district, Tamil Nadu, to estimate the prevalence of pre-hypertension and hypertension and identify associated risk factors. The study found that 32.4% of participants had pre-hypertension and 24.1% had hypertension, while 43.4% had normal blood pressure. These findings indicate a substantial burden of elevated blood pressure among adults in rural Tamil Nadu.

The prevalence of hypertension observed in the present study is comparable to recent national estimates. Mohammad et al. (2024), using NFHS-5 data, reported that hypertension affects nearly one-fourth of Indian adults, with significant prevalence in rural populations as well.[7] Similarly, Uthakalla et al. (2024), in a systematic review and meta-analysis of rural Indian studies, reported a pooled hypertension prevalence of 24%, which closely corresponds with the findings of the present study.[8]

Age was identified as one of the strongest non-modifiable risk factors for hypertension in the present study. The prevalence of hypertension increased from 8.4% among participants aged less than 30 years to 66.1% among those aged 60 years and above. Similar findings were reported by Mohammad et al. (2024), who observed a marked increase in hypertension prevalence with advancing age among Indian adults. Longkumer et al. (2023), in a rural North Indian cohort study, also demonstrated increasing hypertension prevalence among older adults.[7,9] The association may be explained by age-related arterial stiffening, endothelial dysfunction, and progressive atherosclerotic changes.

In the present study, males had a higher prevalence of both pre-hypertension and hypertension compared with females. Similar observations were reported by Mohammad et al. (2024), who found that hypertension was more prevalent among men than women in India. Thomas et al. (2025) also observed a higher prevalence of hypertension and pre-hypertension among males in both rural and urban populations.[7,10] Greater exposure of men to behavioural risk factors such as tobacco use, alcohol consumption, occupational stress, and unhealthy dietary practices may explain this finding.

Family history of hypertension was significantly associated with elevated blood pressure in the present study. Participants with a positive family history had a substantially higher prevalence of hypertension than those without such history. Mohammad et al. (2024) similarly reported family history as an important non-modifiable risk factor for hypertension among Indian adults.[7] This association may reflect both genetic predisposition and shared lifestyle behaviours within families.

The present study found a significant association between excess dietary salt intake and elevated blood pressure. More than half of the participants consumed salt above the WHO-recommended limit of 5 g/day, and both excess salt intake and added salt consumption were significantly associated with pre-hypertension and hypertension. Agrawal et al. (2023) reported that excessive sodium intake remains a major contributor to hypertension in India. Similarly, Bhattacharya et al. (2022) highlighted high dietary salt consumption as an important modifiable risk factor contributing to the growing burden of hypertension among Indians.[11,12]

Behavioural risk factors such as smoking and alcohol consumption were significantly associated with elevated blood pressure in the current study. Smokers and alcohol consumers had higher prevalence of both pre-hypertension and hypertension compared with non-users. A systematic review by Kaur et al. (2021) identified tobacco use, alcohol consumption, sedentary lifestyle, obesity, and excess salt intake as major determinants of hypertension among Indian adults.[13] Similar associations have also been reported in recent community-based studies from different regions of India. Physical activity was not significantly associated with blood pressure status in the present study. Although participants reporting inadequate physical activity had a higher prevalence of hypertension compared with those reporting adequate physical activity, this difference did not reach statistical significance. Similar associations between sedentary lifestyle and elevated blood pressure have been reported by Manapurath et al. (2022) among young Indian adults.[14] The absence

of a statistically significant association in the present study may be related to differences in the age distribution, measurement of physical activity, sample characteristics, or the relatively limited sample size. Nevertheless, regular physical activity remains an important component of cardiovascular risk reduction and blood pressure control.

The present study also demonstrated a significant association between low fruit and vegetable intake and elevated blood pressure. Participants consuming fruits and vegetables less than five times per day had a higher prevalence of both pre-hypertension and hypertension. Mohammad et al. (2024) similarly reported that inadequate consumption of fruits and vegetables was associated with hypertension among Indian adults.[7] Reduced intake of potassium-rich foods may contribute to impaired blood pressure regulation.

Body mass index was significantly associated with blood pressure status in the current study. Obese participants had the highest prevalence of both pre-hypertension and hypertension. Similar findings were reported by Mohammad et al. (2024), who identified overweight and obesity as major determinants of hypertension. Manapurath et al. (2022) also observed a significant association between higher BMI and elevated blood pressure among Indian adults.[7,14] The association between higher BMI and elevated blood pressure may be explained by mechanisms including increased sympathetic nervous system activity, insulin resistance, activation of the renin–angiotensin–aldosterone system, and chronic low-grade inflammation.

Overall, the findings of the present study highlight the substantial burden of pre-hypertension and hypertension in rural Tamil Nadu. Both non-modifiable factors such as age and family history and modifiable factors including smoking, alcohol consumption, physical inactivity, obesity, high salt intake, and inadequate fruit and vegetable consumption were significantly associated with elevated blood pressure. These findings emphasize the need for strengthening community-based screening, lifestyle modification programmes, and risk reduction strategies under existing non-communicable disease control initiatives.

CONCLUSION

The present study demonstrated a high prevalence of pre-hypertension (32.4%) and hypertension (24.1%) among adults in rural Kanyakumari district, indicating a substantial burden of elevated blood pressure in the community. Age, gender, family history of hypertension, smoking, alcohol consumption, physical inactivity, high salt intake, inadequate fruit and vegetable consumption, and increased body mass index were significantly associated with pre-hypertension and hypertension. The high proportion of individuals with pre-hypertension highlights an important opportunity for early intervention to prevent progression to established hypertension and related cardiovascular complications. Strengthening population-level strategies that promote healthy lifestyles and address modifiable risk factors may contribute significantly to reducing the burden of hypertension in rural populations.

Recommendation

Periodical blood pressure screening activities at community level should be strengthened, with special focus on people with family history of hypertension, people who are already prehypertensive, elderly people and other high-risk groups. Services offered under TamilNadu Govternment's NCD screening programme "Makkalai Thedi Maruthuvam" and Government of India's "Rashtriya Bal Swasthya Karyakram" for screening of adolescent hypertension at schools could be utilised for this at the field level. Knowledge regarding the importance of reduced salt intake, restricted fat consumption, cessation of smoking and alcohol in prevention and control of hypertension should be reinforced among the population periodically. Beneficial effects of daily regular physical activity, increased consumption of vegetables and fruits, daily practice of meditation & yoga should be educated to the public right from younger age group when they are highly receptive. For those who are diagnosed with hypertension, ensuring availability of high-quality healthcare services along with measures to monitor drug adherence and treatment compliance are to be strengthened. Integration of the above preventive measures with the existing primary healthcare system, along with timely follow-up and referral, can help reduce the burden of pre-hypertension & hypertension and prevent associated cardiovascular complications in rural community.

Limitation

This study was conducted among the rural population from a single district in Tamil Nadu. An extensive study involving a larger sample size over a wide geographical area would provide a even more precise estimate of the problem, which could not be done here due to time and financial constraints.

Conflicts of interest

The authors declare no conflicts of interest.

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