Global Journal of Medical Research: B
Pharma, Drug Discovery, Toxicology & Medicine
Volume 20 Issue 1 Version 1.0 Year 2020
Type: Double Blind Peer Reviewed International Research Journal
Publisher: Global Journals
Online ISSN: 2249-4618 & Print ISSN: 0975-5888

Determinants of Hypertension in a Rural Area of Kancheepuram District, Tamilnadu

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Objectives

- To assess the prevalence of risk factors of hypertension among the study population.
- To determine the association between socio-demographic factors and hypertension.
- To determine the association between various risk factors and hypertension.

Keywords: *blood pressure, risk factor, cardiovascular disease.*

GJMR-B Classification: *NLMC Code: WG 340*

Strictly as per the compliance and regulations of:

Determinants of Hypertension in a Rural Area of Kancheepuram District, Tamilnadu

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Objectives

- To assess the prevalence of risk factors of hypertension among the study population.
- To determine the association between socio-demographic factors and hypertension.
- To determine the association between various risk factors and hypertension.

Materials and methods: It is a community-based cross-sectional study. The sample size calculated was 1250 and a systematic random sampling method was used. A pre-tested structured questionnaire was used to collect data from the study population. Information regarding socio-demographic characteristics, risk factors, regarding hypertension and physical measurements were obtained. The data analysis was done using SPSS software (version 22).

Results: Among the study population,23.6% were hypertensive, and. in this study,12.8% use tobacco in any form, 18.6% use alcohol, 66.2% of the participants are physically inactive, and 72.5% are consuming an unhealthy diet. In the Univariate analysis, the variables that are significantly associated with hypertension are age, marital status, education, occupation, socio-economic status, family type, positive family history, presence of associated comorbidities, knowledge about hypertension and BMI. In multivariate analysis are age, presence of associated comorbidities, knowledge about hypertension, family type, and BMI.

Conclusion: The prevalence of hypertension and its determinants is high in this study are tumultuous. Lifestyle modification plays a pivotal role, and hypertension is a lifestyle disease change in that harmful lifestyle habits must be adopted.

Keywords: blood pressure, risk factor, cardiovascular disease.

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I. Introduction

High blood pressure (BP) is one of the most important modifiable risk factors for cardiovascular diseases (CVDs). [1]Hypertension (HTN) is a chronic condition of concern because of its role in the causation of coronary heart disease (CHD), stroke, and other vascular complications. It is the most common CVD disorder which poses a significant public health challenge to a population undergoing socioeconomic evolution. It is one of the dominant risk factors for CVD mortality, accounting for 20-50% of all deaths. [2,3]Hypertension (HTN) exerts a substantial public health burden on cardiovascular health status and healthcare systems in India.[4,5]

The analysis showed that about 26% of the population globally is suffering from hypertension, and the prevalence is higher among developed as compared to developing countries.[6] It is predicted that the number of adults with hypertension would increase by about 60% to a total of 1.56 billion by 2025.[7,8]HTN is directly responsible for 57% of all stroke deaths and 24% of all coronary heart disease (CHD) deaths in India.[9,10]

Currently, the incidence of hypertension is 20 to 40% in urban areas and 12 to 17% in rural areas of India. One in three Indian adults has high blood pressure. According to the World Health Statistics 2012 report, India has low rates of hypertension compared to world figures.[11]In India, 23.10% of men and 22.60% of women over 25 years suffer from hypertension.[12,13]As per the NFHS 4 report, prevalence of hypertension in males is 10.3% and in females is 6.7% .[14] Community surveys have documented that in a period of three to six decades, prevalence of hypertension has increased by about 30 times among the urban dwellers and by about ten times among the rural inhabitants.[15,16]

The technological and economic developments have reduced the physical activity of the people to a real large extent and increased the alcohol and tobacco use which are the vital causes for the rising burden of hypertension.[17]The risk factors for non-communicable disease are grouped into three categories they are behavioral, metabolic and biochemical risk factors. Behavioral risk factors include tobacco use, alcohol use, unhealthy diet, and lack of physical activity. Metabolic risk factors include overweight, obesity, diabetes, and

hypertension (HTN). Biochemical risk factors include hypercholesteremia and hypertriglyceridemia.[18]

To contain the increasing burden of Non-Communicable Diseases, Ministry of Health and Family Welfare, Government of India, has launched the National Programme on Prevention and Control of Diabetes, Cardiovascular Diseases and Stroke (NPDCS).[19]As fewer studies has been undertaken in rural India, this study was planned to assess the determinants of hypertension among the rural population of Kancheepuram district of Tamil Nadu. This study will shed some light on the existing problem.

II. Materials and Methods

a) Study design

This study is a community-based cross-sectional study conducted in a rural area of Kancheepuram district, Tamil Nadu.

b) Study area

The study was conducted in Serappanachery Padappai (S. Padappai), which is the rural field practice area of the Rural Health and Training Centre (RHTC) attached to our Institution (Sree Balaji medical college and hospital).

c) Study population

The study population included are those permanently residing in Serappana-chery Padappai and belonging to the adult age group of 20–60 years.

d) Study period

The study was conducted during December 1st2018 –May 31st, 2019.

e) Sample size

The sample size was calculated from a previous study conducted by Kishore J et al, in a rural area in 2016, the prevalence of hypertension recorded in this study was 14.1%.[20] The sample size was calculated using the formula $N = Z\acute{\alpha}^2pq/ [L]^2$ where Z = 1.96, p = 14.1%, q =85.9 (100-14.1), L = 2. 115. Accounting 15% for non-response, the final sample size was calculated as 1245 (rounded off to 1250). [N = 1250]

f) Inclusion criteria

The inclusion criteria for the study were the adult population of age group (20-60 years) residing in Serappanachery Padappaiand willing to participate in the study.

g) Exclusion criteria

The exclusion criteria for the study were females who were pregnant, psychiatric patients, who are severely ill, and those who didn't give consent to participate in the study was excluded.

h) Sampling method

A systematic random sampling technique was used to identify the study subjects. Sampling Interval (N/n) is calculated as follows: [N= Total number of households in Padappai=1851, n = sample size = 1250. N/n=1851/1250= 2]. Thus alternate household is selected for identifying the adult population between 20-60 years of age.

i) Study tool

A structured questionnaire based on the WHO STEPS approach is used as a study stool for data collection, Details included in it are socio demographic profiles, details regarding risk factors for hypertension, and physical measurements (height, weight, waist circumference, and BP).

j) Informed consent

Informed Consent was obtained from each participant before the administration of the interview schedule.

k) Ethical approval

The study proposal was presented and was approved by the Institutional Ethics Committee.

l) Operational definitions

1. Tobacco user:[21]
   Tobacco user was defined as individuals who had used any form of tobacco in the last 30 days.
2. Alcohol user:[21]
   Alcohol users were those who had consumed at least one standard drink of alcohol (30 ml of spirits, 285 ml of beer, or 120 ml of wine) in the last 12 months.
3. Unhealthy diet:[18]
   A unhealthy diet is Low consumption of fruits and vegetables at less than five servings per day (one cup of raw leafy vegetables or a half cup of other vegetables (cooked) was considered one serving. One medium-sized piece of fruit or half cup of chopped fruit was measured as one serving).
4. Physical activity:[18]
   Physical activity low physical activity was defined as <150 minutes of moderate physical activity per week.
5. Overweight:[22]
   Overweight was defined as BMI 23-24.9 kg /m2.
6. Pre obese:[22]
   Pre obese was defined as BMI equal to or more than 25 kg /m2.
7. Obese:[22]
   Obese was defined as BMI equal to as or more than 30 kg /m2.
8. Central obesity:[22]
   Central obesity is assessed based on the waist-hip ratio. As per WHO guideline, males with a waist-hip ratio above 0.9 and females with a waist-hip ratio above 0.85 have central obesity.

III. Results

a) Socio-demographic characteristics of the study population

Socio-demographic characteristics of the study population are shown in Table 1. Among the study participants, 44.2% belonged to 50-60 years of age, 24.2% belonged to 20-30 years of age, and 20.8% belonged to 30-40 years of age. About 57.4% of the study participants were females, and 42.6% were males. Nearly 82.4% are married, and 5.44% were unmarried. Almost 18.7% of the study samples had no formal education, 30.2% had middle school education, and 21.3% had a high school education. Among the participants, around 43.7% were unemployed, 32.2% are engaged in unskilled occupation, and 17.8% are involved in semiskilled occupation.49.6% belonged to lower- middle socio-economic category, and 21.8% belonged to the upper lower socio-economic group. In this study, 56.8% of them belong to the nuclear family,30% belonged to the joint family, and the rest were belonging to three-generation family.

Table 1: Socio Demographic Characteristics of the Study Population

Sl. No.	Socio-Demographic Variable	Frequency (N=1250)	Percentage (%)
1.	**Age**		
	20-30 Years	136	10.9
	30-40 Years	302	24.2
	40-50 Years	260	20.8
	50-60 Years	552	44.2
2.	Sex		
	Male	532	42.6
	Female	718	57.4
3.	**Marital Status**		
	Unmarried	68	5.4
	Married	1030	82.4
	Widower	142	11.4
	Divorcee	10	.8
4.	**Education**		
	Illetereate	234	18.7
	Primary School	282	22.6
	Middle School	378	30.2
	High School	266	21.3
	Post High School Diploma	12	1.0
	Ug/Pg	72	5.8
	Professional	6	.5
5.	**Occupation**		
	Unemployed	546	43.7
	Unskilled	402	32.2
	Semiskilled	222	17.8
	Skilled	46	3.7
	Farmers/Clerks/Shop Owners	10	.8
	Semiprofessional	14	1.1
	Professional	10	.8

6.	Socio Economic Status		
	Upper	90	7.2
	Upper Middle	234	18.7
	Lower Middle	620	49.6
	Upper Lower	272	21.8
	Lower	34	2.7
7.	TYPE OF FAMILY		
	Nuclear Family	710	56.8
	Joint Family	438	35.0
	Three Generation Family	102	8.2

b) Prevalence of hypertension

The prevalence of hypertension is depicted in FIGURE 1.as we can see, the prevalence of hypertension in this study is 23.8% (298). This includes both known hypertensives and newly diagnosed.

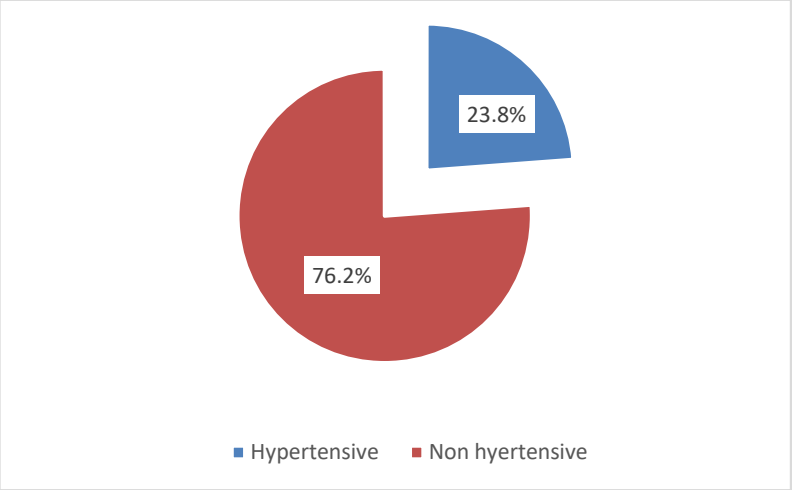

Fig. 1: Food habits of the study population

As we can see from TABLE 2, nearly 89.9% of the study participants were nonvegetarian, and 10.1% were vegetarian. Among the non-vegetarians, 54.1% had nonvegetarian once a week, and 35.1 had nonvegetarian twice a week.

Table 2: Food Habits of the Study Population

Sl. No.	Food Habits	FREQUENCY	PERCENTAGE (%)
1.	Food Type (N-1250)		
	Vegetarian	126	10.1
	Non Vegetarian	1124	89.9
2.	Frequency of Non-Veg Intake (N-1124)		
	Once A Week	608	54.1
	Twice A Week	394	35.1
	Thrice A Week	104	9.2
	Four Times A Week	12	1.1
	> Four Times A Week	6	0.5

c) *Lifestyle characteristics of the study population*

Lifestyle characteristics of the study population are shown in TABLE 3.60.2% of them are involved in sedentary work, and 35.5% were engaged in the moderate type of work. Only 21.4% have the habit of doing regular physical exercise. Among them, 39.6% do it for 1-2 hours per week and 27.7% do it for 2-5 hours a week.

Table 3: Lifestyle Characteristics of the Study Population

Sl. No.	Lifestyle	FREQUENCY	PERCENTAGE (%)
1.	Job Type (N-1250)		
	Sedentary Work	752	60.2
	Moderate Work	444	35.5
	Heavy Work	54	4.3
2.	Exercise (N-1250)		
	Yes	268	21.4
	No	982	78.6
3.	Duration of Exercise (N-268)		
	< 1 Hour/Week	20	7.4
	1-2 Hours/ Week	106	39.6
	2--5 Hours/ Week	74	27.7
	> 5 Hours/ Week	68	25.3

Table 4: Prevalence of Behavioural Risk Factors Among the Study Population

Sl. No.	Risk Factor	Frequency (N-1250)	Percentage (%)
1.	Tobacco Use		
	Yes	160	12.8
	No	1090	87.2
2.	Alcohol Use		
	Yes	232	18.6
	No	1018	81.4
3.	Physical Inactivity		
	Yes	828	66.2
	No	422	33.8
4.	Unhealthy Diet		
	Yes	906	72.5
	No	344	27.5

d) *Prevalence of risk factors among the study population*

Prevalence of risk factors for hypertension is depicted in TABLE 4 and 5.in this study 12.8% use tobacco in any form, 18.6% use alcohol, 66.2% of the participants are physically inactive, and 72.5% are consuming an unhealthy diet. Among the study participants, 21.4 % had a positive family history of hypertension,3% of them are under oral contraceptive pills, and 24.8% are suffering from various comorbidties (TABLE 5).

Table 5: Associated Risk Factors among Study Population

Sl. No.	Risk Factors	Frequency (N-1250)	Percentage (%)
1.	Family History of Hypertension (N-1250)		
	YES	268	21.4
	NO	982	78.6
2.	OCP Pill Intake Among Females (N-718)		
	YES	38	3.0
	NO	680	97.0
3.	Co-Morbidity (N-1250)		
	YES	310	24.8
	NO	940	75.2

e) Prevalence of obesity among the study population

As per the Asian Adults BMI criteria (FIGURE 2), 26.2% were overweight, 22.% were pre-obese and 12.6% belonged to the obese category. Central obesity was assessed based on the waist-hip ratio. About 83.4% of the study participants have central obesity.

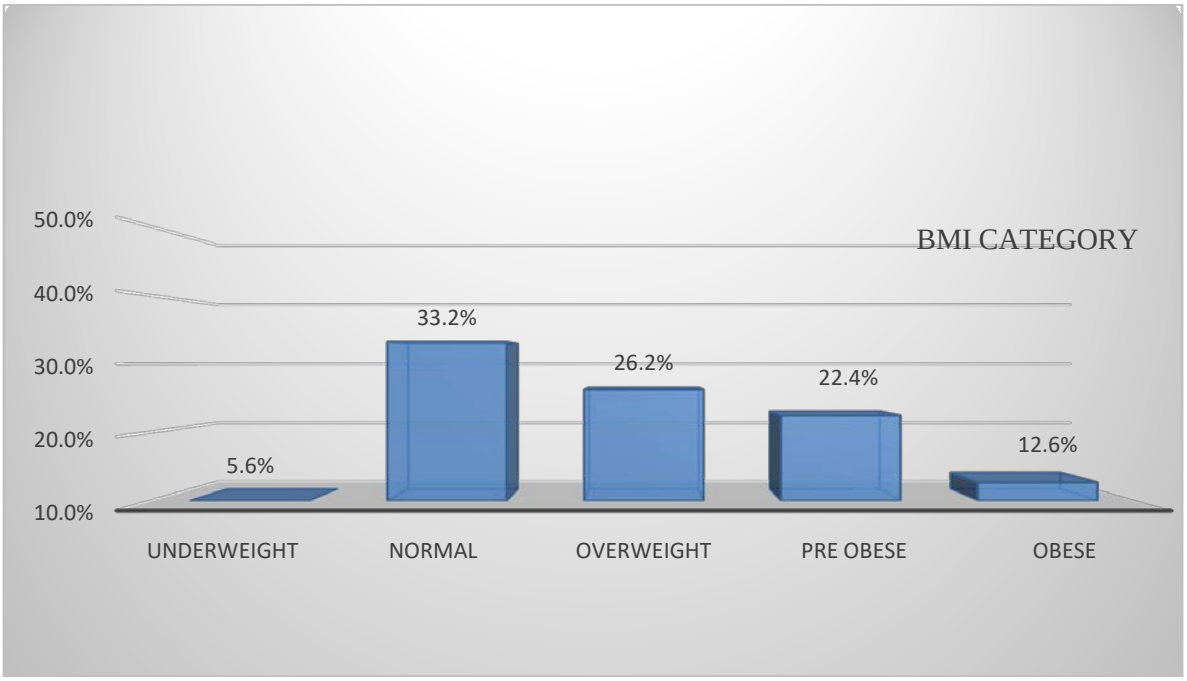

Figure 2: Bmi Classification of the Study Population

Among the males, 86.5% have central obesity, and 80.3% of females have central obesity in this study (FIGURE 3).

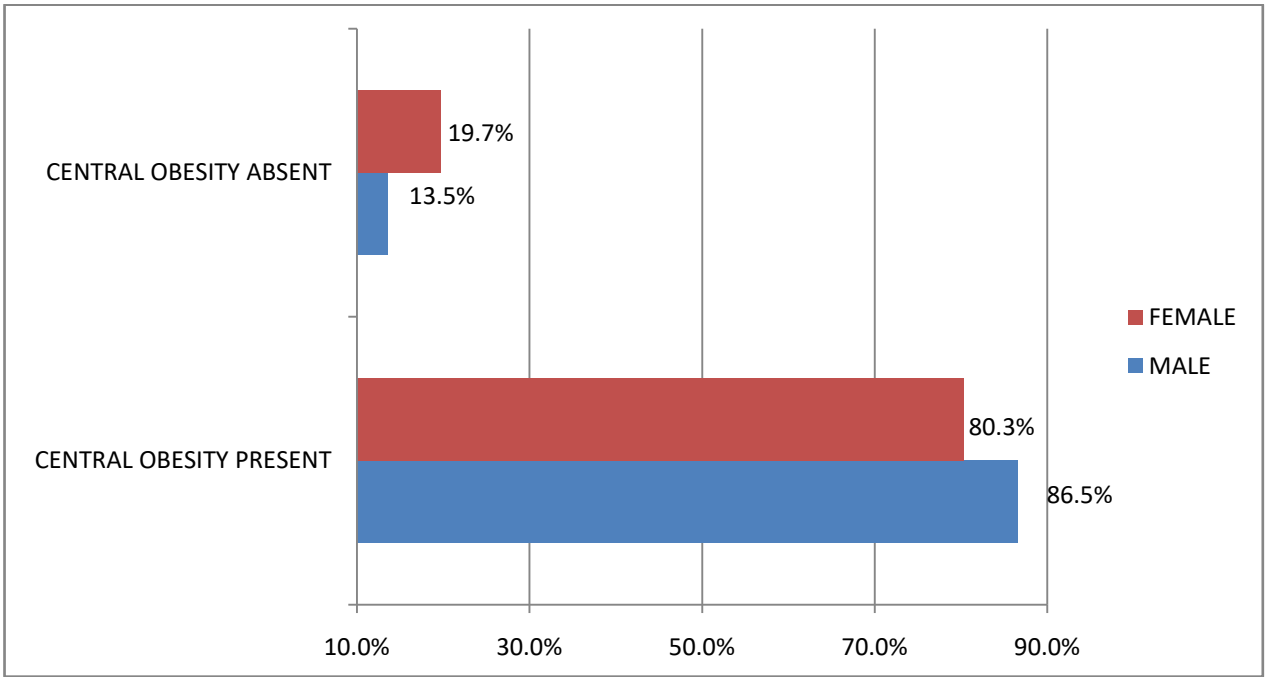

Figure 3: Prevalence of Central Obesity among the Study Population

f) Knowledge regarding hypertension among the study population

Among the study participants, when asked whether they know the normal blood pressure value, 24.8% said they know the normal blood pressure value., and among them, only 60% said the correct blood pressure value and 40% said incorrect value. In this study, 47.5% of the participants have adequate knowledge about hypertension, as shown in FIGURE 4.

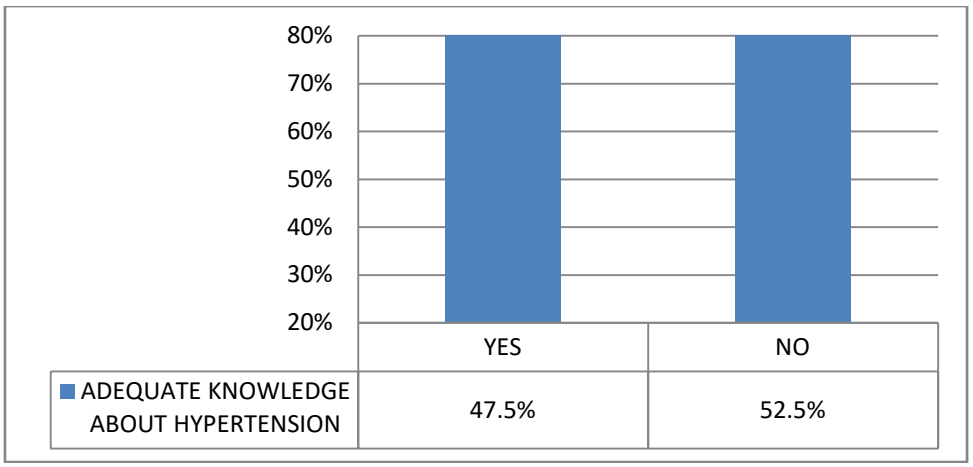

Figure 4: Adequate Knowledge Regarding Hypertension Among The Study Population

g) Univariate analysis findings among the study population

In the Univariate analysis the variables that are significantly associated with hypertension are age (p-value-<0.0001), marital status (p-value-<0.0001), education (p-value-0.015), occupation (p-value-0.003), socio-economic status (p-value-<0.015), family type (p-value-<0.0001), positive family history (p-value-0.009), presence of associated comorbidity (p-value-<0.0001), knowledge about hypertension (p-value-<0.0001) and BMI (p-value-<0.0001). There was no association found between other variables and hypertension.

Table 7: Univariate Analysis Findings

Variable	Total Frequency (N-1250)	Hypertension			
		FREQUENCY (N-298)	CHI-SQUARE VALUE	P VALUE	ODDS RATIO (95%CI)
Age > 40 Years < 40 Years	 438 812	 264 34	124.387	<0.0001***	5.724 3.916-8.366
Sex Female Male	 532 718	 168 130	0.181	0.670	0.949 0.730-1.234
Marital Status Married Unmarried/Divorce /Widower	 1030 120	 226 72	23.943	<0.0001***	17.051 12.407-23.434
Education ≥ High School Education < High School Education	 356 894	 91 207	15.828	0.015**	1.139 0.857-1.514
Occupation ≥ Skilled < Skilled	 80 1120	 22 276	19.501	0.003***	1.225 0.736-2.039
Socioeconomic Status Upper / Middle Class Lower Class	 944 306	 227 71	12.295	0.015**	1.047 0.772-1.420
Family Type Joined/Three Generation Family Nuclear Family	 540 710	 158 140	22.244	<0.0001***	1.684 1.296-2.188
Tobacco Use Yes No	 160 1090	 33 265	1.045	0.307	0.808 0.538-1.125
Alcohol Use Yes No	 232 1018	 59 239	0.397	0.529	1.111 0.799-1.544
Unhealthy Diet Yes No	 906 344	 221 77	0.554	0.457	1.187 0.832-1.503
Physical Inactivity Yes No	 828 422	 194 104	3.427	0.180	0.940 0.715-1.235
Positive Family History Yes No	 268 982	 80 218	6.788	0.009***	1.491 1.102-2.016
Presence of Associated Comorbidity Yes No	 310 940	 129 169	71.718	<0.0001***	3.251 2.456-4.304
Knowledge About Hypertension Yes No	 570 680	 204 94	58.774	<0.0001***	3.071 2.329-4.050
Bmi Overweight/Preobese/Obese Underweight /Normal	 765 485	 234 64	20.277	<0.0001***	2.886 2.128-3.914

*** P value <0.05 is significant and *** P value <0.01 is highly significant*

h) Multivariate analysis findings among the study population

The variables which were significantly associated in Univariate analysis were only included in the multivariate analysis which is shown in TABLE 8. The multivariate analysis was done using the Enter method. The Model was found to be statistically significant (Cox and Snell R2 – 0.240, Nagelkerke R2 –0.3660, P-value <0.001). The variables that are significant in multivariate analysis are age, presence of associated comorbidity, family type, and BMI,Other variables were found to be insignificant in multivariate analysis.

Table 8: Multivariate Analysis Findings

Variable	Hypertension			
	P Value	Adjusted Or	95% Ci	Nagelkerke R Square Value
Age	<0.0001	0.417	0.341-0.510	0.360
Marital Status	0.235	0.807	0.567-1.149	
Education	0.266	0.925	0.806-1.061	
Occupation	0.397	0.935	0.393-1.093	
Socio Economic Status	0.556	1.058	0.877-1.276	
Positive Family History	0.117	1.343	0.929-01.944	Cox And Snell R Square Value
Presence of Associated Comorbidity	<0.0001	2.516	1.806-3.505	
Knowledge About Hypertension	<0.0001	2.712	1.958-3.756	0.240
Bmi	<0.0001	0.530	0.459-0.611	
Family Type	0.0001	0.656	0.517-0.832	

*** P value < 0.05 is significant and *** P value < 0.01 is highly significant*

IV. Discussion

a) Risk factors for hypertension

i. *Tobacco use*

In this study among the study participants, 12.8% use tobacco and of which 3.5% use smokeless tobacco. In a study, by Chataut J, 40.2% of the study population has smoking habit. [23]25.5% of the ever used tobacco in a study by Maroof KA In Uttar Pradesh.[24] In Peter Lloyd-Sherlock study 64.6% had never smoked and 24.1% are smoking daily.[25] 15.9 % are smoking daily, and 73.2% are using smokeless tobacco in a study by Aroor Bhagyalaxmi which was conducted in a rural area of Gujarat, India.[26] Sathish Kumar conducted a study in Salem in which 24.7% had never used tobacco, and 25% are past users. [21]

ii. *Alcohol use*

In this stud, 18.6% are current alcohol users, and 1.1% were past users of alcohol. Sathish Kumar's study showed that 58.3% are using alcohol daily or a few days a week, and 28.6% had used alcohol in the past.[21] 40.9% are consuming alcohol in a study by Chataut J.[23] In a study by K. A. Maroof,35.5% had ever used alcohol,, and the remaining 64.5% had never used alcohol.[24] 76.8% had never consumed alcohol in their lifetime in a study conducted by Peter Lloyd-Sherlock.[25]

iii. *Physical activity*

In this study, 66.2% were physically inactive, and only 33.8% were physically active as per the operational definition, and this showed that the majority of the study participants are following unhealthy lifestyle habits. In Chataut J study, 51.8% are involved in moderate physical activity, and 8% are engaged in sedentary activities.[23] 28.5% are physically inactive in a study done by Peter Lloyd-Sherlock.[25] Aroor Bhagyalaxmi study showed that 14.1% of the study samples were physically inactive.[26] 34.9% were doing sedentary physical activity and 33.8% are involved in vigorous physical activities in a study done by Sathish Kumar.[21]

iv. *Unhealthy diet*

72.5% of the respondents in this study were following an unhealthy diet. In a study conducted by Aroor Bhagyalaxmi most of the study participants i.e. 96.4% were following unhealthy diet.[26] 94.5% were taking low fruit, and vegetables in a study by Garg A.[27]Bhattacherjee S conducted a study in West Bengal in which 60.4% were consuming an unhealthy diet.[28]

v. *Overweight and obesity*

In this study, as per the Asian Adults BMI criteria, 26.2% were overweight, 22 % were pre-obese, and 12.6% belonged to obese category. In V Mohan study 22.5% were overweight and 28.5% of the respondents are obese.[29]12% of the respondents were overweight in a study by Aroor Bhagyalaxmi.[26] In a study done by Prabhakaran D 35% of them were overweight, and 3.3% of the study participants belonged to theobese category.[30]20.5% were overweight, and 4.2% were the obese in Midha T.[31]

vi. *Central obesity*

In this study, central obesity was assessed based on the waist-hip ratio. About 83.4% of the study participants have central obesity. In a study by Isezuo SA. 13% of the study participants had central obesity.[32] Aroor Bhagyalaxmi showed that central obesity was present in 38% of the samples.[26]15.7% of the study participants have central obesity in AK Agarwal study.[33] In a study by K. A. Maroof 30.5% were centrally obese.[24]49.1% have central obesity in a study by V Mohan.[29]

vii. *Food habits*

In this study, nearly 89.9% of the study participants were nonvegetarian and 10.1% were vegetarian. Among the non vegetarians, 54.1% had non vegetarian food once a week, and 35.1 had non vegetarian food twice a week. In Chataut J study, 91.3% of them are were nonvegetarian and 8.7% were vegetarian.[23] Ina study by K. A. Maroof, 86.6% were vegetarian, and 13.4% were nonvegetarian.[24]28.6% were

vegetarian and 71.4% were nonvegetarian in a study by Sathish Kumar.[21]

viii. *Family history of hypertension*

In this study, among the study participants, 21.4 % had a positive family history of hypertension. Rajeev Bhardwaj conducted a study in which only 4% of the study participants have a positive family history of hypertension.[34] In a study by Shyamal Kumar Das, 2.4% of the study participants had a positive family history of hypertension.[35]53.8% of the families have hypertension in a study by Haresh Chandwani.[37]

b) Association between sociodemographic variables, risk factors and hypertension

In this study in the Univariate analysis, the variables that are significantly associated with hypertension are age, marital status, education, occupation, socio-economic status, family type, positive family history, presence of associated comorbidity, knowledge about hypertension, and BMI. The variables that are significant in multivariate analysis are age, presence of associated comorbidity, knowledge about hypertension, family type, and BMI. In a study by Sathish Kumar, increasing age, male gender, increasing BMI levels, tobacco, alcohol, WHR were found to be significant independent predictors of hypertension and on multivariate analysis of these significant variables age, male gender, increasing BMI levels, were found to be significant after adjusting for other variables.[21] In hypertension study group multicentric study multiple logistic regression analyses identified a higher body mass index, higher education status, and prevalent diabetes mellitus as important correlates of the prevalence of hypertension.[37] Jonas JB conducted a study, in which hypertension was associated with higher age, higher body mass index, body height, Higher blood hemoglobin levels, and elevated blood urea concentration.[38]

V. Conclusion

The prevalence of hypertension and its determinants is high in this study are tumultuous. Lifestyle modification plays a pivotal role, and hypertension is a lifestyle disease change in that harmful lifestyle habits must be adopted. The target population for this strategy will be adolescents, and early adults, as the prevention of risk factors will curb the rates of hypertension and its risk factors.

This study will initiate an internalization process of the government sector to make it more attractive, viable, and reliable, thereby giving scope proper screening, early diagnosis and treatment, and to provide accessible quality tertiary care.

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