

## PARADIGMATIC AGE SHIFT OF HYPERTENSION DISEASE: A STUDY AMONG YOUNG ADULTS

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## ABSTRACT

**Objectives:** The objectives of study are to assess the magnitude of hypertension and identify various factors associated with hypertension among participants.

**Methods:** A cross-sectional study done on attendees and patients coming to medicine OPD in a tertiary care hospital in Madhya Pradesh. The earlier diagnosed hypertensive cases were excluded from the study and 500 participants were studied. Clinical measurements and predesigned semi-structured questionnaire were used for data collection. Chi-square test was applied to find association of risk factors with hypertension.

**Results:** About 21.6% of the participants were diagnosed for hypertension. The increasing age, obesity, smoking, alcoholism, and daily salt intake above two teaspoonfuls had significant association with occurrence of hypertension ( $p \leq 0.05$ ).

**Conclusion:** The magnitude of hypertension is increasing among adult population and has strong association with increasing age and other risk factors. Hence, the early diagnosis with the help of screening tools is needed. Opportunistic screening of all adults coming in contact of health system will help the pool of diagnosed cases of hypertension and help to reduce burden of complications caused by hypertension.

**Keywords:** Hypertension, Risk factors, Screening, Obesity, Young adults.

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## INTRODUCTION

Hypertension literally means the raised blood pressure. The blood pressure in a population has normal bell shaped continuous distribution, so there is neither clear demarcation between normal and hypertensive nor there is a fixed generalized definition [1]. However, hypertension is one of the major risk factor for coronary heart diseases, stroke, and other cardiovascular disorders; therefore, clear guideline for classification of blood pressure among adults aged 18 years and above has been adopted based on different intervention trials. At present, the accepted classification of blood pressure measurements has been adopted based on the guidelines for the management of arterial hypertension [2].

Globally, the prevalence of hypertension among adults is around 30–40% and is a leading cause of morbidity and mortality among adults. Even with such a higher prevalence only half of the hypertensive population get aware of their status and only half among them get treated. This is how the rule of halves follows in case of hypertension [3].

The burden of hypertension in India as revealed from National Family Health Survey (NFHS 4, 2015–2016) was 31% in population group 15–49 years. It was 15% in men as compared to 11% in women of same age group [4]. This prevalence raised to 43% in National Family Health Survey (NFHS 5, 2019–21) with 24% in men and 21% in women of age 15 years and above [5]. Hence, in a short period of only 4–5 years, there is rise of 10% in prevalence of hypertension in both the sexes. This high prevalence of hypertension is responsible for more than half of deaths (57%) due to stroke and about one fourth (24%) of all deaths due to coronary artery diseases in India [6].

The prevention of hypertension through lifestyle changes, dietary modifications, etc. is must for each and every individual and early diagnosis of disease is necessary for adequate treatment and thus

reducing burden on health-care system of the country. As discussed above, being an iceberg disease and following the rule of halves, it is necessary to screen out the population for early case detection. Although mass screening has not been advisable due to vast population and scarcity of resources but screening of high-risk population is essential.

The process of screening for hypertension can be easily supplemented by utilizing the opportunity to screen every adult individual who comes in contact of a health center for self-care or for care of their family members and relatives. This practice has been in practice in European countries, which says that screening the individuals who come in contact of health services at least once in every 2 years will solve the problem of detecting hypertensive patients who need treatment and intervention [1]. The attenders of patients coming to hospitals are mostly adults and they generally stay for hours in Out Patients Department (OPD) and for days in case of admitted patients in the hospital. Hence, there is ample opportunity to ask and offer them to get their blood pressure measured and if found to be hypertensive can be put on treatment and advised/counseled for reducing the modifiable risk factors for hypertension.

Opportunistic screening of individuals for presence of risk factors for non-communicable disease has been one of the key strategies under National Program for Prevention and Control of Cancer, Diabetes, Cardiovascular Diseases, and Stroke (NPCDCS). Under this strategy, the health workers from peripheral health centre examine persons of the age of 30 years and habits of alcohol, smoking and chewing tobacco, and also do measure of weight, height, and Body Mass Index (BMI), blood pressure, and blood sugar [7,8].

The present study has been done using the above opportunity on adult attendees of patients came to medicine OPD at the medical college hospital of Madhya Pradesh. The objectives of the study are to find out the magnitude of hypertension among participants and also to identify various factors associated with hypertension among participants.

**METHODS****Type of study**

This was a cross-sectional study.

**Study duration**

The study period was from January 2018 to April 2018.

**Study site**

This study was conducted at OPD (outpatient department) of General Medicine in a Medical College of Madhya Pradesh.

**Study population**

Adults attending the general medicine OPD of medical college hospital as patient or patient attendants during the study period.

**Sample size**

The sample size was 500 individuals of age group of 20–40 years.

**Sample size calculation**

As per formula for sample size calculation in cases of observational studies, sample size equals to  $Z^2((1-P))/d^2$  [9]. Here,  $p$  is 31% (according to according to NFHS 4, (2015-16) [4] and confidence interval is 5%. Sample size came out to be 329 rounded off to 500.

**Sampling method**

This was a systematic random sampling.

**Sampling process**

The usual number of patients attending general medicine OPD on working week days ranges from 100 to 250 including new and old patients. It was planned to include every 10<sup>th</sup> patient and or its attender in the study for exit interview and measurement of weight, height, and blood pressure. This adopted method helped the interviewer to give sufficient time for interview and clinical measurements.

**Inclusion criteria**

- Patient or their attenders of age group 20–40 years and means completed the age of 20 years but not yet completed his/her 40<sup>th</sup> birthday were included in the study.

**Exclusion criteria**

The following criteria were excluded from the study:

- People who did not give consent.
- People who are already diagnosed for hypertension and under medication.
- Critically ill patients and persons with disabilities.

**Study tools**

Pre-designed semi-structured questionnaire was used to elicit and record the details on sociodemographic variables such as dietary habits, salt intake, alcohol consumption, family history of hypertension, and stress level.

**Clinical measurements**

1. Blood pressure: Omron digitalized sphygmomanometer was used to measure blood pressure and pulse rate. The validity of instrument was checked before use with the help of mercury sphygmomanometer on randomly selected participants.
2. Weight: Digital weighing scale.
3. Height: was measured in meter (m) using portable stadiometer

**Data collection and analysis**

The study participants were invited at the fixed site in the waiting area of general medicine OPD. All the prerequisites such as consent form, questionnaire, record sheet for clinical measurements, equipment and sitting arrangements (patient stool & chair) for participant and interviewer were made available. First of all, the informed consent was taken from willing participants and details of the questionnaire were recorded through interview in Hindi language. The details of

age, sex, type of family, education, occupation, income, smoking and alcohol intake, daily salt consumption, and oil used for cooking were recorded.

**Measurement of blood pressure**

It was measured in sitting position, on left arm using validated omron blood pressure monitor. The AHA/JNC-8 and NPCDCS approach: Average of first two BP measures; was applied and for that blood pressure was measured before and after the questionnaire-based interview (at least 5 min apart) to record two readings. The average of the two readings was recorded and was used to classify the patient as hypertensive or normal [9]. At present, the accepted classification of blood pressure measurements has been adopted based on the guidelines for the management of arterial hypertension [2] (Table 1).

Measurement of weight and height: weight was measured with portable weighing scale without shoes using a to the nearest kilogram (kg). For height portable stadiometer was used, participant need to stand such that his/her heels, buttocks, occiput touch against the wall/frame, and reading was noted in meters (in decimals nearest centimeters). Using weight and height data, the BMI was calculated using formulae, weight in kilograms divided by height in square meters ( $\text{kg}/\text{m}^2$ ). The participants were categorized into three groups, that is, normal, overweight, and obese for BMI cutoff values of  $<22.9 \text{ kg}/\text{m}^2$ ,  $22.9 \text{ kg}/\text{m}^2$ , and  $\text{BMI} \geq 25 \text{ kg}/\text{m}^2$ , respectively, based on BMI cutoffs for Indians [10].

Data analysis was done using SPSS version 20 software, the continuous data were categorized in group for comparison in hypertensive and normotensive individual. The Chi-square test (two-tailed with Yate's correction) was applied on the categorical data for testing the association,  $p$  value  $\leq 0.5$  was considered to be significant.

**Definitions***Hypertension*

An individual is classified as having hypertension if he/she has a systolic blood pressure level greater than or equal to 140 mmHg, or a diastolic blood pressure greater than or equal to 90 mmHg, or he/she is currently taking antihypertensive medication to lower his/her blood pressure [4].

*Overweight*

Individuals with their calculated BMI 23–24.99  $\text{kg}/\text{m}^2$ .

*Obese*

Individuals with their calculated BMI more than or equal to 25  $\text{kg}/\text{m}^2$ .

*Smoker*

An individual who smoked at least 01 bidi and or cigarette in the last 24 h.

*Alcoholic*

An individual who drunk alcohol (more than 30 ml or 1 peg) at least once in the past 1 month.

**Table 1: Classification of blood pressure measurements [3]**

Category	Systolic blood pressure (mm of Hg)	Diastolic blood pressure (mm of Hg)
Optimal	<120	And <80
Normal	120–129	And/or 80–84
High normal	130–139	And/or 85–89
Grade 1 hypertensive	140–159	And/or 90–99
Grade 2 hypertensive	160–179	And/or 100–109
Grade 3 hypertensive	$\geq 180$	And/or $>110$
Isolated systolic hypertension	$\geq 140$	And $<90$

**Salt intake [11]**

Low or normal-an individual consuming <5 g of salt per day (just under a teaspoon).

High: an individual consuming <9–12 g of salt per day (equal or more than 2 teaspoon).

Moderate: an individual consuming 1–2 teaspoon salt per day.

Ethical issue: Ethical clearance from the Institutional Ethical Committee. Duly informed consent was taken from each participant before interview and clinical measurements. There was no invasive procedure involved which can result any harm to participants.

**RESULTS**

Among the total 500 participants, 280 were males and 220 were females. All the individuals were of age 20–40 years as per inclusion criteria, and mostly were young adults of 20–30 years of age. The magnitude of hypertension was 108 (21.6%) among which 61% were males and 39% were females (Figs. 1 and 2).

The proportions of patients suffering from hypertension were higher in older age groups (above 30years) as compared to younger age groups. Among the hypertensives the most common age group was 30–34 years (Table 2). The older age ( $\geq 30$  years) was found to significantly associated with hypertension,  $p < 0.05$  on applying two tailed Chi-square test with yates 'correction (Table 3).

Among the participants, 90% were either overweight or obese as per body mass index (BMI) criteria for Asians. Although the proportion of

individuals with raised BMI was much high (90%), most of them were still in category of overweight (266 out of 500), (Fig. 3).

The proportion of overweight and obesity among hypertensives was around 94% (overweight 51.85% and obese 41.67%) (Table 2).

Most of the participants (>60%) belongs to joint families and among hypertensives one third patients belong to nuclear families. Among the hypertensive 40.7% were smokers, 34.3% were alcoholic while among non-hypertensives, only 25.5% and 18.6% were smokers and alcoholics, respectively. About 48.1% of hypertensives had a positive family history and 38.9% took high salt more than tea spoonful or 10 g, in their diet whereas 77.81% of non-hypertensives consume <5 g salt daily in their diet (Table 2). The overall observations of risk factors indicate that the prevalence of smoking, alcoholism, and high salt consumption are not so common in the community as approx. 70% of the participants were nonsmokers, non-alcoholics, and take low salt diet.

The applications of statistical test (two-tailed Chi-square with yate's correction) for the assessment of significant association revealed that smoking, alcoholism, and high salt consumptions had the significant association with the hypertension (Table 3). Although the statistical test did not reveal significant association of hypertension with raised BMI when compared against normal BMI (Table 3), but there was significant association of obesity with hypertension when compared against overweight and cumulative normal and overweight category (Table 4).

Among all the participants, 149 had positive family history of hypertension and 52 (48%) of them had hypertension. Positive family history had significant association with the hypertension (Tables 2 and 3).

**DISCUSSION**

The incidence and prevalence of hypertension among adult population is rising at a fast pace throughout the world including India as per continuous researches and survey reports in the recent past [1,4,5]. In the present study, the incidence of hypertension among adults of age 20–39 years was found to be 21.6%. The prevalence of hypertension in age group of 20–29 years and 30–39 years was below 10% and 20%, respectively, as per NFHS-4 report, whereas in this study, even the incidence rates are much higher (17% and 29%) in respective age groups. This contrast finding may be due to the fact being hospital-based study but it indicates that most of the hypertensive cases may be diagnosed through this approach instead of community-based approach. There is increased risk of getting hypertension as the age advances as per findings of this study as well as NFHS-4 and various other studies [12-14].

In this study, it was found more than 40% prevalence of smoking tobacco and 34% prevalence of alcoholism among newly diagnosed hypertensives and both these had significantly associated. Smoking and alcoholism are well known risk factors for hypertension and has been well explained in several studies [15-17] with significant odds ratio [16-18]. In this study, there was significant association of obesity with hypertension. The prevalence of obesity among hypertensives was 41% and of overweight's was 52% and only 6% were had normal BMI. High salt intake and family history of hypertension among any parent were also significantly associated with hypertension. The studies in India and abroad significantly mentioned that increasing age, raised BMI, high dietary salt intake, and the family history are the key risk factors for the development of hypertension [12-21]. Although as per these studies and other research and national family health surveys reports, obesity prevalence among general population and among hypertensive is much high; but in this study, the overweight category has no significant difference among hypertensive as well as in normotensives. It indicates that targeting this overweight population for control of weight gain through lifestyle changes will halt the process of developing obesity and development of hypertension and other NCDs.

The government of India has already focused its attention for the control of NCDs through the national program (NPCDCS), but still

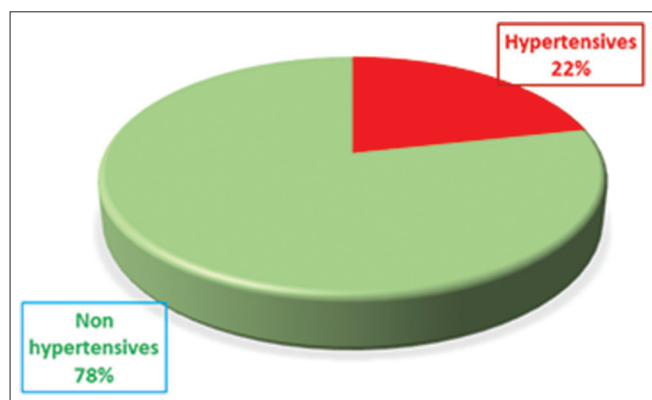


Fig. 1: Proportion of hypertension among participants

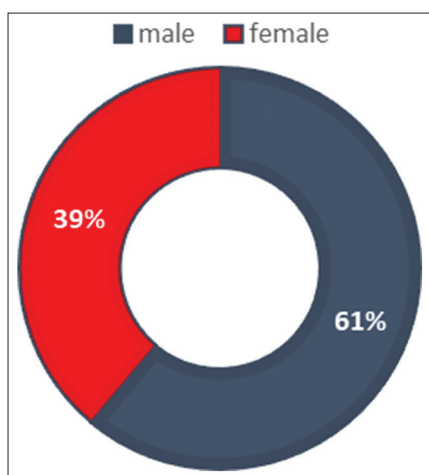


Fig. 2: Distribution of hypertension among different genders

Table 2: Magnitude of risk factors presence among hypertensives and non-hypertensive participants

Variables	Characteristics	Hypertensives	Percentage	Nonhypertensives	Percentage	Total
Age*	20-24	29	26.85	145	36.99	174
	25-29	24	22.22	114	29.08	138
	30-34	34	31.48	77	19.64	111
	35-39	21	19.44	56	14.29	77
	Total	108	100.00	392	100.00	500
Sex	Male	66	61.11	214	54.59	280
	Female	42	38.89	178	45.41	220
	Total	108	100.00	392	100.00	500
Family	Nuclear	36	33.33	155	39.54	191
	Joint	72	66.67	237	60.46	309
	Total	108	100.00	392	100.00	500
Education	Illiterate	57	52.78	157	40.05	214
	Upto high school	41	37.96	195	49.74	236
	Above high school	10	9.26	40	10.20	50
	Total	108	100.00	392	100.00	500
BMI	Normal	7	6.48	43	10.97	50
	Overweight	56	51.85	266	67.86	322
	Obese	45	41.67	83	21.17	128
	Total	108	100.00	392	100.00	500
Smoking	Smokers	44	40.74	100	25.51	144
	Non smokers	64	59.26	292	74.49	356
	Total	108	100.00	392	100.00	500
Alcohol	Alcoholic	37	34.26	73	18.62	110
	Non alcoholic	71	65.74	319	81.38	390
	Total	108	100.00	392	100.00	500
Salt intake	Low or normal	24	22.22	305	77.81	329
	Moderate	42	38.89	78	19.90	120
	High	42	38.89	9	2.30	51
	Total	108	100.00	392	100.00	500
Cooking oil	Vanaspati ghee	3	2.78	10	2.55	13
	Oil	105	97.22	382	97.45	487
	Total	108	100.00	392	100.00	500
Family history	Yes	52	48.15	97	24.74	149
	No	56	51.85	295	75.2	343
	Total	108	100.00	392	100.00	500

Age in completed years. BMI: Body mass index

Table 3: Association of risk factors with occurrence of hypertension among participants

Variables	Total (n=500)	Hypertensives (n=108)	Nonhypertensives (n=392)	$\chi^2$	p
Age groups (years)	20-29 (312)	53	259	9.714	0.0018
	30-39 (188)	55	133		
Sex	Male (280)	66	214	1.208	0.2718
	Female (220)	42	178		
Family	Nuclear (191)	36	155	1.132	0.2874
	Joint (309)	72	237		
Education	Illiterate (214)	57	157	5.094	0.024
	Literate (286)	51	235		
BMI	Normal (50)	7	43	1.429	0.2319
	Raise (450)	101	349		
Smoking	Smokers (144)	44	100	8.85	0.0029
	Non-smokers (356)	64	292		
Alcohol	Alcoholic (110)	37	73	11.171	0.0008
	Non-alcoholic (390)	71	319		
Salt intake	Low or normal (329)	24	305	113.791	0.0001
	Above normal or high (120)	84	87		
Cooking oil	Vanaspati Ghee (13)	3	10	0.017	0.8957
	Oil (487)	105	382		
Family# history	Positive (149)	52	97	21.064	0.0001
	Negative (351)	56	295		

#Either of the parents or both the parents suffering/suffered from clinically diagnosed hypertension. BMI: Body mass index

the incidence and prevalence of NCDs including hypertension are worsening (comparative data of NFHS 4 and NFHS 5) [4,5]. Hence, the strategy to screen out the maximum possible adult population for NCDs is necessary but due to huge resources demanding and tackling with communicable diseases, Maternal and child health on other hand we lag behind. At this time, utilizing the opportunistic screening for all the

adults coming in contact with health system can increase the pool of screened population for NCDs.

The limitation of study was that it is a hospital-based study. Waist-hip circumference wasn't measured in the patients which is an important parameter for determination of obesity. The association between

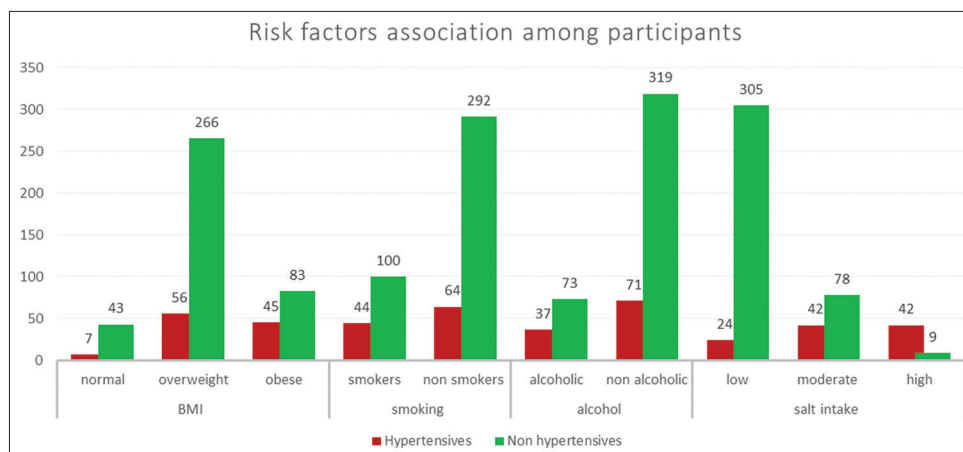


Fig. 3: Distribution different risk factors among participants (hypertensives and non-hypertensives)

Table 4: Association of body mass index (normal, overweight and obese) with occurrence of hypertension

Variables	Total (n=500)	Hypertensives (n=108)	Nonhypertensives (n=392)	$\chi^2$ , p
BMI (normal vs. overweight)	Normal (50)	7	43	0.154, 0.6949
	Overweight (322)	56	266	
	Total (372)	63	309	
BMI (overweight vs. obese)	Overweight (322)	56	266	15.601, 0.0001
	Obese (128)	45	83	
	Total (450)	101	349	
BMI (normal plus overweight vs. obese)	Normal and overweight (372)	63	309	17.610, 0.0001
	Obese (128)	45	83	
	Total (500)	108	392	

BMI: Body mass index

study variables may not imply causatively due to cross-sectional study design.

Cholesterol levels were not taken into account due to lack of consent for obtaining blood samples.

**CONCLUSION**

In the present study, a strong association was found between increasing age and manifestation of hypertension. Furthermore, there is strong association with high dietary salt intake, obesity, smoking, and alcoholism. Almost each fifth adult individual coming in contact with health system was found hypertensive. Provision of opportunistic screening among adult patient attenders can counter the “rule of halves” challenge of hypertension. Early intervention targeting overweight category of adults have potential to halt burden of NCDs in population.

**CONFLICTS OF INTEREST**

None.

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