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Research Article

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Investigation of Risk Factors and Prevalence of Hypertension among Young Adults in Urban and Suburban Population of Central India

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ABSTRACT

Background: The prevalence of Hypertension and its risk factors among the elderly has been extensively researched in many studies on Hypertension in India and abroad. However, it has not been studied much among young adults in the age group of 20-40 years. Hypertension needs early intervention for prevention and control measures. Therefore, a study on the prevalence and risk factors of Hypertension among young adults in the age group of 20-40 years is essential to improve our efforts to reduce morbidity and mortality. This study aims to estimate the prevalence of Hypertension and its risk factors among young adults (20-40 years age group) in urban/suburban population.

Methods: A cross-sectional study of 1000 young adults in the age group of 20-40 years was conducted in the urban and suburban localities of district Bhopal, MP, India, for ten months (Jan-Oct 2023). Socio-demographic data and risk factors of Hypertension were assessed by interviewing subjects. Blood pressure of every participant was measured under well-defined conditions.

Results: Hypertension was detected in 219 subjects out of 1000 subjects (21.9%). There was a significant association ($p<0.05$) of BP with age, education status, occupation, socio-economic class, tobacco consumption, smoking, and alcohol consumption. No significant association was found with gender, religion, or family history with NCDs.

Conclusion: Results showed that One in Five adults in urban/semi-urban population is having Hypertension without being aware of it. This is an alarming situation.

Key-words: Prevalence, BMI, Young adults, Hypertension, Risk factors, Non-communicable diseases (NCDs)

INTRODUCTION

Every year, non-communicable diseases (NCDs) claim the lives of about 41 million people worldwide. NCDs, such as hypertension, have been blamed for a significant number of premature deaths, particularly in the 30- to 70-year-old age range [1]. With over one-sixth of the global population, India is the country responsible for almost two-thirds of all deaths from recognized noncommunicable diseases [2].

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In India today, non-communicable diseases (NCDs) account for over 60% of all deaths, with stroke and CVDs making for almost 30% of the total. Increased morbidity and death are linked to hypertension, which has become a major disease burden. In [3] Hypertension is a multifaceted medical condition that significantly impacts both population health and the Indian healthcare system. Extended periods of undiagnosed and untreated hypertension result in severe disease manifestations and major complications, including heart failure, stroke, ischemic heart disease, chronic kidney disease, and premature death.

Recent epidemiological shifts have raised concerns about the rising prevalence of non-communicable diseases (NCDs). [3] Approximately one in eight adults aged 20 to 40 suffer from hypertension, a prevalent condition

among young people. [4] Adults in India have a 30% overall prevalence of hypertension, with 34% of cases occurring in cities and 28% in rural areas. [5] To prevent, reverse, or contain problems, the main therapeutic objective should be to effectively regulate blood pressure.[8–6] With the right medication and lifestyle changes, hypertension is easily diagnosed and avoided. By using techniques including early detection, treatment, and control, the negative health effects of hypertension can be lessened.

In addition to supporting hypertension control by enhancing worksite well-being and quality control measures, this entails speeding up the procedure and lowering prescription costs through insurance coverage, cost-sharing, and benefit designs. [9] Poor control of blood pressure and increased healthcare expenses are caused in part by low health literacy, low patient self-care, high patient self-medication, various techniques to manage hypertension, and low adherence to treatment plans in India. References 10 Young adults, who stand to gain the most from preventive and control efforts, have relatively little information available regarding the prevalence of high blood pressure and its risk factors. [4,11-13]

Because patients over 50 years of age were the sole participants in most clinical trials, there is also a dearth of knowledge regarding the best course of treatment for younger patients with hypertension. [13–14] To address the escalating trend of Hypertension and establish appropriate measures, awareness of the prevalence and predictors of Hypertension among all age groups of the population, especially the younger lot, is essential. Our study was intended to fill this knowledge gap about Hypertension among young adults in the age group of 20 to 40 years.

MATERIALS AND METHODS

Study design- Cross Sectional study.

Study settings- Field practice area of Mahaveer Institute of Medical Science (MIMS); Bhopal. The study population was selected from urban and semi-urban areas within 20 km radius of MIMS Bhopal.

Study period- January 2023 to October 2023 for ten months.

Sample size and Sampling technique- The 2011 Madhya Pradesh Census states that 18,86,100 people called Bhopal Municipal Corporation home. The target sample size was determined using a hypertension prevalence of 21% in the 20–45 age range [15]. The computed sample size was predicted to be 381 using the method [$n= z^2p (1-p)/e^2$], considering the prevalence of p=21%. Here, n is the size of the study population, p is the estimated proportion of the study population (20.8%), and e is the acceptable error, which is 10% of the total prevalence.

Here, z is 1.96 for the 95% confidence interval. For non-response or partial answers, 38 respondents (10% of the sample size) were added to the original 380 subjects. Therefore, there were 418 samples in all. Since we had enough time and resources, we gathered data from 1000 individuals to get more reliable study results.

Inclusion criteria and Exclusion criteria

Inclusion- Males and Females in the age group of 20–40 years and residents of the study area for more than 6 months.

Exclusion- Age less than 20 years or more than 40 years at the time of interview/ Not a resident of study area/Pregnant women/person with any cardiac disease/person on regular medication for any chronic disease/ seriously ill patients / those not giving consent to participate in the study.

Study tool- A semi-structured questionnaire was created and employed to gather data on personal and family history, as well as socio-demographic factors. Blood pressure, height, and other anthropometric parameters were noted. Senior consultants and faculty members evaluated the questionnaire's validity, and a team of researchers—as opposed to a single researcher—achieved consistency in the findings. The South East Asian Region (WHO) was used to classify body mass index (BMI) [16]. By taking the left arm's blood pressure, hypertension was diagnosed after resting the subject for 10 min in a sitting position with a mercury sphygmomanometer. Three BP readings were recorded for everyone over 10 min. The average of the two closest BP readings was used to categorize the Study participants. It was done according to the JNC 8 classification [17].

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Data collection procedure- The study was carried out following approval by the scientific and ethical committee of MIMS. The purpose of the study was explained to the qualified participants. Personal interviews are used to get pertinent data. Following consent, research teams used semi-structured questionnaires to interview study participants, and field investigators cross-verified the results every day. To identify the study participants, home visits were conducted in conjunction with Anganwadi staff and ASHA. Members of the team received training in gathering data. Calibrating Mercury Sphygmomanometers both before and during the field investigation was done. A Diamond mercury sphygmomanometer, whose accuracy has been verified, was used to measure blood pressure [18]. Before the exam, participants were requested to abstain from alcohol, cigarettes, and caffeinated beverages for at least sixty minutes. After at least ten minutes of rest, the left arm's blood pressure was taken. With the legs extended, the left arm resting on a table, and the antecubital fossa at the level of the lower sternum, the patient's blood pressure was measured while they were seated. During the procedure, two arm cuffs with arm circumferences of 9–13 inches and 13–17 inches were used. To the closest millimeter-hour, three blood pressure values were obtained. The closest three-minute interval's mean for the analysis, two values were employed. Confidentiality was preserved, and respondents' privacy was honored.

Variables- Explanatory or independent variables included socio-demographic attributes and the dependent variable was BP category, which was classified as Pre-hypertension (if the blood pressure is between 80 and 89 mmHg at the diastolic stage and/or between 120 and 139 mmHg at the systolic stage); and hypertension (if the blood pressure is higher at the diastolic stage than 90 mmHg or higher than 140 mmHg at the systolic stage).

Statistical analyses- Microsoft Excel was used to gather and compile pertinent data. Version 3.1 of the Epidata software was used to enter the data, and SPSS version 16 was used for the analysis. The mean and percentages were the statistical instruments used. As a statistical test of significance, the chi-square test was utilized.

Ethical Approval- Approval for this study was obtained from the relevant ethical committee, ensuring that all research procedures adhered to ethical standards and guidelines for protecting participants' rights and confidentiality.

RESULTS

Table 1 shows the Socio-Demographic Profile of the participants. Out of 1000 study subjects, 55.9% & 44.1% were male & female, respectively. 17.3% & 82.7% of study subjects were from the age group 20- 30 Years & 31- 40 Years, respectively. Out of 1000 study subjects, 64.6% were Hindu & 34.5% were Muslim, and 0.9 % were others .1.5% of Study subjects were illiterate, while 26%, 22.3%, 16.8%, 16.1%, 11.2%,6.1% study subject having primary, secondary, middle, high school, Graduate & Postgraduate education respectively. Among the total study participants, 66% were working, while 32% were non-working. As many as 0.6%, 2.6%, 62.1%,14.8%, and 19.9% of subjects were from Social Class – I, Class -II, Class – III, Class - IV, Class - V, respectively, as per modified B.G. Prasad classification, 2022.

Table 1: Socio-Demographic Profile of Participants

Particulars		Frequency (n=1000)	Percentage (%)
Age	20 - 30	173	17.3
	31- 40	827	82.7
Sex	Male	559	55.9
	Female	441	44.1
Educational Status	Illiterate	15	1.5
	Primary	260	26
	Secondary	223	22.3
	Middle	168	16.8

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	High School	161	16.1
	Graduate	112	11.2
	Postgraduate & Above	61	6.1
Occupation status	Working	680	68
	Non-working	320	32
Socio-economic classification according to Modified B.G. Prasad for Year 2022	Class – I	06	0.6
	Class -II	26	2.6
	Class - III	621	62.1
	Class - IV	148	14.8
	Class – V	197	19.9
Religion	Hindu	646	64.6
	Muslim	345	34.5
	Other	09	0.9

Table 2 shows the distribution of family history of NCDs and Addiction to the study Point. Family history of hypertension and diabetes was present in 36.9% and 12.3% of subjects, respectively. Family history of chronic respiratory diseases (CRDs) and cancer were present results in 26.4% and 9.6% of subjects, respectively.

Table 2: Distribution of family History of NCDs & addiction Status

Particulars		**Frequency (n=1000)**	**Percentage (%)**
Family History's of NCDs	Hypertension	369	36.9
	Diabetes	123	12.3
Chronic Respiratory Diseases		264	26.4
Cancer		96	9.6
Addiction Profile	Alcohol	265	26.5
	Smoking	320	32.0
	Tobacco chewing	454	45.4

Table 3 shows the distribution of study subjects according to blood pressure. 26.4% of males and 16.09% of females have hypertension (blood pressure >140mmhg). In all, 21.9% of study subjects had systolic blood pressure >140mmhg.

Table 3: Distribution of study subjects according to Blood Pressure

Particulars	**Male (n = 559)**		**Female (n=441)**		**Total**		**Test of significance p-value**
	No.	**%**	**No.**	**%**	**No.**	**%**	
Systolic Blood Pressure							
<140	411	73.52	370	83.9	781	78.1	0.59
>140	148	26.4	71	16.09	219	21.9	
Diastolic BP							
<90	427	76.38	377	85.48	804	80.4	0.73
>90	132	23.61	64	14.51	196	19.6	

Table 4 shows the Associates of Raised blood pressure of study Subjects with their Socio-economic variable. These are significant associates of raised BP with age, educatio-nal Status, Occupation & Socio-economic class. There are no significant associates of high BP with the gender of the study participant.

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Table 4: Associates of Raised blood pressure of study Subjects with their Socio-economic variable

	Particulars	Total (n)	Normal BP No.	%	Raised BP No.	%	Test of Significance
Age	20-30	406	340	83.70	66	16.25	0.0
	31-40	594	387	65.15	207	34.84	
Sex	Male	559	411	73.5	148	26.4	1.1
	Female	441	370	83.9	71	16.09	
Educational Status	Illiterate	15	074	6.6	085	3.3	0.00
	Primary +Middle+High	651	482	74.03	169	25.96	
	Intermediate +Graduate + Post Graduate	334	278	83.23	56	16.76	
Occupation	Working	603	375	62.18	228	37.8	0.022
	Non-working	397	323	81.3	74	18.63	
Socioeconomic Class	I+II+III	655	538	82.13	117	17.86	0.039
	IV+V	345	224	64.92	121	35.07	

Table 5 shows the association of the Blood pressure of study subjects With Risk factor attributes. Tobacco consumption, alcohol consumption, smoking & BMI all have significant associations with high BP. There were no significant associates of subject BP with family of NCD awareness of NPCDs Programme.

Table 5: Associates of Blood pressure of study subjects With Risk factor Attributes.

Particular		Total	Normal BP		Raised BP		Test of Significance
			No.	%	No.	%	
Family History of NCD	Absent	448	355	79.2	101	22.54	0.72
	Present	552	426	77.1	118	21.3	
Awareness regarding NPCDCS	No	882	703	79.7	179	20.29	0.64
	Yes	118	78	66.1	40	33.89	
Tobacco Consumption	Yes	454	251	55.28	203	44.71	0.00
	No	546	530	97.06	16	2.93	
Alcohol Consumption	Yes	265	104	39.24	161	60.75	0.00
	No	735	531	72.24	204	27.75	
Smoking	Yes	320	141	44.06	179	55.93	0.00
	No	680	524	77.05	156	22.94	
BMI (Asian Criteria)	<Under weight.	119	98	82.35	21	17.64	0.00
	Normal	695	543	78.12	152	21.8	
	>Over weight	196	76	38.7	120	61.2	

Table 6 shows a logistic regression analysis for the raised blood pressure of study subjects. Significant association of education, occupation, and status of subjects with raised BP obtained in univariate analysis was eliminated in the logistic Model. Taking ages 20- 30 Years as a reference, the risk of hypertension was higher in subjects between 31-40 Years. Subjects consuming tobacco, smoking, and alcohol consumption have a high risk of hypertension, as seen in logistic regression analysis.

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Table 6: Logistic Regression analysis for raised blood pressure of Study Subjects

Particulars		Estimation	SE of β	P	AOR	95% CI	
						Lower	Upper
Age	30-41	1.6	0.29	**0.04**	2.99	1.68	5.19
	20-30*	-	-	-	-	-	-
Education	(1) Illiterate	0.55	0.39	0.31	1.4	0.8	4.2
	(2)Primary+ Middle+High	0.59	0.46	0.19	1.65	0.76	3.9
	(3) Intermediate & above*	-	-	-	-	-	-
Occupation	Working	0.79	0.46	0.1	2.9	1.1	5.6
	Non-working*	-	-	-	-	-	-
Socioe-conomic Class	IV+V	0.62	0.39	0.9	2.6	1.9	4.7
	I+II+III*	-	-	-	-	-	-
BMI	Normal	0.12	0.43	0.99	1.7	0.45	3.1
	Overweight+ Obese	0.71	0.59	0.16	2.9	0.69	5.8
	Underweight*	-	-	-	-	-	-
Tobacco Consumption	Yes	0.54	0.28	0.041	1.71	1.1	2.92
	No*	-	-	-	-	-	-
Alcohol Consumption	Yes	0.83	0.32	0.02	2.96	4.32	1.1
	No*	-	-	-	-	-	-

Note: The appropriateness of fitted modal was 73.8%

DISCUSSION

India has a high prevalence of hypertension [19,20]. Numerous previous research has shown that high blood pressure in childhood and adolescent populations can evolve into adult hypertension. Adult hypertension can result from younger age groups experiencing persistently elevated blood pressure [21]. Thus, young people' blood pressure monitoring may be helpful for the early diagnosis and treatment of hypertension. In our study, a significant proportion of young individuals had hypertension.

High rates have also been shown in past research on young adults [22]. This study found that almost one in three participants had hypertension. The prevalence was lower (one out of five) than in the current study, according to a cross-sectional survey carried out in rural Andhra Pradesh by Chow *et al.* [23]. A lower frequency in both male and female individuals was similarly observed by Krishnan *et al.* in rural Haryana [24]. In a cross-sectional study conducted in Aurangabad, Maharashtra, Todkar *et al.* also projected an overall prevalence significantly lower than that of the current investigation [25]. According to Oommen et al.'s findings from a cross-sectional survey conducted in rural Tamil Nadu, the prevalence of hypertension was 17.2% [26].

Researchers Thankappan *et al*. in rural Kerala (32.5%), Singh *et al.* in rural Andhra Pradesh (36.4%), Swaminathan et al. in rural Tamil Nadu (37.8%), Tushi et al. in rural Nagaland (43.2%), and Mohanraj et al. in suburban Tamil Nadu (47.1%) all reported findings of overall blood pressure higher than the present study [27–31]. Increases in BMI were associated with a steady and sharp rise in the prevalence of hypertension in both sexes; in NFHS 4, 29% of obese women and 38% of obese males were found to be hypertensive [32]. Ghosh *et al.* and Kumar and Misra's analysis of cross-sectional survey data from the National Family Health Survey (NFHS) fourth round (2015–2016) revealed that the following factors were also significant predictors of hypertension: advancing age, obesity/overweight, male sex, alcohol consumption, and contrast high socio-economic status [33,34].

The results of the current study are consistent with a multivariate regression analysis conducted in the ICMR INDIAB study by Bhansali *et al.* Additionally, a

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quantitative analysis conducted in coastal Karnataka by Rao *et al.* found that multivariate logistic regression significantly correlated hypertension with advancing age, central obesity, overweight, and obesity as defined by BMI [35,36]. In addition, a study by Oommen et al. in nine villages in a rural block of Vellore district, Tamil Nadu, found a significant correlation between hypertension and aging, male sex, living in an urban area, alcohol consumption, scheduled caste status, low physical activity, BMI ≥25 kg/m^2, central obesity, and a family history of the condition [26]. Disparities in study subjects' characteristics, study settings, and periods could account for variations in the degree of hypertension observed in the studies mentioned above.

The results of this research offer valuable insights into the prevention, screening, and targeted care of individuals from rural areas of India. Nevertheless, the survey's cross-sectional design only offers the burden of hypertension at a specific moment in time. Since the study primarily looks at adult rural populations, nation-based figures are preferred. To determine the precise frequency and predictors of hypertension in the community, a sizable community-based study involving both rural and urban people is needed. The research disproves the conventional wisdom that suggests hypertension is not a significant issue in rural India. A sizable portion of the populace does not know whether they have hypertension.

The study's conclusions suggest that to counteract the need for lifelong hypertension management. Basic healthcare settings should take precedence over pricey tertiary care facilities. This study sheds light on the co-morbidities and risk factors associated with hypertension in young Indian adults (≤40 years of age). In addition, variables like age, sex, BMI, waist circumference, past medical history, alcohol use, blood pressure readings, smoking patterns, and sedentary lifestyle were also considered. Among these risk factors, individuals with hypertension, dyslipidemia, and hypertension and diabetes showed significant associations with age, alcohol, sedentary lifestyle, waist circumference, and family history of diabetes, hypertension, and dyslipidemia. These findings support the high prevalence of hypertension in the population of young adults in India, indicating that early detection of hypertension and the application of preventative measures could aid in the early diagnosis of the condition and the better management of its co-morbidities, thereby reducing the number of premature deaths in the Indian population.

The median BMI for the entire population was 27 kg/m^2, which is considered overweight. The results of this study showed that the levels of SBP and DBP were exactly linearly associated with BMI, suggesting that being overweight or obese may be the primary cause of hypertension in young individuals. According to published research, BMI is a consistent factor in the high prevalence of hypertension, independent of age and gender. The most important predictor of hypertension is a sedentary lifestyle, which was exhibited by most of the patients across all age categories. The current study focuses on alcohol use and smoking habits as additional lifestyle factors that are critical in raising the incidence of hypertension.

In previous research, physical inactivity and non-adherence to medication caused a significant prevalence of hypertension among participants with higher levels of education and economic status, including those who were aware of the risk factors for the condition. This study admits several shortcomings. The clinical health records that were accessible for some of the individuals contained insufficient clinical data. In particular, the patients' socio-economic, educational, and dietary statuses were not documented in this study, which would have helped conclude the observations. Furthermore, no data about race, treatment strategy, or geographic location was gathered. As a result, it is impossible to extrapolate these findings to the entire Indian population.

CONCLUSIONS

Hypertension was found to be a problem among young adults advancing age, tobacco consumption, and alcohol consumption. Socio-economic status leads individuals to hypertension. Most of the cases were previously undiagnosed & need early identification to minimize complications later in life.

Further study needs to be conducted as there is a lack of data on hypertension in a young population.

CONTRIBUTION OF AUTHORS

Research concept- Swapnil Jain, Daneswar Singh, V K Sharma

Research design- Daneswar Singh, V K Sharma

Supervision- Swapnil Jain, Daneswar Singh

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