



# Prevalence of Hypertension and Its Risk Factors among Adults in Rural Community: A Cross-Sectional Study

Sangeeta Kori<sup>1</sup>, Aarti G Sahasrabudhe<sup>2</sup>, Vinod K Arora<sup>3</sup>

<sup>1</sup>Associate Professor, Department of Community Medicine, Index Medical College Research Centre, Indore

<sup>2</sup>Professor, Department of Community Medicine, Index Medical College Research Centre, Indore

<sup>3</sup>Professor & Head, Department of Community Medicine, Index Medical College Research Centre, Indore

## ABSTRACT

**Introduction:** Hypertension is a chronic condition of concern due to its role in the causation of coronary heart disease, stroke and other vascular complications. Objectives of this study were to find out prevalence of hypertension among adults of rural community and association between hypertension and its risk factors.

**Methodology:** Cross sectional community-based study was done with a sample of 501 adults between 18 to 60 years of age including both men (244) and women (257). A pretested semi-structured proforma was used collect data by trained doctors.

**Results:** The overall prevalence of hypertension was found to be 32.13 %. Higher prevalence found among males (34%), age group 51-60 year (49.5%) and in class III SES (38.9%). Hypertension was found to be significantly associated with family history of hypertension (OR=2.41, CI= 1.50-3.80), smoking (OR= 1.78, CI=1.08-2.93), alcohol use (OR=1.8, CI=1.20-2.60), high salt intake (OR= 3.2, CI=1.80-5.45), junk food consumption (OR=2.40, CI=1.63-3.52), physical inactivity (OR=2.8, CI=1.90-4.14), overweight (OR=3.14, CI=2.11-4.66) and obesity (OR=3.78, CI=2.41-5.95).

**Conclusion:** Increasing prevalence of hypertension in rural areas is major public health problem. Appropriate strategies are needed to create awareness regarding risk factors of hypertension.

**Key Words:** Hypertension, prevalence, risk factors, rural, cross-sectional

## INTRODUCTION

According to 'Global Status Report on Non Communicable Diseases 2014', in 2012 non communicable diseases (NCDs) accounted for 68% of total deaths worldwide. In simple terms, two out of every three deaths can be attributed to NCDs<sup>1</sup>. Across all WHO regions, with the exception of Africa, NCDs cause greater number of deaths than communicable, maternal, perinatal and nutritional causes combined. It is interesting to note that 80% of cardiovascular and diabetes deaths, and almost 90% of deaths from Chronic Obstructive Pulmonary Diseases (COPD), occurred in Low- & Middle-Income Countries<sup>2</sup>. Contra-

ry to the assumption that NCDs predominantly affect the old, data from many countries show that a significant percentage of adults are more likely to experience NCDs. The proportion of NCD deaths below 60 is higher in South East Asia Region (34%) as compared with that in the rest of the world (23%)<sup>3</sup>. Raised blood pressure is a leading risk factor globally. According to the estimates of 'Global Burden of Disease Study 2010' it accounts for 9.4 million deaths and 7% of global Disability Adjusted Life Years<sup>4</sup>.

India is experiencing a rapid health transition, with a rising burden of NCDs. NCD cause significant morbidity and mortality both in urban and rural population,

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**Correspondence:** Aarti Gopal Sahasrabudhe (Email: aarti3004@gmail.com)

with considerable loss of potentially productive years 35-64 years of life. In urban areas of India cardiovascular diseases, cancers and COPD, ranked first, second and fourth respectively<sup>5</sup>. Hypertension is a chronic condition of concern due to its role in the causation of coronary heart disease, stroke and other vascular complications. It is the commonest cardiovascular disorder, posing a major public health challenge to population in socio-economic and epidemiological transition. In India the prevalence of hypertension was varying from 17 to 21 percent in all the states with marginal rural-urban differences<sup>6</sup>. Rural areas have a prevalence that varies from 14.8 to 27.6% whereas urban areas have a prevalence ranging from 21.4% to 33.8%<sup>7</sup>. Rapid technology advancement and changing lifestyle may pose an important risk to develop hypertension in rural population. There is limited number of studies on prevalence of hypertension in rural population of central India. Therefore this study was done to know the prevalence of hypertension and their associated risk factors among adults of rural community of central India.

## METHODOLOGY

It was a community based cross sectional study designed to reveal the prevalence of hypertension in the age group of 18 to 60 year of adults in rural field practice area of a tertiary health care institute in Indore, Madhya Pradesh. Study was done over a period of six months duration i.e. from June 2015 to November 2015 and simple random method was used for collection of data. Sample size of 518 was calculated assuming prevalence of hypertension as 25.2% in adult population<sup>8</sup>, absolute error 4% and non-response 10%. Total 501 adults participated (96.7% response rate) in the study, of which 244 were male and 257 were female. Adults between age group of 18 to 60 year of age who gave the consent were included. Known Hypertensive with or without medication were also included while pregnant women and adults who did not give consent were excluded from the study. A pretested semi structured proforma was used to collect information regarding sociodemographic profile, salt intake, fat intake, physical activity, tobacco use, alcohol intake, past history of disease, as well as findings of physical examination including weight, height, waist circumference (WC), hip circumference, waist hip ratio (WHR), Body Mass Index (BMI) and blood pressure measurements.

Physical examination was done by the trained doctors (Interns posted under community medicine during the study period). Height was measured in meter with heel, buttock and back of head touching to wall in straight position looking forward (Frankfurt plane) and weight in kilograms using bathroom weighing machine with minimal clothing. The WC was measured in centimeters with the help of measuring tape in standing position with his or her weight

evenly distributed on both feet, and the feet about 25-30 cm apart. The measurement is taken midway between the inferior margin of the last rib and the crest of the ilium, in horizontal plane. The hip circumference was taken at level of buttock in horizontal plane<sup>9</sup>.

Blood pressure was measured in sitting position with a standard mercury sphygmomanometer with 12.5 cm cuff avoiding any exercise, alcohol or tobacco intake before last 30 minutes. The systolic and diastolic pressures were measured three times over a period of 3 minutes and the lowest reading was recorded<sup>6</sup>. JNC VII<sup>10</sup> criteria was used to diagnose hypertension. Hypertension was diagnosed if the systolic blood pressure was  $\geq 140$  mmHg and/or diastolic blood pressure was  $\geq 90$  mmHg or the participant was known hypertensive. Pre-hypertensive were assumed as normotensive for statistical calculation. BMI was calculated as weight in kg divided by square of height in meters and overweight and obesity is considered as BMI of  $\geq 23$  and  $\geq 27.5$  respectively as per Asian classification of BMI<sup>11</sup>. Abdominal obesity was diagnosed for men with a WC  $\geq 102$  cm and/or WHR  $\geq 1.0$  and for women with a WC  $\geq 88$  cm and/or WHR  $\geq 0.85$ <sup>6</sup>. A person who has been using *bidi* or cigarette or other smoke form of tobacco at least once in a day for at least six months from the study, considered as smoker and any form of smokeless tobacco use like *gutkha*, *khainee* or other forms at least once in a day for at least six months from the study was taken as smokeless tobacco user. Alcohol use was considered if a person consumed at least 10gm of alcohol per day for at least six months from the study. Physical inactivity was defined as doing no or very little physical activity at work, home, transport and discretionary time<sup>12</sup>. Saturated Fat and salt intake was asked and daily consumption was calculated. After taking interview, blood pressure and physical measurements, health education regarding risk factors of hypertension and importance of regular medication was given to the participants by the trained doctors. Chi square test was applied to find out association between hypertension and various risk factors. Strength of association was calculated by odds ratio with 95 % confidence interval.

## RESULTS

The study included 501 participants in which 244 were males and 257 were females. The overall prevalence of hypertension was found to be 32.13 %. Out of 501 participants 161 (32.1%) were hypertensive, 297 (59.3%) had normal blood pressure while 43 (26.7 %) were in pre-hypertensive stage. Among 161 hypertensive, 56 (34.7%) were newly diagnosed while 105 (65.2%) were known hypertensive and out of these 105 previously diagnosed hypertensives 69 (42.9%) had normal blood pressure and reported regular antihypertensive medication while 12 (12.4%) were in pre-hypertensive stage and

24(24.8%) had high blood pressure even after on being antihypertensive medication.

**Table 1** shows socio-demographic determinants of hypertension. The prevalence of hypertension was slightly higher among male (34%) than female which was found to be 30.3%. Hypertension had shown an upward trend as age advances. Lowest prevalence was observed in 18-30 yr age group while highest among 51-60 year age group. This difference was found statistically significant ( $p < 0.001$ ). There was no significant difference in prevalence of hyperten-

sion among different occupation although some differences have been observed in various socioeconomic groups (Modified B.G. Prasad's classification). It was highest in class III SES (38.9%) while lowest in Class V (27.3%). Prevalence was slightly higher among single participants (32.9%) (Unmarried/Widow/ Divorcee/ Separated) than married (32%).

**Table 2** shows association between prevalence of hypertension and various risk factors. Chi square test has been applied and p value and odds ratio with 95% CI has been shown.

**Table 1: Sociodemographic Determinants of Hypertension**

Variable	Hypertensive	Non Hypertensive	Odds Ratio	95% CI	P Value
<b>Sex</b>					
Male	83(34.0)	161(66.0)			
Female	78(30.3)	179(69.6)	1.1	0.81-1.72	0.38
<b>Age</b>					
18-30	29(19.2)	122(80.8)	1		
31-40	38 (27.3)	101(72.7)	0.6	0.36-1.09	
41-50	42(39.6)	64 (60.4)	0.36	0.20-0.63	
51-60	52(49.5)	53 (50.5)	0.24	0.13-0.42	<0.001
<b>Occupation</b>					
Service	34(32.3)	71 (67.7)	1		
Business	15(31.9)	32 (68.1)	1.02	0.4-2.1	
Farmer	35(36.1)	62 (63.9)	0.8	0.4-1.5	
Laborer	18(28.6)	45 (71.4)	1.2	0.6-2.3	
Housewife	59(31.2)	130 (68.8)	1.05	0.6-1.8	0.8
<b>Socioeconomic Status*</b>					
I	16 (32.0)	34 (68.0)	1		
II	25(36.2)	44 (63.8)	0.82	0.38-1.79	
III	30(38.9)	47 (61.1)	0.7	0.34-1.56	
IV	55(31.1)	122(68.9)	1.04	0.53-2.05	
V	35(27.3)	93(72.7)	1.25	0.6-2.54	0.4
<b>Marital Status</b>					
Married	136(32.0)	289(68.0)			
Single#	25 (32.9)	51 (67.1)	0.96	0.57-1.61	0.8

\*Modified BG Prasad's classification, #Unmarried/Widow/Divorcee/Separated

**Table 2: Association between Hypertension and Various Risk Factors**

Variable	Hypertensive	Non hypertensive	Odds Ratio	95% CI	P Value
<b>Family History</b>					
Yes	45 (48.9)	47(51.1)			
No	116(28.4)	293(71.6)	2.41	1.50-3.80	<0.001
<b>Smoking</b>					
Yes	33(43.4)	43(56.6)			
No	128(30.1)	297(69.9)	1.78	1.08-2.93	0.02
<b>Smokeless Tobacco use</b>					
Yes	38 (42.2)	52(57.8)			
No	123 (29.9)	288(70.1)	1.7	1.07-2.73	0.02
<b>Alcohol Use</b>					
Yes	64 (41.3)	91(58.7)			
No	97 (28.0)	249(72.0)	1.8	1.20-2.60	0.003
<b>Salt Intake</b>					
>5gm/day	142 ( 37.4)	238(62.6)			
<5gm/day	19 ( 15.7)	102(84.3)	3.2	1.80-5.45	<0.001
<b>Saturated Fat (% of total Energy Intake)</b>					
>10%	96 ( 32.8)	197(67.2)			
<10%	65 (31.2)	143(68.7)	1.07	0.73-1.50	0.7
<b>Junk Food</b>					
Daily	85(44.0)	108(56.0)			
Rarely	76(24.7)	232(75.3)	2.4	1.63-3.52	<0.001
<b>Physical Inactivity</b>					
Yes	97(44.9)	119(55.1)			

No	64(22.5)	221(77.5)	2.8	1.90-4.14	<0.001
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**Table 3: Association of hypertension with overweight and obesity Indicators**

Risk Factors	Hypertensive	Non hypertensive	Odds Ratio	95% CI	P Value
<b>Body Mass Index</b>					
≥23	109(44.5)	136(55.5)	3.14	2.11-4.66	<0.001
<23	52(20.3)	204(79.7)			
≥27.5	58(56.9)	44(43.1)	3.78	2.41-5.95	<0.001
<27.5	103(25.8)	296(74.2)			
<b>Waist Circumference</b>					
(men ≥102cm+ women ≥88cm)	106(48.8)	111(51.2)	3.97	2.67-5.91	<0.001
(men <102 cm+ women <88cm)	55(19.4)	229(80.6)			
<b>Waist Hip Ratio</b>					
(men ≥1.0 + women ≥0.85)	116(35.9)	207(64.1)	1.65	1.10-2.48	0.01
(men <1.0 + women <0.85)	45(25.3)	133(74.7)			

Prevalence of hypertension was higher (48.9%) among those who had positive family history of hypertension than those who had not and this difference was found to be significant ( $P < 0.001$ ). Higher Prevalence of hypertension has been observed in Smokers, smokeless tobacco users and alcohol users i.e. 43.4%, 42.2% and 41.3% respectively. Excessive salt intake ( $>5\text{gm/day}$ ) was found to be positively associated with hypertension ( $p < 0.001$ ) while excessive saturated fat intake ( $>10\%$  of total energy intake) has not shown any association. Prevalence of hypertension has been found to be higher among those who consumed junk food daily (44%) and showed physical inactivity (44.9%) ( $P < 0.001$ ).

**Table 3** indicates association of hypertension with overweight and obesity indicators. BMI was  $\geq 23$  in 245 participants and among them 44.5% were hypertensives while total 102 participants had BMI  $\geq 27.5$  in which 56.9% were hypertensives ( $p < 0.001$ , OR 3.14 and 3.78). Out of 501 participants, 217 had WC higher than the cut off and 48.8% of them had hypertension ( $P = 0.001$ , OR = 3.97). In 323 participants, WHR was higher than the cut off and among them prevalence of hypertension was found to be 35.9% ( $p = 0.01$ , OR = 1.65).

In our study we have also searched for the comorbidities associated with hypertension which is not done in others studies except for diabetes mellitus. In present study it has been found that out of 161 hypertensives 54 (33.5%) participants had some diseases. Diabetes mellitus (59.2%) was the most common co-morbid condition followed by thyroid disorders (27.8%), myocardial infarction (7.4%) and chronic kidney disease (22.2%). Although statistical tests has not been applied for it.

## DISCUSSION

The overall prevalence in present study was 32.1%. Slightly lower prevalence was shown in studies of Raghupathy A et al<sup>13</sup> and Bansal SK et al<sup>14</sup> which was 29.8 % and 30.9% respectively. It shows prevalence of hypertension is increasing day by day even in rural areas also and it may be because of changing life style, increasing use of junk food and low physical activity. In present study prevalence of hyperten-

sion was slightly higher among males (34%) than in females (30.3%). Similar pattern was reported by Laxmaiah A<sup>15</sup> and Agrawal VK<sup>16</sup>. The prevalence of pre-hypertension in our study was found to be 26.7%. Other studies reported higher prevalence of prehypertension i.e. 45% to 39% and 50% to 57% among men and women<sup>17, 18</sup>. The upward trend of prevalence of hypertension with increasing age has been observed in this study. Similar trend has been observed by Kannan L et al<sup>8</sup> and Laxmaiah A et al<sup>15</sup>. This may be due to increasing arterial stiffness with advancing age. Present study revealed that hypertension was higher among those who had positive family history. There was 2.41-fold higher risk of hypertension than those who had no family history for the same. (CI: 1.50-3.80) Our findings are at par with Miao liu et al<sup>19</sup> and Ranasinghe P et al<sup>20</sup>. It may be due some genetic factors responsible for hypertension and other cardiovascular diseases. Other factors might be contributing like high alcohol, tobacco and salt consumption practices, common trends run in the families sometime in successive generations also. Our study results show that smoking was present in 15% of participants while smokeless tobacco use was seen in around 18% of them. When association of hypertension among them was observed, around 1.7 times higher risk has been recorded in smokers as well as in smokeless tobacco users. ( $p = 0.02$ ) Choudhary et al<sup>21</sup> also find significant association of hypertension with both forms of tobacco use. Alcohol users showed higher prevalence of hypertension i.e. 41.3% as compare to non alcoholics. On statistical analysis 1.8 times higher odds (CI = 1.20-2.73) has been observed. ( $p = 0.003$ ). Similar results were reported by Laxmaiah A<sup>15</sup>, Meshram I et al<sup>17</sup>. The average salt intake in our study was found to be 12gm/day/person which is quite high than the recommended. Very high number of participants i.e. 380 (75%) given history of high salt consumption ( $>5\text{gm/day}$ ) and higher prevalence of hypertension was observed (37.4%) among them. The risk was calculated 3.2 times higher as compare to those who consumed low salt ( $<5\text{gm/day}$ ). In various studies high salt consumption has been found associated with hypertension<sup>16, 22, 23</sup>. Daily consumption of junk food was found significantly associated ( $P < 0.001$ , OR = 2.40, CI = 1.63- 3.52). High saturated fat intake ( $>10$

% of total energy intake) has not been found significantly associated with hypertension. Physical inactivity was found to be important risk factor. Higher prevalence of hypertension (44.9%) has been observed among physically inactive participants ( $P < 0.001$ ,  $OR = 2.8$ ,  $CI = 1.90-4.14$ ).

Higher odds has been recorded for BMI  $> 23$  and  $> 27.5$  with hypertension i. e.  $3.14$  ( $CI = 2.11-4.66$ ) and  $3.78$  ( $2.42-5.95$ ) respectively. It shows that as BMI increases the chances of development of hypertension increases. Meshram I et al<sup>17</sup> and Mishra C et al<sup>24</sup> reported 1.9 and 6.0 times higher risk of hypertension among overweight respectively. We have observed 56.9% while Srinivas S<sup>25</sup> found 30 % of obese participants as hypertensive. This higher prevalence might be due to Asian classification of BMI and higher age group involved in our study. In our study central obesity also shows significant relationship with development of hypertension. High WC and high WHR above the cut off by used criteria show 3.97 and 1.65 times higher risk of hypertension. Comparable results in relation to hypertension has been observed in study done by Meshram I et al<sup>17</sup> which shows odds ratio of 3.71 and 1.90 for high WC and high WHR respectively. Obesity and lifestyle choices are the significant drivers of hypertension. It is the need of the hour, to introduce and implement community-based intervention to create awareness regarding risk factors of hypertension.

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