

## Original Research Article

# Prevalence of hypertension and its modifiable risk factors among rural population aged $\geq 13$ years

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## ABSTRACT

**Background:** Hypertension is a silent physiological ailment leading to bizarre pathological complications. Every year, some 12 million fatal and 20 million nonfatal strokes and myocardial infarctions occur worldwide (WHO, 2002). Prevalence was noted between rural and urban parts of India 27.6% (23.2-32.0) and 33.8% (29.7-37.8).

**Methods:** Study design community-based cross-sectional study. Sampling technique multistage random sampling technique was used to select representative sample from rural population of Kanpur.

**Results:** The overall prevalence of hypertension (HTN) in our study was found to be 21.27%, more among females 23.2% than males 19.7%. The results of logistic regression analysis with HTN status as dependent variable, to identify the effects of 6 risk factors (independent variables) for hypertension body mass index (BMI), grade of work, excess salt consumption, mental stress, smoking/chewing tobacco, alcohol intake. The odds ratio was 3.57 for the BMI with lower limit of 95% C.I. being 2.73, implying that it's at least 2.73 times related to hypertension and odds of other risk factors shows that all the 6 risk factors related statistically. There was significant correlation was found between BMI, blood pressure (BP) and age. There was significance ( $p < 0.01$ ) of positive correlation BMI with both systolic and diastolic BP with correlation coefficient (0.395) was stronger than diastolic BP (0.301).

**Conclusions:** Overall prevalence of hypertension was 21.3%. Smoking, tobacco chewing increases the prevalence and Quantity of alcohol consumption were seemed to pose definite impact on mean systolic BP. BP levels increases steadily with increasing BMI and with decreasing level of physical activity (sedentary lifestyle).

**Keywords:** Prevalence of HTN, JNC-7, Modifiable risk factors

## INTRODUCTION

Hypertension is a silent physiological ailment leading to bizarre pathological complications related to cardiovascular and central nervous systems. Its various correlates are grouped into two sub heads one of them are non-modifiable risk factors (age, sex, family history of hypertension (HTN) etc.) for which nothing much can be done. Another group of risk factor are modifiable. Most of the interventions for the control of HTN are directed to these. There are two population phenomena regarding HTN tracking (track record of HTN)) and rule of halves (in

respect to burden of disease). As estimated by WHO 1.13 billion people worldwide overall prevalence for hypertension in India was 29.8% (with 95% confidence interval (26.7-33.0). differences in hypertension prevalence were noted between rural and urban parts [27.6% (23.2-32.0) and 33.8% (29.7-37.8)].<sup>1</sup> According to the studies by global burden of hypertension in 2005 and then in 2010, there is an alarming rise in prevalence of hypertension (HTN). It is expected to rise further by 2025 involving over 1.5 billion people.<sup>2</sup>

The effects of hypertension are devastating. If left

untreated, hypertension causes cardiovascular disease, like stroke, myocardial infarction and cardiac failure, dementia, renal failure and blindness. Every year, some 12 million fatal and 20 million nonfatal strokes and myocardial infarctions occur worldwide, most in low and middle-income countries, (WHO, 2002).<sup>3</sup>

### Objective

The objectives of the study were to know the prevalence of HTN among rural population aged  $\geq 13$  years, to evaluate the role of modifiable risk factors (nutritional status and lifestyle) on occurrence of hypertension in the community. Period of study was one year between from December 2017 to November 2018.

### METHODS

The present study was conducted in the field practice area of (RHTC), Department of Community Medicine, in Shivrajpur block of district Kanpur Nagar (U.P.). Community-based cross-sectional study. Multistage random sampling technique was used to select representative sample from population of rural Kanpur, first stage out of 4 sub centers belonging to area of jurisdiction of RHTC Shivrajpur two of the sub centers were selected randomly.

Second stage at the second stage, 1 village was selected randomly from each of the two sub centers. House to house survey was carried out in each of the selected villages, starting from the first house on the left, applying inclusion and exclusion criteria. Sample size total 348 family's households surveyed. 1450 respondents were identified, out of whom  $\geq 13$  years old ( $n=1410$ ) Individuals were include in study by using formula for calculating sample size for proportions ( $n \geq 4 * PQ / L^2 = 1380$ ). \*P (prevalence) =0.224 (NFHS 4 report; the mean prevalence of blood pressure to be 22.4%).<sup>4</sup>

### Inclusion and exclusion criteria

All family members  $\geq 13$  years included in study those who are willing to participant except critically ill, pregnant women, subjects who were found absent during two consecutive visits.

### Ethical consideration

Ethical clearance was obtained from ethical committee of RMCH and RC for conducting the study.

### Study tool

Data was collected using predesigned and pretested pro-forma. Mercury sphygmomanometer blood pressure measuring apparatus, calibrated electronic weighing machine, and stature meter slider with scale for measuring height respectively.

### Definition of HTN

A subject was considered to be hypertensive if his/her BP was in the range of stage1 or stage2 hypertension and/or he/she was on treatment with anti-hypertensive medication since the past 3 months, as confirmed by prescription.

Joint national committee (JNC-7): defined prehypertension and stages of hypertension classification; (normal  $<120/<80$ , pre-HTN, 120-139/ 80-89, HTN stage-I 140-159/ 90-99, HTN stage-II  $\geq 160/ \geq 100$ ).

### RESULTS

Most of the 353 study subjects were in age group 20-30 years out of which 221 were males and 142 were females and minimum 141 study subjects were in age group 50-60 years out of which 69 were males and 72 were females (Figure 1). The mean blood pressure of study subjects in various age groups, adolescent (13-19 years) was  $1-10.43 \pm 7.96$  and elderly ( $\geq 60$  years) was  $133.29 \pm 23.50$  (Table 1 and Figure 2). Patterns of blood pressure among various age groups (according to JNC-7 classification adolescent population aged (13-19 years). Out of total 213 subjects in this age group (80.3%) were normotensive, 13.1 pre-hypertensive, 6.6% had stage-I hypertension. Among elderly population aged ( $\geq 60$  years) out of total 210 subjects in this age group 45.2% were normotensive, 12.4 were pre-hypertensive, 13.3% had stage-I hypertension and remaining 29% had Stage-II hypertension. The overall prevalence of HTN in our study was found to be 21.27%, more among females (23.2%) than males (19.7%). Assessing from diastolic blood pressure showed that those who were overweight/obese ( $BMI \geq 23 \text{ kg/m}^2$ ) were 2.49 times more likely to have pre-hypertension, 3.76 times more likely to have stage I hypertension, and 7.39 times more likely to have stage II hypertension than those who were in normal BMI category. Those who were underweight ( $BMI < 18.5 \text{ kg/m}^2$ ) were less likely to have higher systolic and diastolic blood pressure than those who were in normal BMI category.

Association of risk factors hypertension among study subjects. The results of logistic regression analysis with HTN status as dependent variable, to identify the effects of 6 risk factors (independent variables) for hypertension odds ratio for BMI, grade of work, excess salt consumption, mental stress, smoking or chewing tobacco, alcohol intake. The regression coefficient B is found statistically significant for all 6 variables (risk factors) the variables for HTN status in the equation. Odds ratio is 3.57 for the BMI with lower limit of 95% C.I. being 2.73, implying that it's at least 2.73 times related to hypertension and odds of other risk factors shows that all the 6 risk factors related statistically. Mild and moderate alcohol intake has got minimal or no risk but heavy intake of alcohol was significant risk for hypertension (Table 3).

Correlation between BMI, age and BP shows positive correlations with levels of significance ( $p < 0.01$ ) positive

correlation of BMI with both systolic and diastolic BP. There was significant increase in BP with increase in BMI. Correlation coefficient showed that relationship of BMI with systolic BP (0.395) was stronger than diastolic

BP (0.301). There was also significant ( $p<0.05$ ) positive correlation between age and BMI, but the magnitude of correlation of age with systolic and diastolic BP ( $p<0.01$ ) was more than that of age with BMI.

**Table 1: Prevalence of HTN according to JNC-7 among adolescent (13-19 years), elderly ( $\geq 60$  years) study population.**

Age group	HTN classification				Total N (%)
	Nor-motensive ( $1<120/80$ ) N (%)	Pre-hypertension ( $120-139/80-89$ ) N (%)	Stage I HTN ( $140-159/90-99$ ) N (%)	Stage II HTN ( $>160/100$ ) N (%)	
13-19	171 (80.3)	28 (13.1)	14 (6.6)	0 (0.0)	213 (100.0)
20-30	264 (74.8)	64 (18.1)	23 (6.5)	2 (0.6)	353 (100.0)
30-40	183 (65.1)	43 (15.3)	51 (18.1)	4 (1.4)	281 (100.0)
40-50	131 (61.8)	26 (12.3)	51 (24.1)	4 (1.9)	212 (100.0)
50-60	58 (41.1)	21 (14.9)	47 (33.3)	15 (10.6)	141 (100.0)
$\geq 60$	95 (45.2)	26 (12.4)	28 (13.3)	61 (29.0)	210 (100.0)
Total	902 (64.0)	208 (14.8)	214 (15.2)	86 (6.1)	1410 (100.0)

**Table 2: Mean blood pressure among adolescent (13-19 years), and elderly ( $\geq 60$  years) study population (n=1410).**

Age group (in years)	Number (n)	Percent	SBP (mm of Hg)	DBP (mm of Hg)
			Mean $\pm$ SD	Mean $\pm$ SD
13-19	213	15.1	110.43 $\pm$ 9.02	72.16 $\pm$ 6.40
20-30	253	25.0	116.18 $\pm$ 7.96	75.24 $\pm$ 6.32
30-40	281	19.9	120.51 $\pm$ 13.61	76.57 $\pm$ 7.45
40-50	212	15.0	123.45 $\pm$ 20.04	77.92 $\pm$ 8.86
50-60	141	10.0	130.82 $\pm$ 18.01	82.3 $\pm$ 7.57
$\geq 60$	210	14.9	133.29 $\pm$ 23.50	84.12 $\pm$ 9.84
Total	1410	100	121.28 $\pm$ 17.17	77.48 $\pm$ 8.58

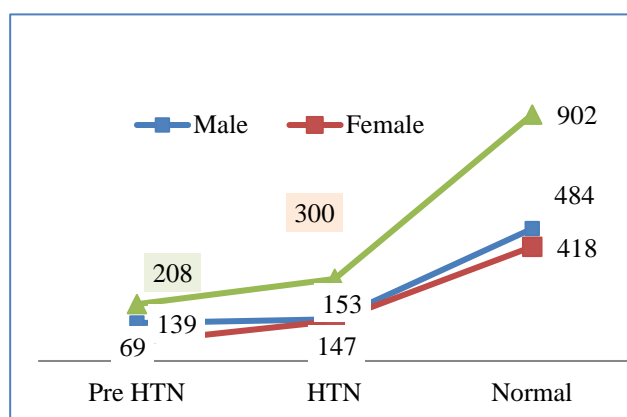
**Table 3: Results of logistic regression analysis to identify modifiable risk factors for hypertension (as dependent variable).**

Variables	B	Sig	Odds ratio (OR)	95% C. I. for odds ratio	
				Lower	Upper
BMI group	1.082	0.000	2.952	2.274	3.832
Duration of work	0.395	0.000	1.48	1.25	1.76
Excess salt consumption	0.719	0.000	2.09	1.50	2.80
Mental stress	0.401	0.012	1.49	1.09.	2.04.
Smoking chewing tobacco	0.516	0.000	1.67	1.27	2.20
Mild (alcohol intake)	0.659	0.003	1.93	1.254	2.978
Moderate heavy (alcohol intake)	1.289	0.000	3.630	2.290	5.754

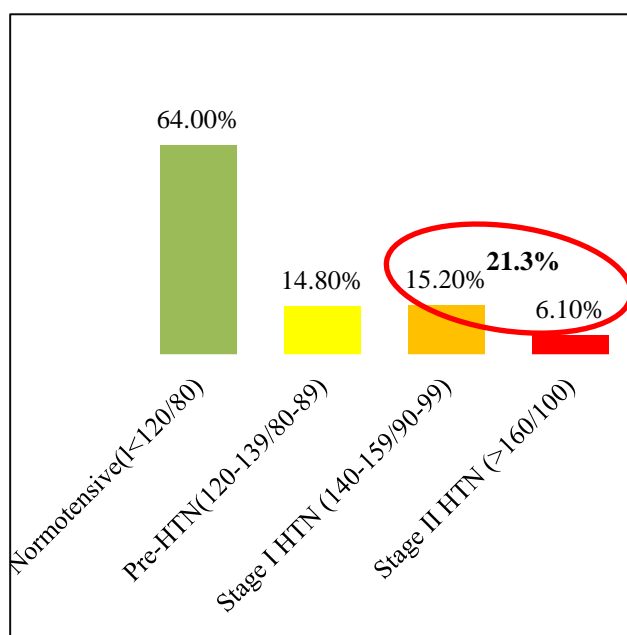
**Table 4: Correlation matrix between BMI, blood pressure and age (n=1410).**

Variables	Age	BMI	Systolic BP	Diastolic BP
Age	1	0.130**	0.411**	0.434**
BMI	0.130**	1	0.395**	0.301**
SBP	0.411**	0.395**	1	0.901**
DBP	0.434**	0.301**	0.901**	1

\*\*Correlation is significant at the 0.01 level (2 tailed).



**Figure 1: Prevalence of HTN (n=1410).**



**Figure 2: Classification of HTN status of study subjects (n=1410) according to JNC-7.**

## DISCUSSION

Prevalence of HTN in our study results are similar to those of national family health survey (NFHS-4) in 2014-2015, India implemented the fourth. 22.4%. The overall prevalence of hypertension was (for both men and women, total of all the three categories#). While prevalence of hypertension in India in rural 21.1% and urban 24.7% population. S4 data depicts the mean prevalence of blood pressure.

This finding compares well with those of Shantirani et al who observed a significant association between physical activity/house hold activity and hypertension in our study sedentary (performing routine work only) is found 22.4% and subjects performing house hold activities including sweeping, cooking, washing clothes found only 17.7% association was found statistically highly significant ( $p=0.000$ ).<sup>5</sup> According to WHO (1996) intake of sodium

chloride, in excess to physiological requirements, is associated with high blood pressure.<sup>6</sup> Deswal et al made a similar observation. The holistic concept of health lays great emphasis on a sound mind, in a sound body, in a sound environment. To the layman, hypertension is synonymous with tension or stress Shantirani et al, Reddy and Prabhu also reported a significant association between hypertension and smoking.<sup>7,8</sup> Xin et al and Janghorbani et al observed the same. Among alcoholics of various grades, the heavy and moderate drinkers were found to show higher mean systolic blood pressure in comparison to light drinkers.<sup>9,10</sup> Mungreiphy et al correlation between BMI, BP, and age were found significant ( $p<0.01$ ) positive correlations of BMI with both systolic and diastolic BP. It showed that BP increased with increase in BMI. Correlation coefficient showed that relationship of BMI with diastolic BP (0.378) was stronger than systolic BP (0.274) in present study but we found stronger relationship with systolic BP than diastolic BP. The reason for stronger relation with systolic BP was might be due to most of the study subjects 566 were in relatively younger in age (13-30 years), including pre-hypertensive among whom systolic blood pressure and changes in BMI had stronger correlation.<sup>11</sup>

## Limitations

A major limitation of the study was that the blood pressure pattern estimates were based on measurement of blood pressure in a single visit.

## CONCLUSION

Overall prevalence of hypertension was 21.3%. Smoking, tobacco chewing increases the prevalence and Quantity of alcohol consumption were seemed to pose definite impact on mean systolic BP. Blood pressure levels increases steadily with increasing BMI and with decreasing level of physical activity (sedentary lifestyle).

## Recommendations

Risk reduction strategies should be taken at both the levels for individual; and Population; by promoting health and providing specific protection population strategy; since lifestyle measures (diet, exercise and weight reduction restricting smoking and alcohol consumption) have been shown to be effective in reducing blood pressure levels in hypertensive individuals as well as in populations.

Thus, further studies recommended to explore the more modifiable risk factors of HTN like stress sleep and environmental factors.

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*Ethical approval: The study was approved by the Institutional Ethics Committee*

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