Original Research Article

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Prevalence and risk factors associated with prehypertension and hypertension among attendants of patients at a rural tertiary care institute of Haryana

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ABSTRACT

Background: Hypertension (HTN) is the leading risk factor for death and disability globally and disproportionately impacts low-and middle-income countries. HTN is present in 25% of urban and 10% of rural subjects in India. Our objective was to estimate the prevalence of pre-HTN and HTN among the attendants of patients at a rural tertiary care institute of Harvana.

Methods: This was a hospital-based cross-sectional study. A total of 309 attendants of patients were enrolled for this study. Diagnosis of pre-HTN and HTN was done on the basis of seventh joined national committee guidelines. Data were collected on a semi-structured proforma and were analysed by using R software.

Results: The prevalence of pre-HTN and HTN was 18.4% and 21.4% respectively. Both the pre-HTN and HTN were significantly higher in males (p=0.002) and in the age group of 45 to 55 years (p<0.001). The multinomial logistic regression analysis revealed that sex, age >55 years and BMI >23 kg/m² were significantly associated with pre-HTN and HTN.

Conclusions: The prevalence of both prehypertension and hypertension is high in rural Haryana. This makes the people of this area vulnerable to several chronic diseases. The findings warrant urgent measures to lower the risk factors in rural communities. So, programs are needed to improve the surveillance systems and implementation of community based screening programs for early detection of hypertension.

Keywords: Hypertension, Prehypertension, Prevalence, Risk factors

INTRODUCTION

Hypertension (HTN) is the leading risk factor for death and disability globally and disproportionately impacts low-and middle-income countries, where more than twothirds of people with HTN live. In 2010, an estimated 9.4 million deaths and 162 million years of life were lost due to HTN. 1,2 Cardiovascular diseases (CVD) account for a large proportion of all deaths and disability worldwide. In the Southeast Asian region HTN is an

important risk factor for attributable burden of disease in the region.^{1,3} HTN is on rise as projected by the global burden of HTN 2005 and global burden of disease 2010 studies which portray a grim picture for the Indian population.^{1,4} Current research have shown that hypertension is present in 25% of urban and 10% of rural subjects in India.⁵ In various studies carried out in Delhi the prevalence of hypertension was 17.4% and 14.1% among slums and rural areas respectively, while the prevalence of hypertension was 40% among urban areas

of Uttarakhand. 6-8 Beyond programs aimed at the prevention of HTN, its treatment remains a challenge in many parts of the world. Because of high burden of disease, the Indian government has launched the National Program for Prevention and Control of Cancer, Diabetes, Cardiovascular Diseases and Stroke for prevention and control of disease and Stroke for prevention and control of disease at community level. 9 Reliable information about the prevalence and risk factors of hypertension is essential to the development of national and local level health policies for prevention and control of HTN. However, the prevalence and determinants of prehypertension (pre-HTN) as well as HTN have not been explored recently from the rural area of Sonepat. These data are important to formulate informed policy as high blood pressure is one of the key targets to reduce premature mortality due to cardiovascular diseases. Thus, this study was conducted with the objective to estimate the prevalence of pre-HTN and HTN among the attendants of patients at a rural tertiary care institute of Haryana.

METHODS

This hospital-based cross-sectional study was conducted among the attendants of patients at BPS Government Medical College for Women and Hospital, Khanpur Kalan, Sonepat, Haryana. World hypertension day (WHD) was observed on 17 May 2017 in the outdoor patient campus of the hospital to aware the public attending the institute. Attendants of the patients visiting the institute on WHD were screened for pre-HTN and HTN. So, a total of 309 participants who consented for participation in the study were enrolled as study subjects. Data were collected on a semi-structured proforma having information on demographic data, personal and family history of HTN, smoking, alcohol, dietary habits including fast food intake, salt and fat intake, exercise etc. Body weight, height, and blood pressure (BP) were measured. Anthropometric measurements were performed with the participants wearing light clothing and no footwear. Body weight was measured to the nearest 0.5 kg using a digital weight scale, which was calibrated by using an object with known weight to ensure accuracy. Height was recorded to the nearest 1 cm in the standing position using a portable stadiometer. Body mass index (BMI) was calculated as the weight (kg)/ height (m) ². Blood pressure (BP) measurements were done by using automatic digital BP monitor with appropriate size cuffs. BP was measured with participants in a sitting position after five minutes of rest. In addition, participants were advised to avoid smoking, taking coffee/tea, and performing any exercise for at least 30 minutes before measuring their BP. Hypertension was defined as per seventh joint national committee guidelines.

Statistical analysis

Data were entered in Microsoft Excel spreadsheet and statistical analysis was done using R statistical software. Chi square test was applied for determining any association for categorical data while continuous data were analyzed by applying analysis of variance test. To study the pooled effect of different variables the data were also analyzed by using multinomial logistic regression analysis.

RESULTS

In the present study, the prevalence of pre-HTN and HTN was 18.4% and 21.4% respectively. Of 309 individuals, more than half (55%) were males and both the pre-HTN and HTN were significantly higher in males (p=0.002). Maximum cases of pre-HTN and HTN were in the age group of 45 to 55 years and minimum in age group of <25 years, and the difference was statistically significant (p<0.001). Maximum study subjects belonged to rural area and Hindu community, but the differences were insignificant. Around one third subjects were educated up to matric in pre-hypertensive and hypertensive. Maximum study participants were home-maker followed by farmer and laborer (Table 1).

Table 2 shows tobacco consumption, history of diabetes mellitus, family history of HTN, family history of diabetes mellitus, exercise, fast-food intake were insignificant risk factors among study subjects while alcohol consumption, BMI, pickles intake in routine practice were found significant risk factors.

Continuous variable were also analyzed by analysis of variance test. Mean age, mean weight, mean height and mean BMI were found significantly higher in prehypertensive and hypertensive subjects as compared to normotensive subjects (Table 3).

Significant positive association was found between age and pre-HTN and HTN. Both pre-HTN and HTN were found significantly higher in males as compared to females. BMI was positively associated with both pre-HTN and HTN (p<0.001). Inverse significant association was found between pickles intake and hypertension but association was not found significant with pre-hypertension (Table 4).

Data were also analyzed by multinomial logistic regression analysis in which overweight and obesity were the most powerful predictor of hypertension with adjusted OR 20.28 and 24.22 respectively. Strong positive association was observed with age, adjusted OR was highest in >55 years age group in hypertension (7.9). Males were at significantly higher risk in both hypertension (p<0.001) and pre-HTN (p=0.01). Pickles intake in routine practice was found as protective factor (p=0.04) in hypertensive group (Table 5).

Table 1: Socio-demographic characteristics of the study subjects.

Variable	Normal	Prehypertension	Hypertension	Total	P value
Sex					
Male	87 (46.8)	39 (68.4)	44 (66.7)	170 (55)	0.002
Female	99 (53.2)	18 (31.6)	22 (33.3)	139 (45)	
Age (years)					
<25	45 (24.2)	8 (14.0)	7 (10.6)	60 (19.4)	
25-35	52 (28.0)	7 (12.3)	10 (15.2)	69 (22.3)	0.001
35-45	37 (19.9)	19 (33.3)	14 (21.2)	70 (22.7)	0.001
45-55	28 (15.1)	12 (21.1)	11 (16.7)	51 (16.5)	
>55	24 (12.9)	11 (19.3)	24 (36.4)	59 (19.1)	
Residence					
Urban	40 (21.6)	13 (22.8)	18 (27.3)	71 (23.0)	0.81
Rural	146 (78.4)	44 (77.2)	48 (72.7)	238 (77)	
Caste					
General	95 (51.1)	34 (59.6)	39 (59.1)	168 (54.4)	0.63
OBC	29 (15.6)	9 (15.8)	8 (12.1)	46 (14.9)	0.03
SC/ST	62 (33.3)	14 (24.6)	19 (28.8)	95 (30.7)	
Religion					
Hindu	176 (94.6)	56 (98.2)	64 (96.9)	296 (95.7)	0.25
Others	10 (5.4)	1 (1.8)	2 (3)	13 (4.3)	
Education					
Illiterate	38 (20.4)	11 (19.3)	12 (18.2)	61 (19.7)	
Primary	49 (26.3)	12 (21.1)	17 (25.8)	78 (25.2)	
Matric	34 (18.3)	18 (31.6)	22 (33.3)	74 (23.9)	0.13
Senior secondary	35 (18.8)	7 (12.3)	7 (10.6)	49 (15.9)	
Graduation	29 (15.6)	9 (15.8)	6 (9.1)	44 (14.2)	
Post-graduation	1 (0.5)	0	2 (3.0)	3(1.0)	
Occupation					
Home-maker	67 (36)	14 (24.6)	19 (28.8)	100 (32.4)	
Farmer/laborer	49 (26.3)	17 (29.8)	16 (24.2)	82 (26.5)	
Govt/private job	22 (11.8)	10 (17.5)	11 (16.7)	43 (13.9)	0.80
Student	16 (8.6)	6 (10.5)	6 (9.1)	28 (9.1)	
Other	32 (17.3)	10 (17.6)	14 (21.2)	56 (18.1)	

Table 2: Distribution of risk factors among study participants.

Variable	Normal	Prehypertension	Hypertension	Total	P value
Tobacco consumption					
No	143 (76.8)	42 (73.7)	47 (71.2)	232 (75)	0.82
Yes	43 (23.2)	15 (26.3)	19 (28.8)	77 (25)	
Alcohol consumption					
No	157 (84.4)	38 (66.7)	57 (86.4)	252 (81.6)	0.005
Yes	29 (15.6)	19 (33.3)	9 (13.6)	57 (18.4)	
H/o diabetes mellitus					
No	176 (94.6)	54 (94.7)	58 (87.9)	288 (93.2)	0.15
Yes	10 (5.4)	3 (5.3)	8 (12.1)	21 (6.8)	
Family h/o hypertension					
No	159 (85.4)	46 (80.7)	50 (75.8)	255 (82.5)	0.41
Yes	27 (14.6)	11 (19.3)	16 (24.2)	54 (17.5)	
Family h/o DM					
No	175 (94.1)	52 (91.2)	58 (87.9)	285 (92.2)	0.25
Yes	11 (5.9)	5 (8.8)	8 (12.1)	24 (7.8)	

Continued

Variable	Normal	Prehypertension	Hypertension	Total	P value	
Exercise (per week)						
Once	13 (7)	4 (7)	10 (15.2)	27 (8.7)	0.39	
Twice	17 (9.1)	5 (8.8)	3 (4.5)	25 (8.1)		
Daily	77 (41.4)	26 (45.6)	30 (45.5)	133 (43)		
Never	79 (42.5)	22 (38.6)	23 (34.8)	124 (40.1)		
BMI						
Underweight	32 (17.2)	0	1 (1.5)	33 (10.7)	0.00	
Normal	59 (31.7)	16 (28.1)	10 (15.2)	85 (27.5)		
Overweight	30 (16.1)	6 (10.5)	15 (22.7)	51 (16.5)		
Obese	65 (34.9)	35 (61.4)	40 (60.6)	140 (45.3)		
Extra table salt intake						
No	116 (62.4)	36 (63.2)	49 (74.2)	201 (65)	0.20	
Yes	70 (37.6)	21 (36.8)	17 (25.8)	108 (35)		
Extra visible fat intake						
No	115 (61.9)	35 (61.4)	46 (69.7)	196 (63.5)	0.73	
Yes	71 (38.1)	22 (38.6)	20 (30.3)	113 (36.5)		
Pickles (routine practice)						
No	113 (60.8)	42 (73.7)	50 (75.8)	205 (66.3)	0.03	
Yes	73 (39.2)	15 (26.3)	16 (24.2)	104 (33.7)		
Fast-food intake (per week)						
Once	65 (34.9)	13 (22.8)	15 (22.7)	93 (30.1)	0.07	
Twice	20 (10.8)	6 (10.5)	2 (3)	28 (9.1)		
Daily	8 (4.3)	3 (5.3)	2 (3)	13 (4.2)		
Never	93 (50)	35 (61.4)	47 (71.2)	175 (56.6)		

Table 3: Analysis of continuous variables by ANOVA test.

Variables	Normotensive	Pre-hypertensive	Hypertensive	P value
Mean age (years)	36.19±13.15	41.28±13.28	45.91±16.10	0.001
Mean weight (kg)	60.12±11.67	74.41±13.35	71.18±10.6	0.001
Height (cm)	160±14.03	166.67±13.1	162.56±13.3	0.002
BMI (kg/m ²)	22.95±4.13	27.0±5.8	24.42±4.85	0.001

Table 4: Univariate analysis of risk factors of pre-hypertension and hypertension.

Variable	Pre Prehypertension		Hypertension	
y at lable	Crude OR (95% CI)	P value	Crude OR (95%CI)	P value
Age (years)				
<25	1		1	
25-35	0.75 (0.91-7.27)	0.61	1.2 (0.43-3.51)	0.69
35-45	2.88 (0.87-6.62)	0.02	2.4 (0.88-6.65)	0.08
45-55	2.41(1.13-7.34)	0.08	2.5 (0.87-7.2)	0.08
>55	2.57 (0.25-2.25)	0.07	6.4 (2.4-17.07)	0.001
Sex				
Male	1		1	
Female	0.40 (0.21-0.76)	0.005	0.43(0.24-0.79)	0.006
Tobacco consumption				
No	1		1	
Yes	1.15 (0.58-2.27)	0.68	1.30 (0.69-2.45)	0.40
Alcohol consumption				
No	1		1	
Yes	2.7 (1.37-5.33)	0.004	0.85 (0.38-1.91)	0.70
H/o diabetes mellitus				
No	1		1	
Yes	0.97 (0.26-3.68)	0.97	2.4 (0.91-6.44)	0.07

Continued

Variable	Pre hypertension		Hypertension	
Variable	Crude OR (95% CI)	P value	Crude OR (95% CI)	P value
Family h/o hypertension	1			
No	1		1	
Yes	1.3 (0.62-2.9)	0.44	1.8 (0.90-3.6)	0.09
Family h/o diabetes				
No	1		1	
Yes	1.5 (0.50-4.6)	0.44	2.1 (0.84-5.7)	0.10
Exercise (per week)				
Once	1		1	
Twice	0.95 (0.21-4.2)	0.95	0.22 (0.05-1.00)	0.05
Daily	1.09 (0.32-3.66)	0.88	0.50 (0.20-1.27)	0.15
Never	0.90 (0.26-3.05)	0.87	0.37 (0.14-0.97)	0.04
BMI				
Underweight	1		1	
Normal	1.24 (1.24-4.91)	0.001	5.4 (0.66-44.0)	0.11
Overweight	9.1 (3.25-2.58)	0.001	16.0 (1.9-128)	0.009
Obese	2.4 (1.24-12.4)	0.00	9.69 (2.5-149.0)	0.004
Extra table salt intake				
No	1		1	
Yes	0.96 (0.52-1.78)	0.91	0.57 (0.30-1.07)	0.08
Extra visible fat intake				
No	1		1	
Yes	1.01 (0.55-1.87)	0.9	0.70 (0.38-1.28)	0.25
Pickles (routine practice	e)			
No	1		1	
Yes	0.55 (0.28-1.06)	0.07	0.49 (0.26-0.93)	0.03

Table 5: Multivariate analysis of risk factors of pre-hypertension and hypertension.

Variable	Pre-hypertension		Hypertension	
Variable	Adjusted OR (95% CI)	P value	Adjusted OR (95% CI)	P value
Age (years)				
<25	1		1	
25-35	0.65 (0.19-2.14)	0.48	1.06 (0.32-3.54)	0.91
35-45	2.70 (0.95-7.67)	0.06	2.29 (0.71-7.42)	0.16
45-55	2.71 (0.85-8.64)	0.09	2.87 (0.82-10.0)	0.09
>55	3.13 (0.92-10.62)	0.06	7.91 (2.32-26.9)	0.001
Sex				
Male	1		1	
Female	0.36 (0.14-0.81)	0.01	0.20 (0.09-0.48)	0.001
Tobacco consumption				
No	1		1	
Yes	0.50 (0.20-1.28)	0.15	1.19 (0.47-2.01)	0.70
Alcohol consumption				
No	1		1	
Yes	2.31 (0.89-597)	0.08	2.31 (0.89-5.97)	0.03
H/o diabetes mellitus				
No	1		1	
Yes	0.57 (0.13-2.50)	0.46	1.18 (0.34-4.08)	0.79
Family h/o hypertension				
No	1		1	
Yes	1.38 (0.54-3.54)	0.49	1.63 (0.67-3.9)	0.27
Family h/o diabetes				
No	1		1	
Yes	1.5 (0.50-4.6)	0.44	2.1 (0.84-5.7)	0.10

Continued

Variable	Pre-hypertension	Pre-hypertension		
variable	Adjusted OR (95% CI)	P value	Adjusted OR (95% CI)	P value
BMI				
Underweight	1		1	
Normal	1.00 (1.00-1.01)	0.001	4.99 (0.54-45.7)	0.11
Overweight	6.92 (2.21-2.16)	0.001	20.28 (2.2-190.3)	0.008

DISCUSSION

Hypertension is important cause of morbidity and mortality among adults and elderly population. Early identification of hypertension and pre-hypertension translates into early interventions and possibly prevention of later morbidity and mortality. 10 In the present study, the prevalence of hypertension and pre-hypertension was 21.35% and 18.44% respectively among the study subjects. According to World Health Organization (2015), the overall prevalence of hypertension in India was 23.5% and gender specific prevalence was 24.2% and 22.7% among the men and women, respectively. 11 The prevalence was higher than a study done in Delhi by Kishore et al and lower than a study done in Nainital by Jha et al, these differences may be due to different study population, social and cultural differences, dietary and lifestyle factors, as well as the research methodology used.^{8,9} Both pre hypertension and hypertension were significantly higher in males in univariate as well as multivariate analysis, the results are similar to the studies done by Jha et al and Panesar et al.^{6,8} One of the possible explanations for this gender disparity in hypertension prevalence could be partially due to biological sex difference and partially due to behavioral risk factors like smoking, alcohol consumption, or physical activity. We speculate that absentia from alcohol and smoking might be few of those protective factors against hypertension in women. Other than that, women are more interested in health care services utilization and also more frequently report their poor health and therefore they are more likely to have better health. 12,13

Hypertension significantly increased as the age increased as shown by the present study, many studies have reported similar observations. 14-16 This clearly depicts that, as more of the population enters older age groups, the burden of hypertension, will further increase. Also the mean age was significantly higher among the hypertensive and pre-hypertensive subjects. Age probably represents an accumulation of environmental influences and the effects of genetically programmed senescence in body systems.¹⁷ With increasing age, the aorta and arteries walls will be stiffened and this contributes to the high prevalence of hypertension in older age groups.¹⁸ There was difference in alcohol intake, higher alcohol intake was found in pre-hypertensive subjects as compared with normal and hypertensive subjects, but was statistically insignificant, may indicate that persons taking alcohol may develop hypertension in near future. Although family history of hypertension was present more in pre-hypertensive and hypertensive subjects as compared with normotensive subjects, but it was not statistically significant, but in a Panesar et al in his study found that positive history of hypertension in both parents is significant risk factor for hypertension.⁶ Among the participants of all three groups the difference in other socio-demographic profiles like caste, religion, residence, education and occupation were found statistically insignificant.

In the present study, the prevalence of hypertension and pre-hypertension was significantly higher in obese and overweight subjects; the results showed that as the BMI increases risk of developing pre-hypertension and hypertension also increases in univariate as well as multivariate analysis. Mean BMI was significantly higher among pre-hypertensive and hypertensive subjects as compared to normotensive. There was positive relation observed between increasing BMI and increasing rate of hypertension, which was consistent with other studies.⁶⁻ 8,12,15,18,19 South Asians have tendency of developing centralized obesity without developing generalized obesity.²⁰ Various epidemiological and physiological mechanisms explained the link between obesity and hypertension. One of the probable reasons behind this positive relation between obesity and hypertension could be that increased weight increases cardiac output and increased peripheral resistance of arterioles. Other than that, urbanization is also a cause of changes in dietary habits and reduced physical activity which leads to obesity and subsequently results in hypertension.¹⁸

Surprisingly, pickles intake in routine practice was found significantly higher among normal subjects as compared to pre-hypertensive and hypertensive subjects, these results are contrary to the available literature. Odds of developing hypertension and pre-hypertension was found more among the subjects who were not taking extra table salt as compared to those taking extra table salt, but this difference was found statistically significant. These results of pickles intake in routine practice and extra table salt are contrary to various studies carried out in different parts of India. ^{68,21,22} To explore the differences in results more detailed studies are needed.

CONCLUSION

The prevalence of both prehypertension and hypertension is high in rural Haryana. This makes the people of this area vulnerable to several chronic diseases and other unbearable health consequences. Moreover, detailed analytical studies are needed to explore the role of salt and pickles in pre-HTN and HTN.

Recommendations

Many of the participants identified as pre-hypertensive are at risk of developing hypertension, thus immediate interventions are indicated, including information, education and communication activities to generate and sustain health awareness activities. Majority of its risk factors of hypertension and pre-hypertension are preventable through early screening, lifestyle modification and simple interventions. So, programs are needed to improve the surveillance systems and implementation of community based screening programs for early detection of hypertension and pre-hypertension.

Limitations

The findings emerging out of the current study cannot be extrapolated to the populations of India, as it is a hospital based study. The inherent limitation in a cross-sectional study design in this study limits our ability for drawing causal inferences. Community based longitudinal studies will provide further exploration of the risk factors for hypertension.

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Institutional Ethics Committee

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