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Original Article

Pre Hypertension and Modifiable Factors Associated with Pre Hypertension among Rural Adult Population of Bikaner, Rajasthan

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ABSTRACT

Background: Hypertension is a major emerging public health problem in India. High prevalence of hypertension has been associated with higher cardiovascular and cerebrovascular risk. It is found that prevalence of Hypertension also increasing in rural population. The present study was carried out to estimate the prevalence of pre hypertension and hypertension and to identify the modifiable factors associated with pre hypertension.

Material & Methods: A cross sectional community based study was conducted in area of Rural Health Training Centre, Udairamsar, District Bikaner of Rajasthan which is also the field practice area of Department of Community Medicine, S.P. Medical College, Bikaner. A total 645 rural inhabitant; 19 year and above were screened. Out of which 326 were male & 319 were female. All participants were interviewed using pretested structured standard questionnaire. Hypertension was defined as Systolic blood pressure more than or equal to 140 mm Hg or Diastolic blood pressure more than or equal to 90 mm Hg or those individual currently taking antihypertensive treatment. Pre hypertension was defined as systolic blood pressure 120 – 139 and/ or diastolic blood pressure 80-89.

Result & Conclusion: Prevalence of Hypertension and pre hypertension in rural population was 28.5% and 52.40% respectively. Education, socio economic status, Salt-Intake, tobacco chewing, BMI, waist hip ratio were found to be significantly associated with hypertension.

KEYWORDS: Alcoholism, BMI, Pre hypertension, Salt intake, Tobacco.

INTRODUCTION

Amongst all cardiovascular diseases, Systemic Arterial Hypertension (SAH) is the most common cardiovascular disease and is a major public health problem in both developed and developing countries. Its significance lies in the fact that besides being a cardiovascular disease in itself, hypertension is one of the major risk factors for development of other cardiovascular diseases. More than a quarter of the world's adult population –totalling nearly one billion- had hypertension in 2000 and this proportion is expected to increase to approximately 29% (1.56 billion) by 2025.[1] There are 600 million hypertensive's in the world at risk for heart attack, strokes and cardiac failure. Raised blood pressure is estimated to cause 7.5 million deaths, about 12.8% of all deaths. It is a major risk factor for cardiovascular disease.[2] The Global Status on Non-Communicable Diseases Report (2011)[3] has reported that there were more than 2.5 million deaths from CVD in India in 2008, two-thirds due to coronary heart diseases and one-third to stroke. These estimates are significantly greater than those reported by the Registrar General of India, and shows that CVD mortality is increasing rapidly in the country. In India, WHO estimated prevalence of hypertension 22.8% (23.10 per cent men and 22.60 per cent women over 25 years old.[4]

With the advent of the twenty first century, it is becoming increasingly clear that cardiovascular diseases have become a ubiquitous cause of morbidity and a leading contributor to mortality in most countries. An estimated 17 million people die of cardio vascular diseases, particularly heart attacks and strokes, every year worldwide.[4] WHO has predicted that from years 2000 to 2020 disability-adjusted life years lost (DALYs) from coronary heart disease in India shall double in both men and women from 7.7 and 5.5 million, respectively.[5] It has also been reported that cerebro-vascular diseases will account for more DALYs than cardiovascular diseases. Pre-hypertension also has been associated with higher cardiovascular risk and is estimated to decrease the average life expectancy by as much as five years, because pre-hypertension often develops into hypertension (50% of people within 4 years). Even then, high blood pressure (hypertension) is still largely ignored as a public health problem in most developing countries; because of the asymptomatic nature of the condition, most hypertensives are unaware they are affected and so many people with hypertension do not seek the help of a doctor. Therefore, the detection and control of hypertension is a major public health challenge both developed and developing countries.[6]

Hypertension and pre hypertension are preventable diseases if life style modification done earlier. Hypertension is a consequence of pre hypertension. This assessment have been carried out on prevalence of hypertension and pre hypertension among rural population in Rajasthan and modifiable factor associated with pre hypertension among adult rural population of Udairamsar, a field practice area of Department of Preventive and Social Medicine, S.P. Medical College, Bikaner.

METHODOLOGY

Study design & setting: This cross-sectional study was carried out in the areas of Rural Health Training Centers of Department of Preventive and Social Medicine.

Sample size: Sample size of study population has been calculated considering a prevalence of hypertension in adult as 22.8 % in India[4], an allowable error of 15% and sample size 578.11 were obtained which was raised to 645.

Sampling design: The village comprises of 15 wards. For selection of desired sample multistage sampling method was followed. As the sample size for study was calculated to be 645 and number of wards are 15 , to get the equal representation from each ward 43 subjects from each ward were to be selected (645/15 = 43). In the first stage from each ward 43 houses were selected randomly using lottery method. From each of the selected house, in next stage one eligible individual was selected randomly using lottery method. In case the individual was not present at the time of visit, that number was excluded and study subject was selected from the same house again using simple random sampling technique.

Inclusion & Exclusion criteria: Individuals aged (≥ 18 years) and willing to participate were included. Individuals not willing to participate in the study, severely ill bed-ridden individuals and pregnant women were excluded.

Study tool: The Interview schedule comprise of two Sections A and B. Section A include questions related to socio-demographic characteristics and risk behavior. Section B include variables that were measured for study of prevalence of hypertension and pre hypertension & associated factors such as blood pressure, weight, height, waist hip ratio. Instruments used were mercury sphygmomanometer, stethoscope, weighing machine and measuring tape.

Measurement of blood pressure and anthropometry: Diagnostic criteria for Hypertension and pre hypertension:

Based on JNC VII[7] criteria, a person was considered as;

1. Hypertensive if SBP ≥140 and/or DBP ≥90 mmHg and persons already on anti-hypertensive treatment .
2. Pre hypertension when systolic blood pressure was 120 – 139 and/ or diastolic blood pressure 80-89 mmHg.

Measurements of variables:

Weight: Body weight was measured (to the nearest 0.5kg) with the subject standing motionless on the weighing scale, the feet are spread 15cm apart, and the weight is equally distributed on each leg. Subjects were made to remove their footwear and heavy clothing while their weight was being measured.

Height: It was measured (to the nearest 0.5cm) with the subject in an erect position against a vertical surface, with the head positioned so that the top of the external auditory meatus was in level with the inferior margin of the bony orbit.

Body mass index: BMI[5] was calculated using the formula

BMI = Weight in kilograms/(Height in meters)^{2}Based on their BMI, individuals were classified into four groups: thin (BMI <18.5), normal (BMI = 18.5-24.9), overweight (BMI = 25.0-29.9) and obese (BMI > 30.0).

Waist Circumference: The waist circumference (WC) was measured in centimetres at the midpoint between the lower border of the rib cage and the iliac crest.

Hip Circumference: The hip circumference (HC) was measured in centimetres at the widest part below the iliac crest.

Waist Hip Ratio: WHR was calculated by Waist Circumference/ Hip Circumference. The cut-off used for waist-hip ratio for males is 1 and for females it is 0.85 to define obesity.[8]

Socio Economic Status: Assessment of SES by modified BG Prasad's Classification for 2013.[9] Definitions: Sedentary: A person who does not perform any physical activity on regular basis on all days of the week. Office workers, most professionals (Doctor's, Lawyers, Teachers etc.,) shopkeepers, unemployed men, house wives in house with mechanical household appliances. Moderate: Persons in light industry, students, building workers (excluding heavy labourers) many farm workers, soldiers not on active service, fishermen, housewives without mechanical household appliances, departmental store workers. Heavy: A person engaged in one hour or more of physical activity on regular basis on all days of the week. Unskilled labourer, wood cutter, army recruits and soldiers on active service, mine workers steel workers, dancers, athletes, stone cutter, construction workers, rickshaw pullers.[10] Smokers: Those who either were smoking at the time of interview or had stopped earlier. Non-smokers: Those who had never smoked at least once a day. Alcoholic: alcohol drinkers were defined as those who reported to consuming alcohol and a person who used to consume alcohol before but not consuming alcohol at present. Non-Alcoholic: A person who has never consumed alcohol. The salt intake was calculated by asking for the average monthly consumption of salt by whole family and dividing it by the number of persons in the family and then further dividing it by 30 to calculate the average daily.[11]

OBSERVATIONS

Study sample characteristics:

Out of total 645 study subjects 326 (50.54%) were males and 319 (49.46%) were females. Majority 88.22% of the study Subjects were Hindu and 11.78% were Muslims. 392(60.78%) were literates and 253(39.22%) were illiterates. Among 392 literate, 58 (8.99%) were graduates, 178 (27.60%) were from secondary and 156 (24.19) were from primary group. 271 (42.02%) were from nuclear family and 374 (57.98%) belonged to joint family. Majority of subjects 78.91% were married, 12.48% subjects were unmarried and rest of subjects 8.68% were divorced/ widowed. maximum number of the study subject belongs to upper lower class 304 (47.13%) and lower middle class 209 (35.50%). Followed by upper middle class 97 (15.04%), upper class 8 (1.24%) and lower class 7 (1.09%). Among the study subjects hypertensive were excluded when analyzing pre-hypertensive (645-184= 461).

Table: 1. Prevalence of Hypertension and Pre Hypertension: (n=645)

Prevalence of hypertension		
B.P Status	**Frequency**	**(%)**
Normal Blood Pressure	123	19.07
Pre Hypertension	338	52.40
Hypertension	184	28.53
Total	645	100

Prevalence of hypertension and Pre hypertension: The table 1 shows that out of 645 study subjects 28.53% were hypertensives, 52.40% were pre hypertensive and remaining 19.07% were had normal blood pressure. Hypertensives were excluded when analyzing pre-hypertensive (645-184= 461). In the present study, out of 645 individuals examined 184 individuals were found to be suffering from hypertension and pre hypertension was found among 338 individuals.

Table 2: Association between pre hypertension and socio demographic factors(n=461)

Risk factors	Pre Hypertension (%)	Normal Blood Pressure (%)	P Value, Chi square value, df
Marital Status			
Married	274(76.11)	86(23.89)	
Unmarried	51(66.24)	26(3376)	χ^2 = 7.87, df=2,
Divorced/Widowed	13(54.17)	11(45.83)	
			P < 0.02
Education			
Graduation & above	49(90.74)	5(9.26)	
Secondary	116(74.36)	40(25.64)	χ^2= 9.47, df= 3,
Primary	76(69.09)	34(30.91)	
Illiterate	97(68.79)	44(31.21)	p < 0.05
Socio economic status			χ^2 = 9.20, df=2,
Upper & Upper Middle Class	59(81.94)	13(18.06)	P <0.02
Lower Middle Class	139(77.65)	40(22.35)	
Upper Lower & Lower class	140(66.67)	70(33.33)	
Type of family			
Nuclear	134(74.44)	46(25.56)	χ^2 = 0.191, df=1,
Joint	204(72.59)	77(27.41)	P>0.50
Family Members			
6	174	66	χ^2 = 0.172, df=1,
>6	164	57	P > 0.50

The table 2 shows that the prevalence of pre hypertension was highest amongst the married population was (76.11%) and (54.17%) divorced/widowed. The data indicates that the risk of pre hypertension is more in married, which was found to be statistically significant ($p < 0.02$). The table shows that in graduate and above had more pre hypertension (90.74%) as compared to secondary (74.36%), primary (69.09%) and illiterates (68.79%) This association between pre hypertension and education level was found statistically significant ($p < 0.05$). The above table shows the prevalence of pre hypertension was highest in the Upper and upper middle Class 81.94% followed by that in Lower middle Class 77.65% and lower class (66.67%). This difference was statistically significant ($P < 0.02$). In present study it was observed that subjects residing in nuclear families had higher prevalence (74.44%) of pre hypertension when compared to those living in joint families (72.59%). This association between hypertension and type of family was statistically not significant ($P > 0.50$). Total Number of family members found no significant association with pre hypertension ($p>0.50$).

The table 3 shows that who were vegetarians had a lesser prevalence 72.83% when compared to those who were consuming non vegetarian diet 76.78%. This association between hypertension and type of diet was not found to be significant ($P > 0.5$). The prevalence of pre hypertension in the subjects consuming salt of more than five grams per day has been found to be more than (82.70%) that of people (67.03%) who consumed salt less than five grams per day. This association between hypertension and quantity of salt consumption was found to be statistically highly significant ($P < 0.001$). The prevalence of pre hypertension was highest 76.06% in the adults who were involved in sedentary or mild physical activity, followed by heavy activity 74.42% and finally those with moderate activity 72.62%. This higher prevalence of pre hypertension in sedentary physical activity was found statistically insignificant ($p = 0.5$) in present study. The table 3 shows among the smokers 81.08% were found pre hypertension while among non-smokers 71.83% were had pre hypertension. High prevalence of pre hypertension among smokers was statistically insignificant ($p = 0.10$). 83.50% of the tobacco chewing subject were pre hypertensive whereas 70.39% of those who did not consume non smoking tobacco. This high prevalence of hypertension among tobacco chewer was found statistically significant ($p < 0.01$). 82.76% current alcoholics were pre hypertensive as compared to 72.68% non-alcoholics. This high prevalence of pre hypertension among alcoholics was found statistically insignificant ($p > 0.10$). This association between pre hypertension and oral contraceptive intake was found to be statistically insignificant ($p > 0.10$) in present study.

Table 3: Association between pre hypertension and risk behaviour factors(n=461)

Risk factors	Pre Hypertension (%)	Normal Blood Pressure (%)	P Value, Chi square value, df
Type of diet			$\chi^2 = 0.392$, df=1,
Vegetarian	295(72.83)	110(27.17)	P > 0.5
Non- vegetarian	43(76.78)	13(23.22)	
Quantity of salt consumption			
≥5gms/day	153(82.70)	32(17.30)	χ^2 =13.91 , df=1,
<5gms/day	185(67.03)	91(32.97)	P < 0.001
Physical Activity			
Sedentary	54(76.06)	17(23.94)	
Moderate	252(72.62)	95(27.38)	$\chi^2 = 0.384$, df=2,
Heavy	32(74.42)	11(25.58)	P =0.5
Smoking Habits			$\chi^2 = 2.71$, df=1,
User	60(81.08)	14(18.92)	
Non-User	278(71.83)	109(28.17)	P = 0.1
Tobacco Chewing			$\chi^2 = 7.02$, df=1,
Yes	86(83.50)	17(16.50)	
No	252(70.39)	106(29.61)	P < 0.01
H/O Alcohol Consumption			$\chi^2 = 1.41$, df=1,
Current User	24(82.76)	5(17.25)	P > 0.10
Non-User	314(72.68)	118(27.32)	
H/O intake of Oral Contraceptives			$\chi^2 = 0.509$, df=1,
Yes	4(80.00)	1(20.00)	P > 0.10
No	146(64.60)	80(29.61)	

Table 4: Association between pre hypertension and obesity (n=461)

Obesity	Pre Hypertension (%)	Normal Blood Pressure (%)	P Value, Chi square value, df
BMI			
<18.5	61(59.22)	42(40.78)	χ^2 = 14.127, df=2, P < 0.001
18.5-24.99	232(76.57)	71(23.43)	
>25.00	45(81.82)	10(118.18)	
Waist Hip Ratio			
Male			
<1	98(52.39)	89(47.59)	χ^2= 4.26, df = 1, p < 0.05
>1	30(69.77)	13(30.23)	
Female			
<0.85	105(58.33)	75(41.67)	χ^2= 15.94, df=1, p < 0.001
>0.85	45(88.23)	6(11.77)	

The prevalence of pre hypertension was highest in subjects having BMI >25 (81.82%) followed by Normal BMI subjects (76.57%). The least prevalence was noticed among underweight (59.22%). This association of pre hypertension and body mass index (BMI) was found highly significant (p <0.0001) in present study. Table depict that male subject those had waist hip ratio < 1 among them 52.39% were pre hypertensive. Male subject those had waist hip ratio > 1 among them 69.77% were pre hypertensive. Female those had waist hip ratio < 0.85 among them 58.33% were pre hypertensive. Female those had waist hip ratio > 0.85 among them 88.23% were pre hypertensive. This association between pre hypertension and waist hip ratio was found statistically significant both among male (p < 0.05) and female (p < 0.001).

DISCUSSION

Our study documented high prevalence of both hypertension and pre-hypertension, and their association with other risk factors those are likely to be important contributors to the epidemic of cardiovascular disease among both sexes. Only few studies were available on pre hypertension to comparisons. Hypertensives were excluded when analyzing pre-hypertensive. In the present study, out of 645 individuals examined 184 individuals were found to be suffering from hypertension and pre hypertension was found among 338 individuals. Over all prevalence rate of hypertension and pre hypertension was found to be 28.53 percent and 52.40 percent among both sexes respectively. Similar prevalence hypertension was observed in other study conducted across the countries Bharti et al.[6], Kannan L et al.[12] Hazarika et al.[13] and However some studies reported lower prevalence like V Mohan et al.[14] and Deshmukh P.R. et al.[15] Bharti et al.[6] found similar prevalence of pre hypertension while Kannan L et al.[12] observed high prevalence of pre hypertension. The prevalence of pre hypertension was high amongst the married population then divorced/ widowed. It was observed in present study that as the education level rise pre hypertension rises statistically significant (p < 0.05) however no significant association was observed by Bharti et al.[6] Higher prevalence of pre hypertension was observed in upper and upper middle Class followed by that in Lower middle Class and lower class. This difference was statistically significant (P < 0.02). In present study it was observed that subjects residing in nuclear families had higher prevalence (74.44%) of pre hypertension when compared to those living in joint families (72.59%). This association between hypertension and type of family was statistically not significant (P >0.50). Total Number of family members 6 or more found no significant association with pre hypertension (p>0.50). Other study Kannan L et al.[12] found significant association. Association of diet with pre hypertension was found statistically insignificant (P > 0.5). Other study by Bharti et al.[6] found a significant association with pre hypertension and diet. The prevalence of pre hypertension in the subjects consuming salt of more than five grams per day has been found to be more than (82.70%) that of people (67.03%) who consumed salt less than five grams per day. This association between hypertension and quantity of salt consumption was found to be statistically highly significant (P < 0.001). Similar result was observed by Alok gupta et al.[16] in their study. Statistically insignificant (p = 0.5) association was found between prevalence of pre hypertension and physical activity in present study. However Alok gupta et al.[16] and Yadav et al.[17] found a significant association. Smokers were found more pre hypertension as compare to non-smokers. This high prevalence of pre hypertension among smokers was statistically insignificant (p = 0.10). Similar result was observed by Alok gupta et al.[16] and Yadav et al.[17] in their study. However other study by Bharti et al.[6] found significant association. Association between tobacco chewing and prevalence of pre hypertension was found statistically significant (p < 0.01). Similar result was observed by Kannan L et al.[12] in their study. Alcoholics were more pre hypertension as compared to non-alcoholics. But this more prevalence of pre hypertension among alcoholics was found statistically insignificant (p >0.10). Similar result was observed by Bharti et al.[6] However other study by Alok gupta et al.[16] found significant association. Association between pre hypertension and oral contraceptive intake was found to be statistically insignificant (p >0.10) in present study. However other study by Alok gupta et al.[16] found significant association. The prevalence of pre hypertension was more in subjects having BMI >25 followed by Normal BMI subjects and underweight. This association of pre hypertension and body mass index (BMI) was found highly significant (p <0.0001) in present study. Similar observation was found in other study by Bharti et al.[6], Alok gupta et al.[16] and Yadav et al.[17] It was depict that male subject those had waist hip ratio > 1 were more pre hypertensive then those had waist hip ratio < 1. Female those had waist hip ratio < 0.85 were less hypertensive then those had waist hip ratio > 0.85. This association between pre hypertension and waist hip ratio was found statistically significant both among male (p < 0.05) and female (p < 0.001). Similar observation was found in other study by Bharti et al.[6] and Yadav et al.[17] in their study.

CONCLUSION

A significant number of individuals were identified to be in the pre hypertension category, stressing the need to initiate screening strategies at an earlier age and promote opportunistic screening for hypertension during routine health care visits. Our findings in present study could lay the foundation for the introduction of lifestyle modification and behaviour change for effective prevention of the cardiovascular diseases.

RECOMMENDATIONS

The key factor to prevent hypertension is detection of pre hypertension and early introduction life style and behaviour changes in community. There is a need for strengthening health education programs promoting hypertension awareness, and emphasizing preventive measures. Multipurpose health workers can be trained for detection and monitoring of pre hypertension and hypertension.

LIMITATIONS

Subjects for the study were chosen from a single locality and thus may not be representative of affluent subjects throughout India. However, we took care to choose a colony which had a representative mix of subjects with all different professions, age groups and religions. Blood pressure measurements were taken on a single day and were not be repeated again for practical reasons. Hence, we may have over-diagnosed both pre hypertension and hypertension.

CONFLICT OF INTEREST: None declared.

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