

Prevalence and Determinants of Hypertension in a Rural Community

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Abstract

Background: There are few epidemiological studies on prevalence of hypertension and its determinants in rural population. This cross sectional study was done to determine the same in a rural community.

Methods: A random sample of 406 people (218 men and 188 women) of 30 years and above was selected from a rural area. The pre tested proforma was used to collect the data by trained doctors.

Result: Prevalence of smoking and tobacco use was 16%, alcohol intake 9.4 %, daily salt intake (≥ 5 gram) 34.2%, daily saturated fat intake (≥ 10 % of daily energy intake) 47.0 % and physical inactivity (work and leisure) as 18.5%. Body Mass Index (BMI) was ≥ 25 in 18 % and ≥ 30 in 3.2% men and women. Prevalence of truncal obesity (Waist Hip Ratio: men ≥ 0.9 ; women ≥ 0.8) was 8.5% with higher incidence in men. Prevalence of abdominal obesity (men ≥ 102 cms; women ≥ 88 cms) was found in 15.7 % with higher incidence in men. Differences in prevalence of risk factors between men and women were statistically significant in case of smoking, alcohol consumption and abdominal obesity. 18.5% men and women were suffering from systolic hypertension (≥ 140 mg Hg) and 15 % from diastolic hypertension (≥ 90 mg Hg). Prevalence of risk factors for hypertension was significantly more among subjects suffering from systolic and diastolic hypertension than normotensive subjects.

Conclusion: Prevalence of systolic hypertension in rural community was 18.5 % and of diastolic hypertension 15% with higher prevalence in the age group of 60 years and above, in case of men and women. There was a significant linear trend in prevalence of systolic hypertension with respect to age group in men whereas it was not significant in case of women.

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Key Words : Hypertension; Prevalence; Determinants; Rural community

Introduction

Coronary heart disease (CHD) is estimated to be the most common cause of death globally by 2020 [1]. Hypertension is one of the most important modifiable risk factors for CHD in western and Asian population [2,3]. Studies from India and Bangladesh have shown an increasing trend in the prevalence of hypertension [4]. Community surveys have documented that in a period of three to six decades, prevalence of hypertension has increased by about 30 times among urban dwellers and by about 10 times among the rural inhabitants. The various studies estimated a prevalence rate of hypertension among urban population ranging from 1.24% in 1949 to 36.4% in 2003 and for rural people from 1.99% in 1958 to 21.2% in 1994[5]. However differential rates are due to different cut off marks in determining the level of hypertension and also differing age groups constituting the study population. Dramatic changes in life style have lead to physical inactivity due to technological advances. Rising affluence has modified the dietary pattern characterized by increased consumption of diets rich in fat, sugar and calories [6].

There is a paucity of data on the prevalence of hypertension and its determinants in rural India and this study was done to determine the same amongst rural population in Maharashtra.

Material and Methods

This study was designed to investigate the prevalence of hypertension in a rural community in the age group of 30 years and above. Sample size of 431 was calculated assuming prevalence of hypertension as 16%, margin of error 3%, nonresponse 10% with 95% confidence interval (CI). A random sample of 431 was selected from rural area, of which 406 people participated in study comprising of 218 men and 188 women. Investigators were trained prior to data collection. The proforma developed under the Government Of India – World Health Organisation collaborative programme 2004 - 05 for integrated disease surveillance project (Non communicable diseases risk factor surveillance) was modified to collect the data for our study and pre tested before use [7]. This proforma included the personal particulars, family history of hypertension, details of major hypertension risk factors such as smoking, alcohol intake, physical activity, salt intake, saturated fat intake, anthropometric and clinical data. Information regarding awareness of risk factors for

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hypertension was also sought. To avoid inter observer bias each investigator recorded separate parameter.

The physical examination included measurement of height, weight, waist-hip ratio (WHR) and blood pressure (BP). Height was measured in meters and weight in kilograms (Kg) using a calibrated spring balance. The supine waist girth was measured at the level of the umbilicus with the person breathing silently and the standing hip girth was measured at the intertrochanteric level according to the WHO guidelines [8]. BP was measured in the sitting position after five minutes of rest. In addition, participants were advised to avoid exercise, alcohol, cigarette smoking and coffee/tea at least 30 minutes before BP measurement. BP was measured using a standard mercury sphygmomanometer. Two readings at five minute intervals as per the WHO guidelines were recorded [9]. If high blood pressure ($\geq 140/90$ mmHg) was noted, a third reading was taken after 30 min. The lowest readings was taken as the blood pressure.

Smokers in India consume tobacco in various forms; rolled tobacco leaves (*bidi*), Indian pipe (*chillum*, *hookah*), cigarettes and chewing tobacco, and more than one form is used by many, making it difficult to accurately measure the amount of tobacco consumed. Therefore, users of all types of tobacco products including present and past smokers were included in the smoker's category [10]. Regular use of alcohol was assessed by using validated questionnaire and show cards and defined those who drink more than five (for women four) standard drinks (10 gram of ethanol) every day [7]. Physical activity was assessed by assessing the activity at work, home, transport and discretionary time. Physical inactivity was defined as doing no or very little activity at work, home, transport and discretionary time [11]. Hypertension was diagnosed if the systolic blood pressure was ≥ 140 mmHg and diastolic blood pressure ≥ 90 mmHg [12] or the person was a known hypertensive. Body mass index (BMI) was calculated as weight in kg divided by square of height in meters and overweight and obesity defined as BMI

of ≥ 25 and ≥ 30 respectively. Truncal obesity was diagnosed if the WHR ≥ 0.9 in males and ≥ 0.8 in females [13]. Salt intake and saturated fat intake was calculated by computing monthly consumption of salt and fat in family and dividing it by number of family members excluding infants.

Prevalence rate for risk factors for hypertension with 95% CI were calculated. Chi-square test was used for comparing the prevalence rate between men and women for various risk factors. Chi-square test for linear trend was used for determining the trend in prevalence rate in various factors for men and women (separately) with respect to age group. Prevalence odds ratio with 95% CI were calculated for prevalence of risk factors in hypertensive population. Chi-square test of independence was used for determining the relationship between the various risk factors and hypertension.

Results

The prevalence of risk factors of hypertension according to sex with 95 % CI is shown in Table 1. The prevalence of smoking, alcohol consumption and abdominal obesity were statistically significantly higher among males.

Prevalence of risk factors for hypertension according to age in men and women are shown in Table 2. Smoking/tobacco use, physical inactivity, saturated fat intake, BMI ≥ 25 , truncal/abdominal obesity and awareness of risk factors for hypertension were found more in 60 years and above age group in case of men. Prevalence of regular alcohol use was higher in 40-49 years of age group and salt intake was more in 30-39 years of age group in case of men. However there was a significant linear trend for saturated fat intake and smoking among men with respect to age. Physical inactivity, smoking, salt intake, and awareness of risk factors for hypertension were found more in above 60 years of age group in case of women. However higher incidence of saturated fat intake, BMI ≥ 25 and abdominal obesity was found in case of women in 30-39 years of age group and truncal obesity in 40-49 years

Table 1
Prevalence of risk factors for hypertension

Risk factor	Men (218)	Women (188)	Total (406)	p value
Hypertension in 1 st degree relative	8.3 (4.6-11.9)	6.4 (2.8-9.8)	7.4 (3.9-10.9)	NS
Smoking and tobacco use	25.7 (19.9-31.5)	4.8 (1.7-7.8)	16.0 (11.1-20.9)	<0.001
Physical inactivity	19.7 (14.4-25.0)	17.0 (11.6-22.4)	18.5 (13.3-23.6)	NS
Regular alcohol use	16.5 (11.6-21.4)	1.1 (-0.4-2.5)	9.4 (5.5-13.2)	<0.001
Daily salt intake ≥ 5 grams	33.0 (26.8-39.3)	35.6 (28.8-42.5)	34.2 (27.9-40.5)	NS
Daily saturated fat intake ≥ 10 % of daily energy intake	47.2 (40.6-53.9)	46.8 (39.7-53.9)	47.0 (40.4-53.7)	NS
BMI ≥ 25 Kg /m ²	18.8 (13.6-24.0)	17.0 (11.6-22.4)	18.0 (12.9-23.1)	NS
BMI ≥ 30 Kg /m ²	3.7	2.7	3.2	
Truncal obesity (WHR: men ≥ 0.9 ; women ≥ 0.8)	20.7 (15.3-26.0)	15.9 (10.7-21.2)	18.5 (13.3-23.6)	NS
Abdominal obesity (men ≥ 102 ; women ≥ 88)	20.6 (15.3-26.0)	10.1 (5.8-14.4)	15.7 (10.9-20.6)	<0.001
Awareness of risk factors for hypertension	30.7 (24.6-36.9)	29.3 (22.7-35.7)	30.0 (24.0-36.1)	NS

Figures are prevalence expressed as percentages. Values in parenthesis are 95 % CI, BMI= body mass index, WHR= waist hip ratio. p value indicates the significance of comparison of prevalence between men and women. NS= not significant

Table 2**Age specific prevalence of risk factors for hypertension**

Risk factor	Age 30-39	Age 40-49	Age 50-59	Age >60	Total	p value
Men (218)						
	82	64	60	12	218	
Smoking and tobacco use	23 (28.0)	12 (18.8)	16 (26.7)	5 (41.7)	56 (25.7)	NS
Physical inactivity	17 (20.7)	15 (23.4)	7 (11.7)	4 (33.3)	43 (19.7)	<0.01
Regular alcohol use	16 (19.5)	17 (26.6)	3 (5.0)	0 (0)	36 (16.5)	NS
Daily salt intake \geq 5 grams	31 (37.8)	23 (35.9)	14 (23.3)	4 (33.3)	72 (33.0)	NS
Daily saturated fat intake \geq 10 % of daily energy intake	20 (24.4)	40 (62.5)	34 (56.7)	9 (75.0)	103 (47.2)	<0.01
BMI \geq 25 Kg/m ²	16 (19.5)	12 (18.8)	10 (16.7)	3 (25.0)	41 (18.8)	NS
BMI \geq 30 Kg/m ²	3 (3.7)	0 (0)	3 (5.0)	2 (16.7)	8 (3.7)	
Truncal obesity (WHR: men \geq 0.9; women \geq 0.8)	16 (19.5)	14 (21.9)	12 (20.0)	3 (25.0)	45 (20.7)	NS
Abdominal obesity (men \geq 102; women \geq 88)	17 (20.7)	11 (17.2)	7 (11.7)	10 (83.3)	45 (20.6)	NS
Awareness of risk factors for hypertension	26 (31.7)	18 (28.1)	16 (26.7)	7 (58.3)	67 (30.7)	NS
Women (188)						
	70	54	56	8	188	
Smoking and tobacco use	0 (0)	2 (3.7)	4 (7.1)	3 (37.5)	9 (4.8)	
Physical inactivity	13 (18.6)	8 (14.8)	4 (7.1)	7 (87.7)	32 (17.0)	NS
Regular alcohol use	1 (1.4)	1 (1.9)	0 (0)	0 (0)	2 (1.1)	
Daily salt intake \geq 5 gram	27 (38.6)	13 (24.1)	23 (41.1)	4 (50.0)	67 (35.6)	NS
Daily saturated fat intake \geq 10 % of daily energy intake	39 (55.7)	22 (40.7)	25 (44.6)	2 (25.0)	88 (46.8)	NS
BMI \geq 25 Kg/m ²	16 (22.9)	10 (18.5)	5 (8.9)	1 (12.5)	32 (17.0)	0.04
BMI \geq 30 Kg/m ²	3 (4.3)	1 (1.9)	1 (1.8)	0 (0)	5 (2.7)	
Truncal obesity (WHR: men \geq 0.9; women \geq 0.8)	14 (20.0)	11 (20.4)	5 (8.9)	0 (0)	30 (15.9)	NS
Abdominal obesity (men \geq 102; women \geq 88)	10 (14.3)	4 (7.4)	5 (8.9)	0 (0)	19 (10.1)	NS
Awareness of risk factors for hypertension	23 (32.9)	17 (31.5)	10 (17.9)	5 (62.5)	55 (29.3)	NS

Values in parenthesis are percentages, BMI= body mass index, WHR= waist hip ratio.

p value indicates trend in prevalence with respect to age, NS= not significant

Table 3**Prevalence of hypertension according to sex**

	Men (218)	Women (188)	Total (406)	p value
Systolic hypertension \geq 140mm Hg	19.7 (14.4-25.0)	17.0 (11.6-22.4)	18.5 (13.3-23.6)	NS
Diastolic hypertension \geq 90 mm Hg	15.6 (10.8-20.4)	14.4 (9.3-19.4)	15.0 (16.2-19.8)	NS

Figures in parenthesis indicate 95% Confidence Interval. p value indicates the comparison between men and women. NS= not significant

of age group. There was a significant linear trend for BMI with respect to age group in women.

Prevalence of systolic and diastolic hypertension according to sex is shown in Table 3. The differences in prevalence of systolic and diastolic hypertension between men and women were not statistically significant. Prevalence of systolic and diastolic hypertension according to age is shown in Table 4. Prevalence of systolic and diastolic hypertension was higher in age group of 60 years and above in case of men and women. There was significant linear trend in prevalence of systolic hypertension with respect to age group in men whereas it was not significant in case of women.

Prevalence of risk factors including odds ratio with 95 % CI in systolic and diastolic hypertensive is shown in Table 5

and 6 respectively. Prevalence of risk factors was significantly high in subjects having systolic and diastolic hypertension. The awareness of risk factors for hypertension was poor in people having hypertension.

Discussion

Increase in prevalence of hypertension in urban and rural India is a cause of concern. Studies from Ludhiana (1985) and Jaipur (1995) have shown the prevalence at 14.08% and 10.99%, respectively [5]. Overall prevalence of hypertension (JNC-VI) was 33.3 % in rural populations in North East, 20.2 % in North India and 12.5 % in South India [14-16]. The pooled estimate of prevalence rate of hypertension in India (urban + rural)

Table 4**Age specific prevalence of hypertension**

	Age 30-39	Age 40-49	Age 50-59	Age > 60	Total	p value
Men (218)						
Number	82 (37.6)	64 (29.4)	60 (27.5)	12 (5.5)	218 (100)	NS
Systolic hypertension ≥ 140 mmHg	11 (13.4)	13 (20.3)	12 (20.0)	7 (58.3)	43 (19.7)	<0.01
Diastolic hypertension ≥ 90 mm Hg	7 (8.5)	13 (20.3)	8 (13.3)	6 (50.0)	34 (15.6)	NS
Women (188)						
Number	70 (37.2)	54 (28.7)	56 (29.8)	8 (4.3)	188	NS
Systolic hypertension ≥ 140 mm Hg	9 (12.9)	8 (14.8)	11 (19.6)	4 (50.0)	32 (17.0)	NS
Diastolic hypertension ≥ 90 mm Hg	8 (11.4)	6 (11.1)	9 (16.1)	4 (50.0)	27 (14.4)	NS

p value indicates trend in prevalence with respect to age; NS= not significant

Table 5**Prevalence of risk factors in systolic hypertensive study population**

Risk factor	Systolic hypertension >140 mg Hg (75)	Prevalence -Odds Ratio (95 % CI)	p value
Family history of hypertension	20 (26.7)	11.7 (4.9-28.5)	< 0.01
Smoking and tobacco use	45 (60.0)	23.3 (11.6-47.1)	< 0.01
Physical inactivity	54 (72.0)	37.9 (18.5-78.9)	< 0.01
Regular alcohol use	23 (30.7)	9.3 (4.3-20.2)	< 0.01
Daily salt intake ≥ 5 gram	43 (57.3)	3.3 (1.9-5.7)	< 0.01
Daily saturated fat intake ≥ 10 % of daily energy intake	50 (66.6)	2.7 (1.5-4.7)	< 0.01
BMI ≥ 25	43 (57.3)	13.5 (7.2-25.5)	< 0.01
Truncal obesity (WHR: men ≥ 0.9; women ≥ 0.8)	35 (46.6)	6.4 (3.5-11.6)	< 0.01
Abdominal obesity (men ≥ 102; women ≥ 88)	34 (45.3)	8.3 (4.4-15.7)	< 0.01
Awareness of risk factors for hypertension	23 (30.7)	1.1 (0.58-1.8)	> 0.89

BMI: Body mass index. WHR: waist hip ratio. CI: Confidence Interval, p value indicates the relationship between systolic hypertension and risk factor

Table 6**Prevalence of risk factors in diastolic hypertensive study population**

Risk factor	Diastolic hypertension > 90 mg Hg (61)	Prevalence - Odds Ratio (95 % CI)	p value
Family history of hypertension	16 (26.2)	8.4 (3.6-19.7)	<0.01
Smoking and tobacco use	35 (57.4)	14.1 (7.2-27.9)	<0.01
Physical inactivity	38 (62.3)	13.8 (7.1- 26.8)	<0.01
Regular alcohol use	20 (32.8)	8.7 (4.1 -19.3)	<0.01
Daily salt intake ≥ 5 gram	38 (62.3)	4.0 (2.2 -7.3)	<0.01
Daily saturated fat intake ≥ 10 % of daily energy intake	45 (73.7)	3.9 (2.0 -7.4)	<0.01
BMI ≥ 25	37 (60.6)	13.0 (6.7-25.4)	<0.01
Truncal obesity (WHR: men ≥ 0.9; women ≥ 0.8)	32 (52.5)	7.8 (4.1- 14.5)	<0.01
Abdominal obesity (men ≥ 102; women ≥ 88)	32 (52.5)	10.8 (5.6- 21.1)	<0.01
Awareness of risk factors for hypertension	21 (34.4)	1.3 (0.7- 2.3)	>0.05

BMI= Body mass index, WHR= waist hip ratio, CI= Confidence Interval, p value indicates the relationship between diastolic hypertension and risk factor

among adults (20 year +) yielded an average prevalence rate of 59.46 per thousand in a meta analysis.

Prevalence of risk factors for hypertension varied from 7.4 - 47 % in this study. High prevalence of saturated

fat intake (47%), salt intake (34.2%) was found in comparison to findings of Gupta et al [17]. While the prevalence of smoking (16%), alcohol intake (9.4%) and physical inactivity (18.5%) was lower than reported

by Gupta et al [18] in Rajasthan. Prevalence of people with BMI ≥ 25 (21.2%) is lower than estimates (26.3-56.0%) for South East Asia [19]. Higher prevalence of abdominal obesity (15.7%) in case of men ($p < 0.001$) has been reported by others also [18]. The higher prevalence of truncal obesity among men (20.7%) than women (15.9 %) though not statistically significant is in contrast to other studies [18]. Prevalence of systolic (18.5%) and diastolic hypertension (15 %) was lower than that reported by other studies [20-22]. There was no statistically significant difference in prevalence of hypertension in men and women in the present study but there was significant linear trend in prevalence of systolic hypertension with respect to age in men but it was not significant in women. Risk factor awareness of hypertension was lower in people with hypertension.

Prevalence of determinants of hypertension varied from 7.4-47 % in our study. These risk factors were significantly associated with hypertension. Further studies are required to assess the prevalence, determinants and preventive interventions of hypertension in rural areas. 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 hypertension. All such efforts must be coupled with continuing medical education programs for healthcare providers to promote awareness of the current guidelines for the diagnosis and treatment of hypertension.

Conflicts of Interest

None identified

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