Research Article

Prevalence of hypertension and its risk factors in a field practice area of tertiary care teaching hospital in rural area of Western Maharashtra

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ABSTRACT

Background: Hypertension is a modern day's epidemic and is a major public health problem in the developed and developing countries. Hypertension is the most common cardiovascular disease, and it accounts for large proportion of all cardiovascular deaths and disability worldwide. **Objectives:** The objectives are (1) to study the prevalence of hypertension in rural area and (2) to study the various risk factors of hypertension. **Materials and Methods:** A descriptive cross-sectional study was carried out to find the prevalence of hypertension and its risk factors in the village of Babhaleshwar of Tal Rahata District, Ahmednagar. A total of 1540 participants were examined using systematic random sampling method. Chi-square test and regression analysis were used to analyze data. **Results:** A total of 1540 participants were examined out of that 57.14% (880) were males and 42.85% (660) were females. The overall prevalence of hypertension was 11.49% (177) and that of pre-hypertension was 11.42% (176). On multiple regression analysis, body mass index, central obesity, and age were found as significant determinants of hypertension**. Conclusion:** The present study showed a higher prevalence of both hypertension and pre-hypertension among the rural population. Hypertension is spreading to rural areas which can be prevented and controlled by simple lifestyle modifications by the means of health education.

KEY WORDS: Hypertension; Pre-hypertension; Rural Population; Obesity; Body Mass Index

INTRODUCTION

Hypertension is a modern day's epidemic and is a major public health problem in the developed and developing countries. The prevalence of hypertension has been exponentially increasing in India and other countries, whereas levels of awareness, treatment, and control remain low.[1] Hypertension is the most common risk factor for the cardiovascular disorder and it produces a marked effect on patient, his family, and society either because of hypertension *per se* or through its complications (stroke, myocardial infarction, transient ischemic attacks, renal failure, and heart failure) which cause premature death or permanent disability.[2] Globally, out of all deaths, one-third of deaths (17 millions) were due to cardiovascular diseases, and out of this, 9.4 million deaths were due to complications of hypertension.[3] Around the world, hypertension causes at least 45% of the coronary heart disease deaths and 51% of the stroke deaths.[4]

The prevalence of hypertension is highest in Africa (46%) while the prevalence in the Americas is 35%.[5] The current estimated that the prevalence of hypertension in India is 10–15% in the rural population and 25–30% in the urban population.[6] The estimated number of Indians with hypertension was 120 million in the year 2000, which is likely to expand to 200 million by 2025.[7] In India, hypertension is directly responsible for 51% of all stroke deaths and 47% of coronary heart disease deaths.[8] Many of these deaths have

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occurred in India at relatively early age compared with all other countries.

Affluence, progressive aging, industrialization, and changes in lifestyle have caused an increase in the prevalence of hypertension and are also spreading to rural areas. This needs to be documented to dispel myths that hypertension is a problem of urban areas only. In addition to this problem, a great majority of the rural population in India has suboptimal access to health care and is not conscious enough to seek health care until sickness causes much distress. There is a paucity of data on the prevalence of hypertension in rural area because field-based studies on the prevalence of hypertension are still scarce. Hence, more studies are required to define the magnitude and epidemiological factors associated with hypertension, for its effective planning and management. With this background in mind, the present study was conducted with following aim and objectives.

Aim

The aim is to study the prevalence of hypertension and its risk factors among the rural population of field practice area of a tertiary care teaching hospital.

Objectives

The objectives are as follows:
To study the prevalence of hypertension in rural area.
To study the risk factors associated with hypertension.

MATERIALS AND METHODS

The present descriptive cross-sectional study was carried out at Babhaleshwar village of Tal Rahata, District Ahmednagar of Maharashtra. The Institutional Ethical Committee's permission was obtained before starting the study. All the persons, both male and females above 18 years, were included and pregnant women, extremely deliberated persons, and subjects who were not willing to give informed consent were excluded. A total of 1537 sample size was obtained using statistical formula $n = Z2(1\text{-}\alpha/2)(1\text{-}P)/\varepsilon 2p$[6] where P, i.e., the prevalence of hypertension taken as 10% from the previous study,[1] Z is 1.96 at 95% confidence interval (CI), and relative precision is 15%. A sample was rounded off to 1540. Sampling interval "4" was obtained using = N/n where "N" is total individuals of and above 18 years (6411) and "n" is calculated sample size (1537), so every 4th individual was included using systematic random sampling method till the completion of sample size. A pilot study was done for validation, practicality, and applicability of questionnaire. Pre-designed and pre-tested questionnaire was used for data collection. Study questionnaire consists of three parts: Part 1 includes sociodemographic variables, Part 2 includes information of risk factors, and Part 3 includes physical examination and blood pressure measurement. The WHO recommendations were used for measurement of blood pressure.[7] Participants were considered as hypertensive when they diagnosed during data collection according to Joint National Committee 7[8] classification or labeled as "known case" of hypertension only when they showed the previous medical examination reports or antihypertensive medication.[6]

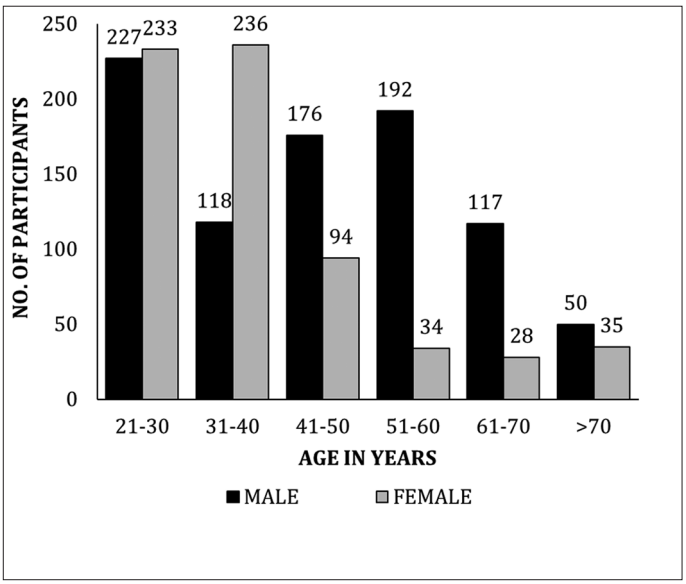
Statistical Analysis

SPSS version 21 software was used for analysis. Chi-square test, mean, standard deviation, and analysis of variance analysis (ANOVA) were used. Multiple linear regression analysis was done to predict dependent variable from independent variables. Level of significance at 5% ($P < 0.05$) was considered statistically significant (two-tailed).

RESULTS

Out of 1540 participants, 57.14% (880) were male and 42.85% (660) were female. The mean age of the participants was 46.42 ± 16.42 years and 38.62 ± 14.23 years for male and female, respectively [Graph 1]. In the present study, the prevalence of hypertension was 11.49% (177) (95% CI 9.99–12.99) and that of pre-hypertension was 11.42% (176) (95% CI 9.92–12.92). Out of all hypertensive participants, 62.14% (110) were in Stage I and 37.85% (67) were in Stage II. Among all hypertensive participants, 22 (12.42%) were known cases of hypertension. Out of known hypertensive, 13 were on treatment, of these 8 were on regular treatment, but their blood pressure was not under control.

Univariate analysis showed that risk factors such as age ($\chi^2 = 296.71$, d.f. = 10, $P < 0.001$) socioeconomic status ($\chi^2 = 223.27$, d.f. = 8, $P < 0.001$), family history of hypertension ($\chi^2 = 70.14$, d.f. = 2, $P < 0.001$), smoking



Graph 1: Age- and gender-wise distribution of participants

Table 1: ANOVA in between groups of blood pressure

Parameters	Classification of blood pressure			*F*-test	Significance
	Normal	Pre-hypertension	Hypertension		
Mean age±SD 95% CI*	42.97±14.99 42.12–43.82	30.26±14.07 28.16–32.35	56.56±13.31 54.54–58.51	140.9	0.001
Mean weight±SD 95% CI*	61.48±10.00 60.91–62.05	73.14±15.76 70.80–75.48	77.64±13.95 75.57–79.72	212.6	0.001

*95 CI: 95% CI. ANOVA: Analysis of variance analysis, SD: Standard deviation, CI: Confidence interval

Table 2: Multiple linear regression analysis of independent numerical variables to SBP and DBP

Variable	R^2 change%	F change	*P* value
SBP			
BMI[#]	28.1	602.05	0.001
WHR[#]	13.61	242.73	0.001
Age[#]	2.9	45.45	0.001
Total variation[@]	35.4	280.60	0.001
DBP			
BMI[#]	23.9	483.85	0.001
WHR[#]	12.6	221.74	0.001
Age[#]	1.3	20.15	0.001
Total variation[@]	29	208.25	0.001

[#]Independent effect of each variable on SBP and DBP, [@]combined effect of all the variables on SBP and DBP. SBP: Systolic blood pressure, DBP: Diastolic blood pressure, BMI: Body mass index, WHR: Waist-hip ratio

(χ^2 = 30.96, d.f. = 2, $P < 0.001$), body mass index (BMI) (χ^2 = 663.37, d.f. = 10, $P < 0.001$), and central obesity (χ^2 = 572.58, d.f. = 2, $P < 0.001$) found to be statistically significant. ANOVA in between groups of blood pressure and with mean age and mean weight was found to be statistically significant [Table 1].

Multiple linear regression analysis showed that BMI was the main independent predictor for systolic and diastolic blood pressure (DBP). BMI alone causes 28% (R^2 = 28.1%) of variability in systolic blood pressure (SBP) and 23.9% (R^2 = 23.9%) variability in DBP. Other risk factors such as waist-hip ratio (WHR) and age was also found as significant predictors for systolic and DBP (P = 0.001). When all the three risk factors combined together, they caused 35% (R^2 = 35%) and 29% (R^2 = 29%) variation in systolic blood and diastolic pressure, respectively [Table 2].

On analysis, Ys=42.85(a)+29.58(b1)X1+1.709(b2)X2+0.24(b3)X3 and Yd=39.75(a)+17.07(b1)X1+0.82(b2)X2+0.093(b3)X3 multiple linear equations were derived for SBP and DBP, respectively. Where "Ys" and Yd are SBP and DBP, i.e., dependent variable, "a" was the constant, "b1," "b2," and "b3" were the partial regression coefficients, and "X1," "X2," and "X3" were the values of WHR, BMI, and age, i.e., independent variables, and after putting these values, blood pressure of an individual could be predicted [Table 3].

DISCUSSION

In the present study, the prevalence of hypertension and pre-hypertension was 11.49% and 11.42%, respectively. Maximum hypertensives were belonged to Stage I of hypertension. Risk factors such as age, socioeconomic status, family history of hypertension, smoking, BMI, and central obesity were found to be statistically significant. Multiple regression analysis showed BMI as important predictors of blood pressure, followed by WHR and age.

In the current study, prevalence of hypertension and pre-hypertension was 11.49% (177) and 11.42% (176), respectively, and prevalence of hypertension was minimum (1.08%) in the age group of 21–30 years and maximum in the age group of above 71 years (35.29%), and the difference between age group and hypertension was found to be statistically significant. A study conducted by Kadu *et al*.[9] reported 12% prevalence of hypertension which was somewhat similar to the current study and his study also showed a significant association between age group and hypertension. A studies of Rajasekar *et al*.[10] and Gupta *et al*.[11] reported 19.1% and 18% prevalence of hypertension which was higher compared to our study. Prevalence of pre-hypertension was also reported higher by Srinivas *et al*.[12] (30%) and Gupta *et al*.[11] (57.9%) as compared to the present study.

Risk factors such as age, socioeconomic status, BMI, smoking, central obesity, and family history of hypertension were found statistically significant in the current study. A study conducted by Todkar *et al*.[13] depicted increasing prevalence of hypertension with increasing socioeconomic status. Similarly, results were also observed in a study conducted by Singh *et al*.,[14] Prabakaran *et al*.,[15] and Kokiwar *et al*.[16] Our study showed that BMI was most important predictor of systolic and DBP, followed by age and central obesity; however, a study conducted by Sharma *et al*.[17] and Sadhukhan *et al*.[18] reported age as an important and significant predictor of blood pressure.

Since it was a cross-sectional study design, non-respondents may have different characteristic than respondents and it may result in a bias of the measure outcome. This was a limitation of the present study.

Table 3: Multiple linear regression analysis of SBP and DBP

Model (variable)	Unstandardized coefficient		Standardized coefficient	*t*	*P* value	95% CI
	B	SE	Beta			
SBP						
Constant (a)	42.85	3.56		12.01	0.001	35.85–49.84
WHR (b_1)	29.58	4.57	0.148	6.46	0.001	20.61–38.56
BMI (b_2)	1.70	0.80	0.494	21.41	0.001	1.55–1.86
Age (b_3)	0.24	0.22	0.226	10.87	0.001	0.19–2.84
DBP						
Constant (a)	39.75	2.01		19.69	0.001	35.76–43.68
WHR (b_1)	17.07	2.58	0.158	6.59	0.001	11.99–22.14
BMI (b_2)	0.82	0.45	0.440	18.20	0.001	0.73–0.91
Age (b_3)	0.093	0.13	0.163	7.47	0.001	0.69–0.11

SBP: Systolic blood pressure, DBP: Diastolic blood pressure, BMI: Body mass index, WHR: Waist-hip ratio,
SE: Standard error, CI: Confidence interval

CONCLUSION

The present study showed a higher prevalence of both hypertension and pre-hypertension among the rural population and risk factors such as BMI, central obesity, and age were the predictors for blood pressure.

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