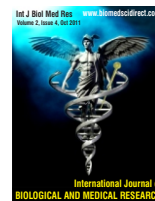


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Original Article

Prevalence of hypertension in a rural community of central India

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ABSTRACT

Objectives: 1.To study prevalence of hypertension. 2. To study association between various factors and hypertension in a rural community of Central India. **Methods:** A community based cross sectional study was carried out in rural community. 924 study subjects aged 30 years and above were selected using systematic random sampling of houses. Anthropometry, blood glucose, and blood pressure were measured with standard instruments and methodology for all the study subjects. Statistical tests like Chi square, Student's t test and chi square trend were used to analyze the data where ever applicable. **Results:** Prevalence of hypertension was 19.04%. It was higher in females (23.4%) than males (14.4%). It was seen that prevalence of hypertension increased with age. Prevalence of Pre hypertension was high (18.8%). 4.3% had isolated systolic hypertension and 0.9% had isolated diastolic hypertension. Older age, increased body mass index and waist hip ratio were significantly higher among hypertensive compared to normotensive. Factors like upper social class, sedentary physical activity, tobacco use and diabetes were significantly associated with hypertension. Alcohol intake was not associated with hypertension. **Conclusion:** The prevalence of hypertension is high and is associated with socio-demographic factors. Hence there is need for primordial prevention efforts on large scale.

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1. Introduction

Hypertension is a chronic condition of concern due to its role in the causation of coronary heart disease, stroke and other vascular complications. It is the commonest cardiovascular disorder, posing a major public health challenge to population in socioeconomic and epidemiological transition. It is one of the major risk factors for cardiovascular mortality, which accounts for 20 – 50% of all deaths [1].

Epidemiological studies conducted in many parts of the world have consistently identified an important and independent link between high blood pressure and various disorders, especially coronary heart disease, stroke, congestive heart failure and impaired renal function. Many factors like alcohol consumption and smoking also increase the risk. High fatty diet and body mass index have a positive correlation and physical activity is negatively related with hypertension [2].

The technological and economical developments in the nation have reduced the physical activity of the people to a very large extent and increased the alcohol and tobacco use. The prevalence of hypertension among adults in developed countries is 25% [3]. Similar prevalence has also been observed in developing countries ranging from 10% to 20% [4].

Community surveys have documented that in a period of three to six decades, prevalence of hypertension has increased by about 30 times among the 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].

As mentioned above, rural areas in India are in transitional phase. This increases the risk of conditions like hypertension in rural areas. Even today there is scarcity of the studies in rural areas of India.

With this background, present study has been undertaken to study the prevalence of hypertension, its associated factors as well as to increase the awareness on importance of lifestyle modifications among rural dwellers of central India.

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2. Materials and Method

A community based cross sectional survey was carried out in the age group of 30 years and above to investigate the prevalence of hypertension and its risk factors among residents of the rural community. This rural community is the field practice area of the Institute.

World Health Organization has reported that the prevalence of hypertension among adults of developing countries ranges from 10% to 20% [4] Gupta R in his meta-analysis of prevalence of hypertension in India reported that prevalence rate of hypertension for rural people ranged from 1.99% in 1958 to 21.2% in 1994 [5].

Based on these reports, a sample size of 810 was calculated considering a prevalence of hypertension as 18%, and an allowable error of 15%.

As per Health Survey Register of the local Primary Health Centre, there were a total of 1610 houses in that selected rural community. As per the record, only those houses were numbered which were having at least one or more persons of age 30 and above. Total number of such houses were 1357. After numbering these houses, first house was chosen randomly. Then every alternate house was selected (Systemic Random Sampling). In this way it was possible to study 924 subjects after their informed consent. The data was recorded in a structured and pre-tested schedule.

Anthropometric measurements viz. height, weight waist circumference and hip circumference were recorded as per standard guidelines laid down by World Health Organization (WHO) [6]. Using height and weight, Body Mass Index (BMI) was calculated and subjects were classified into categories of normal, overweight and obese, based on their BMI [1]. Central obesity was calculated by estimating waist hip ratio (WHR). WHR more than or equal to 0.95 in males and 0.85 in females was taken as the cut off point for diagnosing central obesity [7]. Socio – economic status (SES) was calculated based on Prasad's scale of social stratification for rural areas. It is based on per capita income per month in Indian Rupees [8]. Blood pressure was measured as per standard guidelines by WHO [2]. Hypertension was diagnosed based on drug treatment for hypertension or if the blood pressure was greater than 140 / 90 mm Hg – Joint National Committee VII Criteria [9]. Physical activity of subjects was assessed taking into consideration the occupational as well as non-occupational physical activity. Based on this, a score of physical activity status was calculated as suggested by Singh R B et al [10]. For estimation of alcohol consumption, the Quantity Frequency index developed by Strauss and Bacon was used [11]. Users of all types of tobacco products were included in the category of tobacco users.

All the study subjects except known diabetic underwent the 75 gm Oral Glucose Tolerance Test as per standard procedures and results were interpreted as suggested by WHO [12].

2.1. Statistical Analysis

Statistical analyses were performed using chi square, Student's t test and chi square for trend where ever applicable. P value less than 0.05 was considered significant.

3. Results

In the present study we found that the overall prevalence of hypertension was 19.04%. This was more in females (23.4%) compared to males (14.4%) and this difference was statistically significant ($p < 0.001$). 7.6% were known hypertensive and among them also females (5.4%) had significantly higher cases ($p < 0.001$) than males (2.2%).

Gender wise prevalence of hypertension among different age group is shown in table 1. As the age increased, the prevalence of hypertension also increased in both the sexes. At the age group of 30 – 39 years it was 8.3% in males and 7.8% in females and this increased sharply to 28.4% in males and 47.3% in females at the age of 60 years and above. (chi square trend: males = 12.737, $p < 0.001$, chi square trend: females = 34.272, $p < 0.001$).

Table 1. Age and sex wise prevalence of Hypertension

Age Group (years)	Males			Females			Total		
	No.	HT	%	No.	HT	%	No.	HT	%
30 – 39	144	12	8.3	192	015	07.8	336	027	8.03
40 – 49	124	13	10.5	129	032	24.8	253	045	17.8
50 – 59	089	14	15.7	065	021	32.3	154	035	22.7
≥ 60	088	25	28.4	093	044	47.3	181	069	38.1
Total	445	64	14.4	479	112	23.4	924	176	19.04

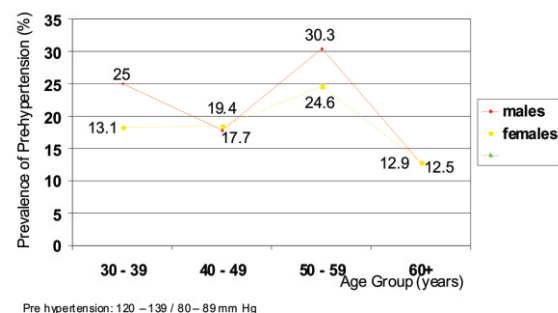
Chi Square (Gender): 12.14, df = 1, $p < 0.001$

Chi Square Trend: males = 12.736, $p < 0.001$

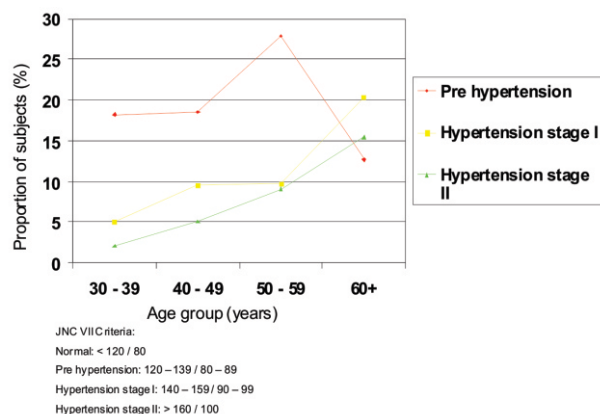
Chi Square Trend: females = 34.272, $p < 0.001$

Fig. 1 shows prevalence of pre-hypertension. It was 18.8%. In contrast to hypertension it was higher in males (21.6%) than females (16.2%). This difference was significant ($p < 0.05$). The prevalence of pre-hypertension increased with age from 18.2% at the age of 30 – 39 years to 27.9% at 50 – 59 years and then dipped to 12.7% at the age of 60 years and above. Similar trend was seen in females, but males showed a bimodal presentation having 25% at the age of 30 – 39 years and 30.3% at the age of 50 – 59 years.

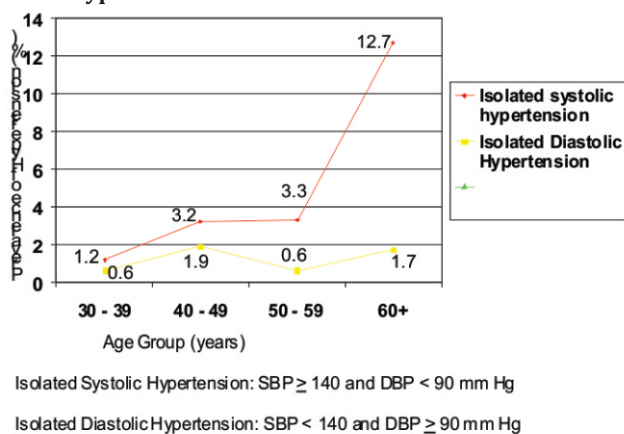
Fig. 1 Age and sex specific prevalence of pre-hypertension



Age specific distribution of blood pressure levels are shown in fig. 2. The prevalence of pre-hypertension, stage I hypertension and stage II hypertension was 18.8%, 10.1% and 6.7% respectively. The prevalence of pre-hypertension, stage I hypertension and stage II hypertension increased with increasing age except for pre-hypertension which increased up to 50 – 59 years and then reduced at the age of 60 years and above.

Fig. 2 Age specific distribution of blood pressure levels.

4.3% had isolated systolic hypertension (2.3% males and 5.6% females) while prevalence of isolated diastolic hypertension was low i.e. 0.9% (0.9% males and 1.04% females). As the age group increased prevalence of isolated systolic hypertension increased at a slower pace until the age of 50 – 59 years after which it increased dramatically giving a prevalence of 12.7% at the age of 60 years and above (9.09% males and 16.1% females). Women had a higher prevalence of isolated systolic hypertension compared to males after the age of 40 years. (Fig. 3)

Fig. 3 Age specific distribution of isolated systolic and diastolic hypertension**Table 2. Association of various factors with hypertension**

Various Factors	Normotensive (n = 748)	Hypertensive (n = 176)	p value
Age (yrs)	44.74 \pm 12.08	53.11 \pm 12.46	< 0.001
Female n (%)	367 (49.06)	112 (63.6)	< 0.001
BMI (kg/m ²)	20.54 \pm 3.52	23.5 \pm 4.7	< 0.001
WHR	0.83 \pm 0.08	0.88 \pm 0.09	< 0.001
Upper social class	50 (6.7)	22 (12.5)	< 0.05
Sedentary activity	87 (11.7)	43 (24.4)	< 0.001
Alcohol	121 (16.2)	27 (15.3)	> 0.05
Tobacco use	366 (48.9)	104 (59)	< 0.05
Diabetes	55 (7.4)	34 (19.3)	< 0.001

Table 2 shows association of risk factors with hypertension. The hypertensive were significantly older, had increased BMI and WHR compared to normotensive ($p < 0.001$). Factors like female sex, upper social class, sedentary activity, tobacco use and presence of diabetes were significantly associated with hypertension ($p < 0.05$ or $p < 0.001$). But there was no significant association between alcohol intake and hypertension ($p > 0.05$).

4. Discussion

Using the JNC VII Criteria among the age group 30 years and above we found a prevalence of 19.04% in the rural population of Central India. The prevalence of hypertension in rural areas of Tamil Nadu in the age group of 45 – 60 years was 33% using JNC V criteria [13]. While Gupta R et al [14] reported a prevalence of 24% in males and 17% in females in the age group of 20 years and above from rural Rajasthan. Gilberts EC et al [15] carried out a study in rural Tamil Nadu in the age group of 20 years and above and found a prevalence of 12.5%. From eastern India, Hazarika NC et al [16] reported a prevalence of 33.3% in the age group of 30 years and above using JNC VI Criteria among the native population of Assam. The prevalence of hypertension was 4.5% in the age group of 16 – 70 years using JNC V Criteria when Malhotra P et al [17] conducted a study in rural Haryana. Guang Hui Dong et al [18] from rural China reported a prevalence of 37.8% in the age group of 35 years and above. Difference in prevalence of various studies observed may be because of variation in age group, geographical differences and diagnostic criteria adopted by authors.

Prevalence of hypertension was significantly higher in females than males. Similar findings were reported by Hazarika NC et al [16] and Malhotra P et al. [17] But Gupta R et al [14] and Guang Hui Dong et al [18] found it more in males. All the studies agree with the fact that prevalence of hypertension increased with age [13,18]. Age probably represents an accumulation of environmental influences and the effect of genetically programmed senescence in body systems [19].

Prevalence of pre-hypertension was more compared to stage I and stage II hypertension up to the age of 50 – 59 years after which it fell down below the levels of stage I and stage II hypertension. Mohan V et al [20] reported similar trend. So we can say that those having pre-hypertension up to 50 – 59 years are susceptible to develop stage I or stage II hypertension. Hence identification of pre-hypertension at 30 – 40 years of age is crucial to prevent development of hypertension.

Overall prevalence of isolated systolic and isolated diastolic hypertension was 4.3% and 0.9% respectively. Prevalence of isolated systolic hypertension increased in both the sexes as the age increased, but the increase after 50 – 59 years was dramatic from 2.24% to 9.09% for males and from 4.6% to 16.1% for females as well as from 3.3% to 12.7% overall for combined groups. Especially for females, there was almost a five fold rise of prevalence from 1.04% at 30 – 39 years to 5.4% at 40 – 49 years. While for males the prevalence of isolated systolic hypertension decreased slightly from 1.39% at 30 – 39 years to 0.87% at 40 – 49 years. Post menopausal changes in females may be the contributory factor for this change.²

In our study we found that increased body mass index and waist to hip ratio were significantly associated with hypertension. Similar findings were reported by other authors [20,21]. World Health Organization study group (1985) has stated that obesity reduces the number of insulin receptors on target cells but in most cases it produces insulin resistance through post receptor changes [22]. Upper social class, tobacco use, sedentary activity were significantly associated with hypertension in the study population. Similar finding was reported by Malhotra P et al [17]. Prevalence of hypertension was significantly high among diabetics which was also reported by Yadav S et al [21] We found a negative association between alcohol intake and hypertension. But Malhotra P et al [17] in their study found that it was positively associated with hypertension.

5. Conclusion

Prevalence of hypertension and pre-hypertension is high in the present study which supports the increasing trend in the rural communities of India which are under the epidemiological transition. Pre-hypertension has been identified as important precursor of hypertension by us as most of them developed hypertension by 60 years of age. Hence identification of subjects with pre-hypertension around 30 years of age and using high risk strategy of prevention of hypertension among them is important in the prevention of hypertension in rural societies to prevent the emerging pandemic of hypertension.

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