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Research Article

Sexual Dimorphism in Blood Pressure and Hypertension among Adult Parengi Porjas of Visakhapatnam, Andhra Pradesh, India

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The present study investigated blood pressure levels as well as the prevalence of hypertension among adult Parengi Porja tribals of village Munchingput Mandalam, Visakhapatnam district, Andhra Pradesh, India. A cross-sectional study was used to collect data on systolic blood pressure (SBP), diastolic blood pressure (DBP), and pulse rate. A total of 137 adults (100 males and 37 females) were measured and classified into three age groups, that is, Gr-I: 23 to 32 years, Gr-II: 33 to 42 years, and Gr-III: ≥ 43 years. Negative significant sex difference in SBP among age group I ($t = -2.409$; $P < 0.05$) was observed. Positive significant sex difference in DBP among age group I ($t = 2.545$; $P < 0.05$) was also observed. Significant age group difference was noticed for SBP ($F = 4.332$; $P < 0.01$) among males. Based on SBP, the prevalence of prehypertension and stage I hypertension in males was 25.0% and 5.0%, respectively. Similarly, in females the prevalence of prehypertension and stage I hypertension based on SBP was 32.4% and 5.4%, respectively. On the basis of DBP, the prevalence of stage I hypertension in males was 5.0%. Similarly, in females, the prevalence of stage I hypertension based on DBP was 5.4%. Our results suggest that females of this ethnic group were more prone to have prehypertension and stage I hypertension than males.

1. Introduction

Hypertension is a major modifiable risk factor, which significantly and independently increases the risk of developing cardiovascular disease (CV) complications. On the other hand, an effective treatment of hypertension substantially reduces the risk of developing such complications [1]. Although importance of blood pressure as a risk factor in cardiovascular disease is well established [2–4], how blood pressure is influenced by different environmental factors is the key for the understanding of coronary diseases. The people of South Asian origin have increased cardiovascular risk due to more centralized deposition of body fat with higher mean of WC and WHR compared to Europeans [5–7].

Since hypertension is an ideal identifiable target to reduce global cardiovascular risk, it is clear that effective strategies, aimed at improving high BP control in the general population of hypertensive patients, represent a fundamental step of any preventive strategy in our country. Therefore, the purpose of the present study was to screen adults Porjas, a Particularly Vulnerable Tribal Group (PTG) of Visakhapatnam, Andhra Pradesh, India, for blood pressure and hypertension status. Hitherto, information on blood pressure among adult Porja tribals of Visakhapatnam, Andhra Pradesh, India, is limited.

2. Materials and Methods

The present cross-sectional study was conducted in Visakhapatnam, Andhra Pradesh, India. Visakhapatnam is situated

Table 1: Descriptive statistics and t-test among the subjects.

Variables	Sex	N	Mean	SD	t
SBP	M	100	119.1700	9.53786	−1.090
	F	37	121.1351	8.88558	
DBP	M	100	66.2500	10.51826	1.309
	F	37	63.4865	12.12349	
MAP	M	100	83.8900	8.16910	0.758
	F	37	82.7027	8.05107	

about 75 km from *village Munchingput Mandalam*, Visakhapatnam. A total of 137 adults (100 males and 37 females) aged above 23 years were measured for blood pressure. Porja are mainly distributed near the hill slopes of Munchangiputtu, Ananthagiri, and Pedabayalu mandal of Visakhapatnam district of Andhra Pradesh. Their population as per 2001 census is 32,669 among whom males are 16,132 and females are 16,537. The total literacy rate among Porja is 26.55 according to 2001 census. They are recognized as Particularly Vulnerable Tribal Group (PTG). They have their own dialect. In addition to their own dialect, they speak Telugu as well as Adivasi Oriya. They are said to be a section of Khond/Gadaba tribe of Ganjam district [8]. There are 7 endogamous units who differ in language, food habits, customs, and traditions. The Porja living in Andhra Pradesh belong to the Parengi Porja [9, 10] on whom the present study has been conducted. Pirangi Porja population can be found in Paderu, Araku (Munchingputtu Mandal) of Visakhapatnam district. They belonging to Austro Asiatic linguistic family where recently migrated from Orissa [11]. Most of the Porja are farmers and day laborers. They live in houses made of wattle thatch (poles intertwined with twigs, reeds, or branches). Porja community is patriarchal (male dominated) and patrilineal (descent through male lineage). The eldest male is the head of the family. Cross cousin marriages are preferred, and marriages are often polygamous (having multiple spouses).

This study was carried out during March-April, 2012. Data were collected after obtaining the necessary approval from the competent authorities. Informed consent was also obtained from each participant. Information on age, gender, and blood pressure measurements was collected on a pretested questionnaire by house-to-house visit following interview and average of three consecutive measurements (following 2 minutes gap between readings) was recorded. The measurements were taken from the participant during day time. Subjects were classified into three age groups, that is, Gr-I: 23 to 32 years, Gr-II: 33 to 42 years, and Gr-III: ≥ 43 years. And the sex wise distributions among males and females in each age group are 27, 41, and 32 in males and 20, 13, and 4 in females.

The physiometric variables included measurement of systolic blood pressure (SBP), diastolic blood pressure (DBP), and pulse rate. Two consecutive readings were recorded for each of SBP and DBP and the averages were used. The measurements were taken with the help of digital blood pressure machine in a sitting position with the left forearm placed horizontal on the table. All efforts were made to minimize the factors which affect blood pressure like anxiety, fear, stress, laughing, and recent activity [12]. Blood pressure was categorized as normal BP based on SBP/DBP as less than 120/80 mmHg, prehypertension as 120–139/80–89 mmHg, stage I hypertension as 140–159/90–99 mmHg, and stage II hypertension as equal to and above 160/100 mmHg [13].

Mean arterial blood pressure (MAP) was calculated for each of the two readings taken for SBP and DBP by using the followingstandard formula:

$$\mathrm{MBP} = \mathrm{DBP} + \frac{(\mathrm{SBP} - \mathrm{DBP})}{3}. \quad (1)$$

See [14].

All data were analyzed by SPSS (Statistical Package for Social Sciences, Version 16). Mean, standard deviation, independent samples t-test, ANOVA (F-test), and Chi-square test (χ^2) were performed to investigate age and sex variations.

3. Results

Table 1 presents the means, standard deviations, and t-test between *the sexes* of the studied variables. There was no significant sex difference in mean SBP, DBP, and MAP.

Mean, standard deviation, t-test, and F-test (ANOVA) of the studied variables, namely, SBP (mm/Hg), DBP (mm/Hg), and mean arterial pressure (MAP) (mm/Hg), of three different age groups of males and females are presented in Table 2. Negative significant sex difference in SBP among age group I ($t = -2.409$; $P < 0.05$) was observed. Positive significant sex difference in DBP among age group I ($t = 2.545$; $P < 0.05$) was also observed. Significant age group difference was noticed for SBP ($F = 4.332$; $P < 0.01$) among males.

Table 3 shows the correlation matrix of age with SBP, DBP, and MAP for both sexes. It can be observed from the table that there was no significant correlation between age and blood pressure among the subjects.

Table 4 presents the prevalence of hypertension based on SBP and DBP. On the basis of SBP, the prevalence of prehypertension and stage I hypertension in males was 25.0% and 5.0%, respectively. Similarly, in females, the prevalence of prehypertension and stage I hypertension based on SBP was 32.4% and 5.4%, respectively. On the basis of DBP, the prevalence of stage I hypertension in males was 5.0%. Similarly, in females the prevalence of stage I hypertension based on DBP was 5.4%.

Table 2: Age-sex specific descriptive statistics of the subjects.

Variables	Age group (years)	Males			Females			t
		N	Mean	SD	N	Mean	SD	
Age (years)	(23–32)	27	28.70	2.77	20	29.00	2.60	−0.372
	(33–42)	41	38.24	2.91	13	38.00	2.83	0.265
	(≥43)	32	50.28	3.57	4	47.50	2.89	1.493
	F	100	360.827***		37	98.042***		
SBP (mm/Hg)	(23–32)	27	116.33	7.52	20	121.85	8.07	−2.409*
	(33–42)	41	122.39	9.74	13	121.15	10.86	0.388
	(≥43)	32	117.44	9.84	4	117.50	6.45	−0.012
	F	100	4.332**		37	0.386		
DBP (mm/Hg)	(23–32)	27	65.26	9.55	20	64.40	14.41	0.246
	(33–42)	41	64.78	11.81	13	64.08	9.74	0.195
	(≥43)	32	68.97	9.25	4	57.00	2.45	2.545*
	F	100	1.608		37	0.632		
MAP (mm/Hg)	(23–32)	27	82.28	7.72	20	83.55	9.73	−0.497
	(33–42)	41	83.98	8.45	13	83.10	5.62	0.351
	(≥43)	32	85.13	8.20	4	77.17	2.41	1.910
	F	100	0.888		37	1.077		

* Significance at (<0.05); ** (<0.01); and *** (<0.001).

Table 3: Correlation (r) of age with SBP, DBP, and MAP among the subjects.

Variable	Men (n = 100)	Women (n = 37)
SBP	−0.019	−0.217
DBP	0.144	−0.188
MAP	0.116	−0.268

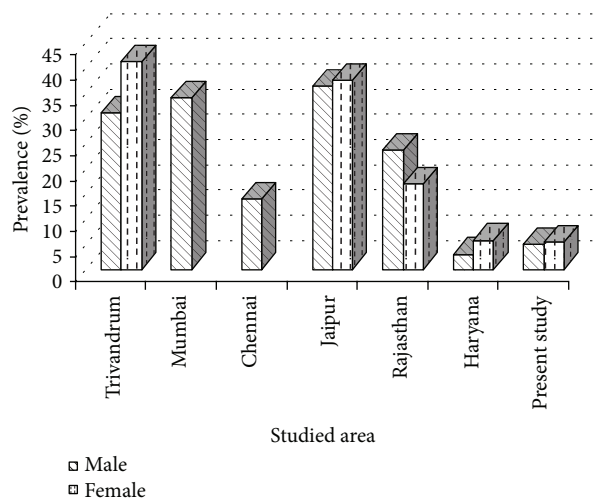

Figure 1: Comparative prevalence of hypertension among adults of different parts of India.

4. Discussion

There are at least 970 million people worldwide who have elevated blood pressure (hypertension). In the developed world, about 330 million people have hypertension, as do around 640 million in the developing world. The World Health Organization rates hypertension as one of the most important causes of premature death worldwide and the problem is growing. In 2025 it is estimated that there will be 1.56 billion adults living with high blood pressure [15]. Present study documents a higher prevalence of prehypertension (SBP based) among females (32.4%) compared to males (25.0%). The high incidences of hypertension are likely to be important contributors to the epidemic of cardiovascular disease in affluent Indian subjects. The prevalence of hypertension has been increasing in India, both in rural and urban regions [16]. The prevalence of hypertension in urban areas of India ranged from 2.6 to 5.2 percent between 1960 and 1980 (28–30) and it has increased to 20–33 percent in the last decade [17–19]. The prevalence of hypertension was significantly higher in males compared with females, possibly due to the increased prevalence of metabolic risk factors for hypertension and prehypertension in males. Greenland et al. [20] reported that subjects with prehypertension were 1.65 times more likely to have at least 1 other adverse cardiovascular risk factor than those who were normotensive and to have 1.8 times increased risk of cardiovascular events. However, we took concern to select a settlement which had a representative merge of subjects with all different professions and age groups. Figure 1 presents the prevalence of hypertension using SBP and DBP among previously studied adult population in India. Prevalence of hypertension in males was highest in Jaipur (36.4%) [21] and lowest in Haryana (3.0%) [22]. Similarly, in females Jaipur adults have highest (37.5%) [21] and present study females have the lowest (5.4%).

In addition, the Third National Health and Nutrition Evaluation Survey (NHANES III) showed that, in general, men had higher blood pressure than women through middle age [23]. Furthermore, the incidence of uncontrolled hypertension is also greater in men than in women [24]. Blood

Table 4: Prevalence of prehypertension and hypertension among studied subjects using SBP and DBP.

Variable	Classification	Male		Female		χ^2
		Frequency	Percent	Frequency	Percent	
SBP	Normal	70	70.0	23	62.2	0.806
	Prehypertension	25	25.0	12	32.4	
	Stage I hypertension	05	5.0	02	5.4	
	Stage II hypertension	0	0	0	0	
DBP	Normal	95	95.0	35	94.6	0.009
	Prehypertension	0	0	0	0	
	Stage I hypertension	05	5.0	02	5.4	
	Stage II hypertension	0	0	0	0	

pressures of 130–9/85–9 in this range are referred to as stage 2 prehypertension [25]. Stage 2 prehypertensives are at about threefold greater risk for progression to hypertension than normal BP persons and approximately double the risk of clinical cardiovascular disease independent of progression to hypertension [25]. Stage 1 prehypertension, that is, 120–129/80–84 mmHg, is also associated with excess risk but about half that of stage 2 prehypertension when both are compared with normotensives with blood pressure of less than 120/80 mm Hg. [25].

The high prevalence of prehypertension found, especially in women, is a cause of major concern. Given that individuals with prehypertension (especially those at 130–9/85–9 mmHg) are more likely to develop hypertension than normotensive individuals [25], the significant proportion of relatively young subjects (especially women) with prehypertension could lead to an epidemic of hypertension in the next few years. Thus, proactive measures are required to prevent this epidemic.

5. Conclusion

The present study is limited by its small sample size, being from monoethnic group of Andhra Pradesh, India. These results may therefore only be representative of a small sample size and not representative of the district, state, or country. To obtain a broader representation, we suggest that more studies involving BP among adults from different parts of India should be undertaken.

However, it may be concluded that the present study, although descriptive in nature, reflects the presence of high blood pressure among females that may lead to higher incidences of cardiovascular diseases among them. Similar studies should be undertaken among various tribal populations of India to identify prehypertensives and hypertensives so that preventive measures could be taken in advance. India is a land of vast ethnic heterogeneity having numerous tribal populations. From the biological anthropology viewpoint, it would be interesting to study variation in blood pressure and hypertension between them. Such descriptive study will help to raise the awareness of an individual to check his/her blood pressure levels in order to not reach hypertensive levels.

Conflict of Interests

The authors declare that there is no conflict of interests regarding the publication of this paper.

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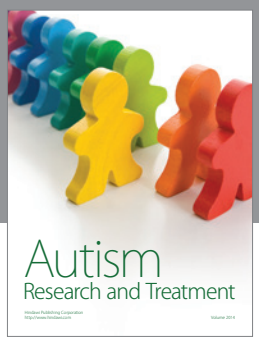

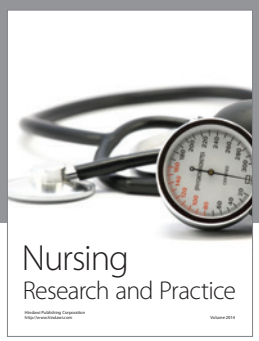

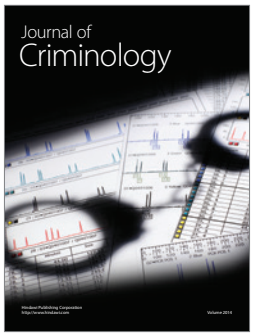

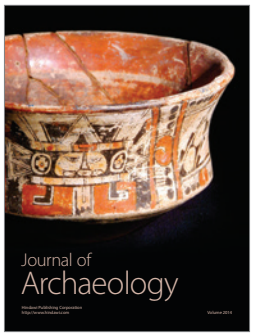

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