

RESEARCH ARTICLE

Blood pressure pattern and hypertension rates among selected tribal population of Kerala

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ABSTRACT

Background: Non-communicable diseases such as hypertension, diabetes, and cancer have replaced communicable diseases as the leading cause of mortality in most parts of the world including India. Hypertension is a major public health problem in India which often results in coronary artery disease and stroke. As tribal populations are relatively isolated from the modern lifestyle, it is often hypothesized that their blood pressure is lower than the general population. **Aims and Objectives:** This study aims to describe the normal pattern of blood pressure and to assess the prevalence and associated factors of hypertension among a selected tribal population of Kerala. **Materials and Methods:** The study was carried out among tribal settlements of Kannavam Area, Kannur District, Kerala. Using convenient sampling method, 300 individuals aged 18 years and above were selected. Pregnant women and those individuals who were not willing to participate were excluded from the study. Data on sociodemographic variables, physical activity, tobacco consumption, and alcohol intake were collected. Blood pressure was recorded and classified according to Joint National Committee - 8 criteria. Data entry and analysis was done on SPSS version 17. **Results:** The mean systolic and diastolic blood pressure was found to be 125.2 mmHg and 77.1 mmHg, respectively. Only 45.7% of the study individuals had normal blood pressure, and the rest had either hypertension or pre-hypertension. Increasing age, alcohol intake, sedentary lifestyle, obesity, and central obesity were found to be significant factors responsible for high blood pressure. **Conclusion:** The tribal population's mean systolic and diastolic blood pressure was similar to those of rural population of Kerala. A large proportion of the population had elevated blood pressure especially the elderly, thus necessitating annual screening in them. Alcohol intake and obesity were found to be associated with hypertension; hence, health education on harmful effects of alcohol and benefits of a balanced diet should be given to the tribal population.


KEY WORDS: Blood Pressure; Tribal Population; Risk Factors; Joint National Committee 8

INTRODUCTION

Since time immemorial, humanity has been affected by various diseases, the pattern of which keeps changing based

on the level of evolution. Till the 20th century, communicable diseases such as plague, cholera, tuberculosis used to be the major contributors to mortality where as in the 21st century non-communicable diseases such as hypertension, diabetes mellitus, and cancer have taken over as the major mortality contributors.^[1]

Hypertension is a major public health problem in both developed and developing countries. It is responsible for 9.4 million deaths worldwide.^[2] The World Health Organization world health statistics 2015 reported the global prevalence of hypertension as 25.9% among males

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and 24.8% among females.^[3] High blood pressure possesses two fold higher risk of developing coronary artery disease, four times higher risk of congestive heart failure and seven times higher risk of cerebrovascular disease compared to normotensive people.^[4]

It has long been believed that the blood pressure levels of tribal people are lower than the general population as they are isolated from the modern lifestyle and may have a lower prevalence of risk factors of hypertension such as sedentary lifestyle, unhealthy diet, obesity, mental stress, tobacco and alcohol intake. Many past research studies have also found the prevalence of hypertension to be lower in naïve tribal populations than the general population, but a recent meta-analysis has pointed out a change in this scenario with an increasing trend in prevalence of hypertension.^[5-14] This could be due to changing lifestyle and a higher level of acculturation due to better road connectivity, use of gadgets such as television and mobile phones, emigration in search of better education and job opportunities.

As there are limited studies done to understand the blood pressure profile and its variation among tribal people, the current study was undertaken to describe the normal pattern of blood pressure and to assess the prevalence and associated factors of hypertension among tribal population of Kannavam, Kerala.

MATERIALS AND METHODS

The study was carried out among tribal settlements of Kannavam Area, Kannur District, Kerala. Kannur is a major port city of North Kerala and has a population of 25,25,637 according to Census 2011. There are around 6,000 tribal people residing in Kannavam forest area of Kannur, and it is spread across four-gram panchayats (Chittariparamba, Kolayad, Pattiom, and Thrippangottur). Off the 35 major tribes in Kerala, Kurichiyas and Paniyas are the dominant tribes residing in Kannavam forest area, and they formed the sampling frame. The present study was conducted from October 2014 to August 2016, and the design is community-based cross-sectional study. The required sample size was estimated at 300 using the formula $4pq/l^2$ (prevalence of 25%, relative precision of 20% was considered at 95% confidence interval).

Ethical clearance for the study was taken from Institutional Ethics Committee, and permission to carry out the study was taken from the area tribal officer. Local leaders were contacted, and their support garnered. Volunteers were recruited from the tribal population for assistance in carrying out the study. Convenient sampling was used to select 300 tribal people aged ≥ 18 years for the study. Pregnant women and those individuals who were not willing to participate were excluded from the study.

Written informed consent was obtained from the study participants after explaining the study to them in their own language. Information was collected using a pretested and semi structured questionnaire. Data on sociodemographic variables, physical activity, tobacco consumption, and alcohol intake were collected. Modified B G Prasad socioeconomic classification was used to classify people according to their socioeconomic status.^[15] Weight was recorded and rounded off to the nearest 0.5 kg using an electronic weighing machine. For recording height, the subjects were made to stand erect; looking straight on a level surface and height was read to the nearest 0.5 cm. Waist circumference was measured to the nearest 1 mm, using a nonelastic plastic tape with the subject in standing position midway between the lower rib margin and the iliac crest. Hip circumference was measured around the widest portion of the buttocks, with the tape parallel to the floor. Body mass index of ≥ 25 kg/m² was considered as obesity, and waist hip ratio of ≥ 0.95 in males and ≥ 0.85 in females was considered as abdominal obesity.^[16]

Blood pressure was recorded using a mercury sphygmomanometer in the right arm with the subject in the seating position. Two readings were taken and the average of these readings was taken for analysis. The first reading was taken after at least 15 min of rest and the second reading was taken 15 min after the first reading. Joint National Committee (JNC) - 8 criteria were used for diagnosis of hypertension.^[17] Hypertension was defined as systolic blood pressure more than or equal to 140 mmHg and/or diastolic blood pressure more than or equal to 90 mmHg. Individual aged ≥ 60 years were considered to be hypertensive if their systolic blood pressure more than or equal to 150 mmHg and/or diastolic blood pressure more than or equal to 90 mmHg. Those individuals already diagnosed as hypertensive were also labeled as such. Data entry and analysis was done on SPSS version 17. Results of categorical variables are presented as number and percentage, whereas continuous variables are presented as mean and standard deviation. Student's *t*-test (two-tailed, independent) and Chi-square test have been used to find the significance of study parameters. $p < 0.05$ was considered to be significant.

RESULTS

A total of 300 tribal people participated in this study, out of which 121 (40.3%) were males and rest females (Table 1). The mean age (\pm standard deviation) of the study participants was 42.9 (15.9) years. According to B G Prasad socioeconomic classification, it was observed that a large proportion of people belonged to class V (lower class) and class IV (lower middle class).

The mean systolic and diastolic blood pressure was found to be 125.2 mmHg and 77.1 mmHg, respectively. Both systolic and diastolic blood pressure levels were higher in males as

compared to females, but this difference was not found to be statistically significant (Table 2). It was observed that only 45.7% of the tribal people had blood pressure in the normal range, another 31.0% had pre-hypertension and were at a high risk of developing hypertension in near future. The prevalence of hypertension among tribal people was 23.3% (Table 3).

Increasing age, alcohol intake, sedentary lifestyle, obesity and central obesity were found to be significant factors responsible for high blood pressure (Table 4). Gender, socioeconomic class, and tobacco intake were not found to be significant for high blood pressure.

Table 1: Sociodemographic variables of the tribal population

Variable	Frequency n=300 (%)
Age	
20-29 years	59 (19.7)
30-39 years	76 (25.3)
40-49 years	65 (21.7)
50-59 years	41 (13.7)
60-69 years	38 (12.7)
≥70 years	21 (7.0)
Sex	
Males	121 (40.3)
Females	179 (59.7)
Socioeconomic status	
Class I (>6323)	6 (2)
Class II (3161-6322)	34 (11.3)
Class III (1897-3160)	55 (18.3)
Class IV (948-1896)	93 (31.0)
Class V (947)	112 (37.3)

Table 2: Systolic and diastolic blood pressure distribution among males and females of the study population

Variable	Mean±SD			p*
	Combined	Males	Females	
Systolic blood pressure (mmHg)	125.2±17.6	126.7±14.5	123.9±19.3	0.184
Diastolic blood pressure (mmHg)	77.1±10.8	78.3±9.6	76.3±11.5	0.122

*Unpaired 2 sided *t*-test has been used, SD: Standard deviation

Table 3: Blood pressure profile of the study population

Blood pressure class	Frequency (%)
Normal	137 (45.7)
Prehypertension	93 (31.0)
Stage 1 hypertension	56 (18.7)
Stage 2 hypertension	14 (4.6)
Total	300 (100)

Based on Joint National Committee 8 Classification

DISCUSSION

The present study was undertaken to understand the normal pattern of blood pressure and to assess the prevalence and associated factors of hypertension among a selected tribal population. Based on the inclusion and exclusion criteria, a total of 300 tribal people (121 males, 179 females) were selected for the study.

The mean systolic and diastolic blood pressures were both higher among males as compared to females, but this difference was not found to be statistically significant. Mean systolic blood pressure was 126.7 mmHg among males and 123.9 mmHg among females. On an average, the systolic blood pressure was 2.8 mmHg higher in males. Mean diastolic blood pressure was 78.3 mmHg among males and 76.3 mmHg among females. On an average, the diastolic blood pressure was 2.0 mmHg higher in males. These levels are similar to those reported in rural areas of Kerala by National Family Health Survey 3 report.^[18] Lower blood pressure in females is due to the action of estrogen hormone. The mean blood pressure of females is lower than males till the time they reach menopause, and later the blood pressure levels will be similar in both sexes.^[19]

The study found 45.7% and 31.0% of people to have normal blood pressure and prehypertension respectively. According to the latest JNC criteria, normal blood pressure is defined as systolic blood pressure <120 mmHg and diastolic blood pressure <80 mmHg. Prehypertension is defined as systolic blood pressure between 120 and 139 mmHg (up to 149 mmHg for people aged more than 60 years) and diastolic blood pressure between 80 and 89 mmHg. The prevalence of hypertension in the tribal population was 23.3%. This was lower than the estimates given by a study conducted in Kerala by Meshram et al. Who reported an estimated prevalence of 40%.^[8] The prevalence of hypertension among various tribal's of the country has been reported from as low as 16.1% from Gujrat to as high as 43.4% in Uttarakhand.^[5-14] This variation is mainly due to the difference in their lifestyle and level of acculturation.

With regard to the factors affecting blood pressure, it was observed that the chance of being hypertensive increased with advancing age. Among young people aged 20-29 years, only 6.8% had hypertension whereas among elderly people aged more than 70 years, 47.6% had hypertension. With increasing age, arteries and arterioles become less elastic due to atherosclerotic changes resulting in elevated blood pressure levels in older people. Gender and socioeconomic status did not significantly affect the blood pressure of the study tribal population.

It was observed that around 30% of the study individuals consumed alcohol and most of them took it on a daily basis. The present study found the odds of increased blood pressure

Table 4: The factors associated with hypertension

Variable	Total (n=300)	Hypertensive n (%)	Normotensive n (%)	Odds ratio (95% CI)	χ^2	p
Age in years						
20-29	59	04 (06.8)	55 (93.2)	1	27.09	<0.001 [#]
30-39	76	10 (13.2)	66 (86.8)	2.1 (0.6-7.1)		
40-49	65	19 (29.2)	46 (70.8)	5.7 (1.8-17.8)		
50-59	47	15 (36.6)	26 (63.4)	7.9 (2.4-26.2)		
60-69	32	12 (31.6)	26 (68.4)	6.4 (1.9-21.5)		
≥70	21	10 (47.6)	11 (52.4)	12.5 (3.3-37.1)		
Sex						
Males	121	26 (21.5)	95 (78.5)	1	0.386	0.534
Females	179	44 (24.6)	135 (75.4)	0.8 (0.5-1.4)		
Socioeconomic class						
Class 1	06	02 (33.3)	04 (66.7)	1.9 (0.3-9.2)	4.194	0.380
Class 2	34	09 (26.5)	25 (73.5)	1.4 (0.6-3.4)		
Class 3	55	09 (16.4)	46 (83.6)	0.8 (0.3-1.8)		
Class 4	93	27 (29.0)	66 (71.0)	1.6 (0.8-3.1)		
Class 5	112	23 (20.5)	89 (79.5)	1		
Tobacco smoking						
Smoker	43	11 (25.6)	32 (74.4)	1.2 (0.5-2.4)	0.142	0.698
Non-smoker	257	59 (23.0)	198 (77.0)	1		
Tobacco chewing						
Present	78	17 (21.8)	61 (78.2)	0.9 (0.5-1.6)	0.139	0.709
Absent	222	53 (23.9)	169 (76.1)	1		
Alcohol intake						
Present	99	30 (30.3)	69 (69.7)	1.8 (1.1-3.1)	4.012	0.045*
Absent	201	40 (19.9)	161 (80.1)	1		
Sedentary lifestyle						
Yes	70	23 (32.9)	47 (67.1)	1.9 (1.1-3.4)	4.629	0.031*
No	230	47 (20.4)	183 (79.6)	1		
Obesity						
Obese	35	13 (37.1)	22 (62.9)	2.2 (1.2-4.5)	4.224	0.040*
Non-obese	265	57 (21.5)	208 (78.5)	1		
Abdominal obesity						
Present	79	26 (32.9)	53 (67.1)	2.0 (1.1-3.5)	5.500	0.019*
Absent	221	44 (19.9)	177 (80.1)	1		

* $p < 0.05$, [#] $p < 0.001$, CI: Confidence interval

among alcohol consumers to be 1.8 times that of non-alcoholics. A similar finding has also been reported among other studies conducted among different tribal groups of India.^[10,13,14] Alcohol causes elevation of blood pressure by the direct pressor effect of alcohol on blood vessels, sensitization of resistance vessels to pressor substances, sympathetic nervous system stimulation and increased production of adrenocortical hormones.^[20] With regard to tobacco intake and hypertension, the study did not observe any association.

A large proportion of people leading a sedentary lifestyle and those having obesity (general or abdominal) had

elevated blood pressure levels. The odds of an obese person being hypertensive were two times that of a non-obese person (Table 4). A similar finding has been reported in other tribal studies.^[6,12,13] Obesity causes hypertension by activating the rennin angiotensin aldosterone system, increasing sympathetic activity, promoting insulin resistance and leptin resistance, increasing cholesterol levels, increased procoagulatory activity and by endothelial dysfunction. Other mechanisms include increased renal sodium reabsorption, causing a shift to the right of the pressure natriuresis relationship and resulting volume expansion.^[21]

CONCLUSION

The tribal population's mean systolic and diastolic blood pressure was 125.2 mmHg and 77.1 mmHg respectively and these levels similar to those of rural population of Kerala. It was also observed that only 45.7% of the study individuals had normal blood pressure and the rest had either hypertension or pre-hypertension. As elevated blood pressure was common among elderly, annual screening should be done among them. Alcohol intake and obesity were found to be associated with hypertension; hence, health education on harmful effects of alcohol and benefits of regular physical activity and proper balanced diet should be given to the tribal population.

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