Original Research Article

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Hypertension: prevalence, awareness, treatment and control in a rural area of North Kerala, India

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ABSTRACT

Background: High blood pressure is prevalent all over the world and is one of the major causes of cardiovascular morbidity and mortality. In considerable proportion of cases the disease tends to be asymptomatic for prolonged time, hence also labelled as "silent killer". Awareness, treatment, and control of hypertension remain major challenges worldwide. The objective of this study was to determine the prevalence, awareness, treatment and control of hypertension in Northern Kerala.

Methods: A community-based cross-sectional study among 687 subjects aged ≥20 years was conducted from March 2017 to July 2017. Data was collected by personal interviews, followed by anthropometric and blood pressure measurements. Diagnosis of hypertension was based on Joint National Committee (JNC) VIII guidelines.

Results: The prevalence of hypertension (JNC VIII) was 48.2% with a 95% confidence interval ranging from 44.46% to 51.94%. Prevalence among males: 58.1% and females: 44.5%. Among the total hypertensives, 38.7% were aware. Of these, 94.5% taking treatment, 47.1% achieved adequate blood pressure control. Advancing age, current diabetic status, body mass index, and family history of hypertension were identified as risk factors for hypertension by multivariate logistic regression.

Conclusions: High prevalence of hypertension was observed in the population. The low levels of awareness and control underscores the large gap between evidence and practice that needs to be bridged, for effective control of hypertension. This calls for plan to adopt preventive and control strategies and promote the health of the population.

Keywords: Prevalence, Awareness, Treatment, Control, Hypertension, Kerala

INTRODUCTION

Hypertension is a public health epidemic. Approximately 4 in 10 adults older than 25 years have hypertension, and in many countries another 1 in 5 has prehypertension. Increased BP was the cause of an estimated 9.4 million deaths and 162 million years of life lost in 2010 and the cause of 50% of heart disease, stroke, and heart failure. Existing data suggests that the prevalence of hypertension has remained stable or has decreased in economically

developed countries during the past decade, while it has increased in developing countries.² Not only is hypertension more prevalent in low- and middle-income countries, there are also more people affected because more people live in those countries than in high-income countries. Further, because of weak health systems, the numbers of people with hypertension who are undiagnosed, untreated and uncontrolled are also higher in low- and middle income countries compared to highincome countries. Premature death, disability, personal and family disruption, loss of income, and healthcare

expenditure due to hypertension, take a toll on families, communities and national finances. Families face catastrophic health expenditure and spending on health care, which is often long term in the case of hypertension complications, pushing tens of millions of people into poverty. If no action is taken to tackle hypertension and other non-communicable diseases, the economic losses are projected to outstrip public spending on health.3 Given the rising prevalence of hypertension in countries undergoing epidemiological developing transition like India, increased awareness, treatment, and control of high blood pressure are critical to the reduction of cardiovascular disease risk and prevention of the associated burden of illness.4 This study was done with the objective of assessing the prevalence of hypertension and data on awareness, treatment and control of hypertension.

METHODS

The study was carried out in Kulappuram village, which comes under Cheruthazham Panchayat in Kannur district, Kerala. The village has a total of 520 houses and 2206 residents. The local nongovernmental organization, Kulappuram Vayanashala, in association with the Department of Community Medicine, Pariyaram Medical College is running a health-promotion initiative in the area, "the model health village project". For the project, the village is divided into 20 clusters based on geography and each cluster has 25 to 30 houses.

Study period

March 2017 to July 2017

Inclusion criteria

Subjects aged 20 years and above of both sexes giving consent to participate in the study

Exclusion criteria

Bedridden, comatose subjects were excluded.

The study was approved by Institute Ethical Committee of Academy of Medical Sciences, Pariyaram, Kannur, Kerala. All individuals aged 20 years and above were eligible to participate in the study. We expected that the total population above the age of 20 years would be an estimated 1200 individuals. NSS student volunteers of 3rd year MBBS were trained to measure blood pressure, height and weight. The volunteers were provided with BP apparatus, stethoscope, weighing scale, and a stadiometer for measuring blood pressure, height and weight.

The participants were interviewed after obtaining informed verbal consent. The demographic and socioeconomic details of the participants including information on tobacco use, alcohol use, diabetes mellitus, dyslipidemia, ischemic heart disease, and stroke

were recorded using a semi structured questionnaire. Following this, anthropometric measurements and blood pressure were recorded.

The height of the participants was measured (to the nearest millimeter) using a stadiometer (Seca 213) while they were standing erect without footwear and with their head positioned such that the external auditory meatus was level with the inferior margin of the orbit. Weight was measured (to the nearest 0.5 kg) using a mechanical weighing scale while subjects were standing unsupported without footwear or heavy clothing. Body mass index (BMI) was calculated using the formula of weight (kg)/height (m²). Blood pressure was recorded in the sitting position in the right arm to the nearest 2mmHg using the mercury sphygmomanometer (Diamond Deluxe BP apparatus, Pune, India). Two readings were taken 5 minutes apart and mean of two was taken as the blood pressure.

Obesity

Generalized obesity was defined using the cut offs for Asian Indians i.e. BMI>25 kg/m².⁵

Hypertension

Hypertension was defined as systolic blood pressure \geq 140 mm of Hg and/or a diastolic blood pressure \geq 90 mm of Hg and/or current use of blood pressure lowering medications for hypertension– Joint National Committee 8 (JNC VIII) criteria.⁶

Family history of hypertension

Either one of the parents or sibling having hypertension

Behavioral risk factors

Current smokers were defined as individuals who had smoked any tobacco in the last 30 days. Alcohol users were those who had consumed one or more than one drink of any alcohol in the last 12 months.

Awareness, treatment and control of hypertension: Individuals were considered to be aware of their hypertension based on the prior diagnosis of hypertension or high blood pressure by a health professional. Current use of antihypertensive medication was defined as treatment of hypertension. Control of hypertension was defined as BP<150/90 mm of Hg for general population aged \geq 60 years, and BP<140/90 mm of Hg for general population aged \leq 60 years and for those with diabetes.

Statistical methods

Data entry and analysis were performed using SPSS 16.0 software. Student's t tests were used for continuous variable and chi square test for proportions, a p<0.05 was considered as statistically significant. Logistic regression

analysis was used to find the risk factors associated with hypertension. A multiple logistic regression analysis was carried out to obtain adjusted odds ratios for the variables. Variables with significant adjusted odds ratios (p<0.05) were considered to be independently associated with hypertension.

RESULTS

Total number of individuals studied was 687. Among them, 501 were females and 186 were males. Of the total subjects, 86% were Hindus, 11% were Christians and 3% were Muslims.

Prevalence of hypertension

The overall prevalence of hypertension in the study population was 48.2%, with a 95% confidence interval ranging from 44.46% to 51.94%. The mean systolic BP was 131.68 (\pm 17.12) mm Hg while the mean DBP was 83.4 (\pm 10.64) mm Hg. The prevalence of hypertension in males was 58.1% and in females it was 44.5% and this difference was statistically significant (p=0.002).

The prevalence of hypertension steadily increased with age in both sexes and was 8% in males and 3% in females at the age group of 20-29 years, which increased steadily and reached a prevalence of 27% in males and 26% in females at the age group of 60–69 years (Figure 1).

It was found that hypertensives had a significantly higher mean age as well as BMI compared to the normotensives. (Table 1).

Age-specific estimates of the distribution of blood pressure

Overall, 10.9% of the study sample had normal blood pressure. The overall prevalence of prehypertension, stage 1 hypertension and stage 2 hypertension were 40.9%, 33.3% and 14.8% respectively. The number of individuals in the normotension and prehypertension category were more in the younger age groups, while stage 1 and stage 2 hypertension was higher in the older subjects. Statistical significance was noted between hypertension and advancing age of the subjects (p<0.001) (Table 2).

Prevalence of isolated systolic and isolated diastolic hypertension

Based on the JNC-VIII classification, isolated systolic hypertension (SBP \geq 140 and DBP <90 mm of Hg) was present in 32.6% of the subjects while isolated diastolic hypertension (DBP \geq 90 and SBP<140 mm of Hg) was present in 37.3% of the subjects. Among the elderly (>60 years) population, women (65%) had higher prevalence of isolated systolic hypertension compared to men (55.6%).

Table 1: Comparison of normotensives and hypertensives with respect to specific characteristics.

Variable		Normotensive	Hypertensive	P value
Age		44.36±17.17	55.82±14.82	< 0.001
Sex, n (%)	Male	78 (41.9%)	108 (58.1%)	0.002
	Female	278 (55.5%)	223 (44.5%)	0.002
BMI		22.60±4.23	23.92±4.36	< 0.001

Table 2: Classification of blood pressure levels based on JNC VIII criteria.

Age(in yrs)	Non-hypertensive	s, n (%)	Hypertensives, n (%)	
	Normotension	Prehypertension	Stage 1 hypertension	Stage 2 hypertension
20-29	20 (19.6)	66 (64.7)	14 (13.7)	2 (2.0)
30-39	23 (19.8)	60 (51.7)	25 (21.6)	8 (6.9)
40-49	14 (12.7)	42 (38.2)	40 (36.4)	14 (12.7)
50-59	6 (4.6)	48 (36.9)	45 (34.6)	31 (23.8)
60-69	4 (3.1)	35 (27.6)	62 (48.8)	26 (20.5)
70+	8 (7.8)	30 (29.4)	43 (42.2)	21 (20.6)
Total	75 (10.9)	281 (40.9)	229 (33.3)	102 (14.8)

Table 3: Behavioral risk factors among the study population.

Variables		Hypertension n (%)	P value	
Current smoker	Yes	14 (73.7)	0.024	
Current smoker	No	317 (47.5)		
Current smokeless tobacco user	Yes	2 (40)	0.999	
Current smokeless tobacco user	No	329 (48.2)	0.999	
Current alcohol user	Yes	24 (64.9)	0.037	
Current aconor user	No	307 (47.2)	0.037	

Table 4: Awareness, treatment and control of hypertension

Variables	All hypertensives n (%)			
variables	Aware	Treated	Controlled ^a	
Total (n=331)	128 (38.7)	121 (94.5)	57 (47.1)	
Men (n=186)	35 (18.8)	34 (97.1)	21 (61.7)	
Women (n=501)	93 (18.6)	87 (93.5)	36 (41.3)	
With diabetes Mellitus ^b (n=75)	54 (72)	45 (83.3)	24 (44.4)	

 $^{^{}a}$ BP <140/90 mm Hg for <60 yrs and those with diabetes and BP <150/90 mm of Hg for ≥60 yrs.

Table 5: Summary table of significant correlates for hypertension.

Variables	Crude OR	P value	95% CI	Adjusted OR	P value	95% CI
Age (in years)	1.044	< 0.001	1.033-1.054	1.042	< 0.001	1.031- 1.053
Gender						
Female	1.00					
Male	1.726	0.002	1.228-2.426			
BMI	1.076	< 0.001	1.037-1.116	1.086	< 0.001	1.044-1.131
DM						
No	1.00					
Yes	3.110	0.001	1.833-5.276	1.859	0.037	1.038-3.330
Smoking						
No	1.00					
Yes	3.110	0.032	1.104-8.705			
Alcohol						
No	1.00	_	_			
Yes	2.063	0.04	1.032-4.122			
Family h/o HTN						
No	1.00	_	_			
Yes	1.461	0.022	1.056-2.023	1.645	0.007	1.144-2.365

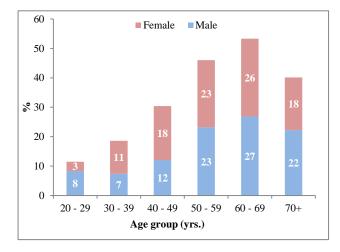


Figure 1: Prevalence of hypertension by sex and age among the study population.

Family history of hypertension

Among the total study subjects who gave a family history of hypertension (212), 54.7% of them had hypertension whereas among those without a family history of hypertension, 45.3% had hypertension. This difference was statistically significant (p=0.022).

Behavioral risk factors

Among the current smokers, 73.7% had hypertension whereas 47.5% of those who did not smoke currently had hypertension and this difference was found to be statistically significant. Among current alcohol user, 64.9% had hypertension whereas 47.2% of those who were not current alcohol users had hypertension and this difference was statistically significant (Table 3).

Comorbidities

Diabetes mellitus was the most common, present either singly or in combination with other comorbidities. The prevalence of self-reported diabetes mellitus was 10.9%. Among the diabetics 72% were also hypertensives whereas among those who did not have diabetes 45.3% were hypertensive. This difference was found to be statistically significant (p<0.001) (Figure 2).

Awareness and control of hypertension

Among the total hypertensive subjects, the proportion of subjects who were aware of their hypertension was 128 (38.7%). Of the 128 known hypertensive subjects, 121 (94.5%) were under treatment for hypertension.

^b Based on self report.

However, of these 121 individuals, only 57 (47.1%) had blood pressure under control (<140/90). A similar analysis was done among the diabetic population. Of the total diabetic subjects, 54 (72%) had hypertension. Among them, 45 (83.3%) had taken treatment and of them, 24 (44.4%) had their blood pressure under control (Table 4).

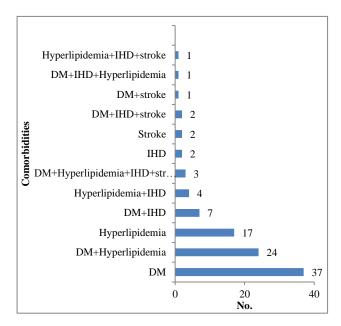


Figure 2: Co morbidities (self-reported) among the study population.

Multiple logistic regression analysis

Age, male sex, BMI, diabetes, current smoking, current alcohol consumption and family history of hypertension were found to be significant risk factors using univariate logistic regression analysis. Multiple logistic regression analysis was done to identify the risk factors for hypertension. Age, BMI, diabetes mellitus and family history of hypertension remained significant. The odds of getting hypertension increased by 4.2% for each year increase in age, whereas it was 8.6% for each unit (1 Kg/m²) increase in BMI. The odds of getting hypertension were 1.859 times higher in diabetics compared to non-diabetics. It was found that the odds of hypertension were 1.64 times more among those with family history of hypertension as compared to those who do not have family history of hypertension (Table 5).

DISCUSSION

The overall prevalence of hypertension in this study was 48.2%. This is similar to other reported literature from other parts of Kerala and coastal Karnataka. The percentage of individuals having hypertension was 36.6% in rural area of Kerala as reported by district level household survey (DLHS) IV in 2012-2013. The prevalence of hypertension in our sample was also higher than that reported from other parts of India. Most of the

studies report a prevalence ranging between 20%–30%. A12,13 The higher prevalence of hypertension in our study could be due to the faster epidemiological transition in Kerala compared to other Indian states. The difference in prevalence rates could also be due to different cut off points used in defining the level of hypertension and also differing age groups constituting the study population and the sample size.

The prevalence of hypertension increased with age, consistent with prior reports. ^{2,8,9,14-16} The higher prevalence noted among males was similar to other reported literature. Study by Mohan et al in "The Chennai urban rural epidemiology study" (CURES) in urban Chennai among 26,001 individuals aged >20 years, the prevalence of hypertension in men was 23.2% as compared to that of women 17.1%. ⁴ Yet another study on Risk factor profile for chronic non-communicable diseases in Thiruvananthapuram, males (30.9%) had higher prevalence of hypertension compared to females (26.8%). ¹⁷ In contrast, the prevalence of hypertension was almost equal in both sexes in other studies from Kerala. ^{10,14}

Isolated systolic hypertension was present in 32.6% of the subjects while isolated diastolic hypertension was present in 37.3% of the subjects. This was higher than that reported from the Chennai study, where isolated systolic and isolated diastolic blood pressure was present in 6.6% and 4.2% of the study population respectively. Systolic hypertension, due to hardening and loss of elasticity of the major arteries is an unavoidable consequence of aging and augmented by hypertension, in contrast to diastolic blood pressure which was thought to be a function of peripheral resistance. ¹⁸

Among the total hypertensive individuals in our study, only 38.7% were aware of the condition.

This awareness level is more than that found in the Chennai study (32.8%) but less than that reported from other literature. 4,13,15,19 A high proportion of those who were aware of hypertension was on treatment (94.5%) and among these 47.1% which represents only 17% of the total hypertensive group had adequate blood pressure control. Similar blood pressure control was reported by Mohan et al (15%) but was more than that reported by Anchala et al, 10.7%. 4,16 A high percentage of hypertensives, unaware (61%) of their condition may be due to adopting the earlier thresholds of 160/95 mmHg, instead of the 140/90 mmHg criteria to identify hypertension and also belief that a high blood pressure in the elderly is 'normal' for the age. This calls for health care providers as well as the community to be effectively informed that high blood pressure, while common, is by no means 'normal' in terms of risk in the elderly.²⁰

Prevalence of hypertension among diabetics was 72%. Coexistence of diabetes mellitus and hypertension was found to be very common in this study. Hypertension and

diabetes are closely linked, and one cannot be properly managed without attention to the other.³ Diabetes and hypertension is responsible for at least nearly 50% of all cases of Chronic Kidney Disease (CKD). Thus, if we concentrate on these 2 diseases only on a community basis for a prevention program for CKD, we may be able to prevent a large number of CKD cases.²¹

In the multivariate analysis body mass index, diabetes mellitus and family history of hypertension were significantly associated with hypertension. This was in conformity with studies done in India and abroad. 9,14,22,23

Blood pressure measurements taken during a single visit could overestimate the actual blood pressure, but due to resource constraints more visits could not be conducted. Person already diagnosed with diabetes was considered as diabetic and no screening test was applied to detect undiagnosed cases. Effective management of high blood pressure is possible when the magnitude of the problem is assessed. This study was conducted to quantify the problem of hypertension in the area, and future interventions are planned based on the existing level of the risk factor in the study population

A high prevalence of hypertension was observed in the rural population of North Kerala. It is dangerous to ignore high blood pressure, because this increases the chances of life-threatening complications to major organs such as the brain and kidneys. Subjects with hypertension were advised regarding appropriate medical care. Obesity, coexistence of diabetes mellitus and family history of hypertension could be some of the potential reasons for the high prevalence of hypertension seen in the area. Educational interventions, health checkup to get BP checked regularly and understand what it should be, lifestyle modifications like regular exercise to attain and maintain a healthy body weight, and healthy diet are recommended to reduce these factors. Also integrated programs at the primary care level for control of hypertension are to be implemented.

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Institutional Ethics Committee

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