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Determinants of hypertension among urban adult population in Kancheepuram district of Tamil Nadu

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ABSTRACT

Background: Hypertension affects approximately 1 billion people worldwide and around 7.1 million deaths per year (13% of the total) may be attributable to it. In India, the overall prevalence of raised blood pressure among adults aged 18 years and above was estimated to be 25.9% among males and 24.8% among females. Keeping in mind the growing burden of NCDs like hypertension, this study was conducted with the objective to estimate the prevalence of hypertension and its associated determinants so as to understand the gravity of the problem and to plan possible corrective measures.

Methods: This community based cross sectional study was done among adult population in an urban area in Kancheepuram district using a sample size of 1634 calculated based on the prevalence of a previous study. Probability Proportion to Size and simple random sampling method was used. A structured questionnaire was used to collect data and data analysis was carried out using SPSS version 15 by calculating appropriate percentages and strength of association of variables.

Results: This study results shows that the prevalence of pre – hypertension was 51.3% (males 54.2% and females 48.5%). Overall prevalence of stage I hypertension was 17.2% (males 20.2% and females 14.4%), stage II hypertension was 5.2% (males 6.3% and females 4.2%). A statistical significant association was found between hypertension and its associated determinants such as increasing age, gender (male predominance), history of diabetes mellitus and overweight/obesity (P value <0.05).

Conclusions: This study outcome shows that the prevalence of pre-hypertension and hypertension is high among the adult population. For non-communicable diseases like hypertension every level of preventive care plays a major role to bring about a healthy behaviour and lifestyle change among the population which in turn will help in reducing the morbidity and mortality due to cardiovascular diseases.

Keywords: High blood pressure, Pre-hypertension, Risk factor, Non communicable diseases

INTRODUCTION

Arterial blood pressure is defined as the force exerted by the blood on the wall of a blood vessel as the heart pumps (contracts) and relaxes. Systolic blood pressure is the degree of force when the heart is pumping (contracting) and the diastolic blood pressure is the degree of force when the heart is relaxed. Risk of illness and death are related to changes in blood pressure. There is no particular dividing line which indicates a person is definitely ill. This can be interpreted only by a physician in light of the total health picture of the individual.¹

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Usually high blood pressure (hypertension) is when the systolic blood pressure is 140 or more, and/or diastolic blood pressure is 90 or more. (Written as 140/90 mmHg). It is a condition in which the blood vessels have persistently raised blood pressure. Most of the time, high blood pressure does not cause symptoms. For most patients, high blood pressure (BP) is found when they visit their health care provider or have it checked elsewhere. Hypertension is the most common condition seen in primary care and leads to myocardial infarction, stroke, renal failure, premature mortality and disability if detected early and treated appropriately.² Hypertension is the most common cardiovascular disorder, posing a major Public Health challenge to the individual and the population in socio-economic and epidemiological transition and is a major risk factor for cardio vascular mortality.³

Hypertension affects approximately 1 billion people worldwide and around 7.1 million deaths per year (13% of the total) may be attributable to hypertension.⁴ In India, the rising trend in the consumption of processed food has led to a 24-30% prevalence of hypertension in urban areas, and 12-14% in rural areas. The overall prevalence of raised blood pressure among adults aged 18 years and above was 25.9% among males and 24.8% among females.⁵ The prevalence of hypertension increases with advancing age. As the population ages, the prevalence of hypertension will increase even further unless broad and effective preventive measures are implemented. The age standardised adjusted estimates for raised blood pressure was found to be 25.8%. Recent data from the Framingham Heart Study suggest that individuals who are normotensive at age 55 have a 90% lifetime risk for developing hypertension.

The relationship between BP and risk of Cardiovascular Disease (CVD) events is continuous, consistent, and independent of other risk factors. The higher the BP, the greater is the chance of heart attack, heart failure, stroke, and kidney disease. The increasing prevalence is attributed to growing population, non-modifiable risk factors such as ageing, familial tendency and behavioural risk factors. The modifiable behavioural risk factors include unhealthy diet, tobacco use, physical inactivity, obesity, diabetes, raised blood lipids and harmful consumption of alcohol. B

Hypertension is thus considered as a "silent killer" globally. High Blood pressure was chosen as the theme of the World Health Day 7th April 2013 to create a global awareness of its significance and high light the benefits of preventing and controlling high blood pressure among the masses in terms of reduced morbidity and mortality due to CVD's.⁹

Based on these epidemiological factors and the high morbidity and mortality related to hypertension, we have planned to conduct this study to estimate the prevalence of hypertension and its associated determinants in an urban area of Kancheepuram district, so as to understand the gravity of the problem and to plan possible corrective measures.

METHODS

Study design

This is a population based cross sectional study carried out in Anakaputhur, an urban area of Kancheepuram District of Tamil Nadu.

Study area and population

The study area for identifying the prevalence of hypertension is the catchment area of the Urban Health Training Centre attached to a Medical College, comprising a total population of 45,562. The study area comprise of 15 wards. The study population identified was any adult male or female in the age group of 20 to 60 years residing in the study area permanently at the time of the study.

Study period

This study was carried out during January to June 2016.

Sample size and sampling technique

The sample size for the study was calculated based on the prevalence of hypertension among a similar study population in Tamil Nadu which showed that about 31.2% of people had high BP.¹⁰ Using the formula [4 pq/L²], the sample size was calculated and rounded off to 1634 with a precision of 7.5% and refusal rate of 8%.

There are totally 15 wards in the study area. Out of the 15 wards, 5 wards were selected by simple random sampling. The population of each selected ward were 1464, 973, 863, 1029, 1261 which sum up to a total of 5,590. Subjects in each ward were selected using probability proportion to size sampling (PPS). The number of samples from each ward was calculated using the formula n/N*N1 where n = sample size (1634), N = population size (5590) and N1 is population in each strata. With this formula, the number of subjects calculated from each wards were 428, 284, 252, 301, 369 (total of 1634). From each of these wards, the required samples were selected by simple random sampling.

Inclusion and exclusion criteria

The inclusion criteria for the study were any adult male or female, who were apparently healthy looking and willing to participate in the study. The exclusion criteria for not including in the study were any adult who is not healthy looking and who is suffering from any form of severe illness.

Data collection

The data for this study was collected using a standardized pretested structured interview schedule, consisting of the socio-demographic particulars, history of diabetes mellitus [DM], cardio vascular diseases [CVD], smoking, alcoholism etc. Anthropometric measures like height and weight and clinical measurement of blood pressure twice after making the person to sit in an erect posture comfortably. Mercury sphygmomanometer was used for blood pressure measurement. As blood pressure values fluctuates within minutes and hence for obtaining the most accurate results, blood pressure was checked a second time, 3 to 5 minutes after first measurement and the average value calculated. The standard operative procedure was followed in BP recording to maintain a uniform standard and accuracy based on the "pulse and blood pressure procedures for household interviewers" recommended by CDC Atlanta and the recommendations suggested by Pickering et al.11

Operational definition

Blood-pressure classification

Normal adult blood pressure is defined as a systolic pressure less than 120 mm Hg and a diastolic pressure less than 80 mm Hg. Higher blood pressures are considered to indicate pre-hypertension and hypertension, which is also divided into stages, based on JNC-7 criteria (Table 1). 12

Table 1: Classification of blood pressure for adults based on JNC 7 recommendations.

| BP classification | SBP mm Hg | DBP mm Hg |
|-------------------------|-----------|-----------|
| Normal | <120 | <80 |
| Pre-hypertension | 120-139 | 80-89 |
| Stage 1 hypertension | 140-159 | 90-99 |
| Stage 2 hypertension | >160 | >100 |

SBP - systolic blood pressure; DBP - diastolic blood pressure.

Data analysis

All the data collected were entered into the structured questionnaire and had been counter checked by the Investigator for any data error. The data analysis was carried out using SPSS software version 15. The prevalence of hypertension and grades of hypertension were calculated using percentages. Strength of association (Odds ratio and 95% Confidence Interval) and Statistical significance (chi square test and p value) were tested to look for association between sociodemographic characteristics, nutritional status and comorbid conditions.

Ethical clearance and informed consent

The study was carried out after obtaining approval from the Institutional Ethical Committee. The participants were briefed about the study and informed consent was obtained prior to the data collection.

Support

All the materials, man power and other resources needed for conducting the study were provided by the Institution as part of the logistics support.

RESULTS

This study was conducted to estimate the prevalence of hypertension among adult population and also its associated determinants such as age, gender, history of DM, CVD, habits such as smoking, alcohol consumption and BMI. The findings are as follows.

Table 2: Distribution of various determinants of blood pressure among the study population.

| S. No | Characteristic | Frequency [N=1634] | % |
|----------|--|--------------------|------|
| 1 | Age (in years) | | |
| | <30 | 408 | 25 |
| | 31-45 | 508 | 31.1 |
| | 46-60 | 417 | 25.5 |
| | >60 | 301 | 18.4 |
| 2 | Sex | | |
| | Male | 799 | 48.9 |
| | Females | 835 | 51.1 |
| 3 | History of diabetes | | |
| | Present | 309 | 18.9 |
| | Absent | 1325 | 81.1 |
| 4 | History of hypertension | | |
| | Present | 317 | 19.4 |
| | Absent | 1317 | 80.6 |
| 5 | History of CVD | | |
| | Present | 48 | 2.9 |
| | Absent | 1586 | 97.1 |
| 6 | History of smoking | | |
| | Present | 178 | 10.9 |
| | Absent | 1456 | 89.1 |
| 7 | History of alcoholism | | |
| | Present | 177 | 10.8 |
| | Absent | 1457 | 89.2 |
| 8 | Body mass index | | |
| | Underweight (<18 | 615 | 37.6 |
| | kg/m ²) | | |
| | Normal (18-22.99 | 532 | 32.6 |
| | kg/m ²) | | |
| | Overweight (23-27.99 kg/m ²) | 373 | 22.8 |
| | Obese (>28 kg/m ²) | 114 | 7 |

Regarding the background characteristics of the study population, the mean age of the participants is 44.2±15.9 years. Females constituted 51.1% and 19.4% were known hypertensive. In this study, 18.9% had history of diabetes mellitus, 2.9% had history of any CVD, 10.9% were smokers, 10.8% were alcoholics and 22.8% were overweight (Table 2).

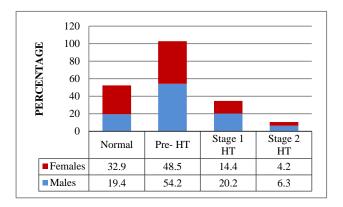


Figure 1: Prevalence of hypertension among the study population.

Regarding the prevalence of hypertension, 51.3% (males 54.2% and females 48.5%)were found to be pre – hypertensive, 17.2% were categorised as stage I

hypertension (males 20.2% and 14.4%) and 5.2% as stage II hypertension (males 6.3% and females 4.2%) based on their blood pressure measurement (Figure 1 and Table 1).

Regarding the association between hypertension and its risk factors, it was observed that 29.8% of participants above 45 years of age were hypertensive with an odds ratio of 2.2 (CI - 1.7 to 2.8). This association was statistically significant (p value <0.05). Among the study participants it was observed that 26.4% of males were hypertensive compared to 18.6% of females who were hypertensive with an odds ratio of 1.6 (CI - 1.2 to 1.9). There was statistical significant association between hypertension and gender (p value <0.05). Regarding the association between history of diabetes mellitus and hypertension, there was statistical significant association (p value <0.05). Among the participants, 28.8% of them had history of diabetes along with hypertension with an odds ratio of 1.5 (CI - 1.1 to 2.02). Regarding the BMI among study participants, 24.8% of overweight/obese individuals were hypertensive and this association was statistically significant (p value <0.05). The odds of being hypertensive were 1.4 times higher among obese/ overweight individuals. (CI – 1.08 to 1.7). Other risk factors were not statistically significant (Table 3).

| Table 3: Accord | ation between co- | morbidities/risk f | actors and h | vnortongion |
|------------------|-------------------|--------------------|--------------|--------------|
| Table 5: Associa | ation between co- | morbiallies/risk i | actors and n | vbertension. |

| S. No | Risk factor | N[1634] | Hypertension | Chi sq | P value | Odds ratio CI | |
|-------|-------------------------------------|---------|--------------|--------|---------|---------------|--|
| | Age (in years) | | | | | | |
| 1 | >45 | 773 | 230 (29.8%) | _ | | 2.2 | |
| | <45 | 861 | 136 (15.8%) | 45.6 | 0.0001* | 1.7-2.8 | |
| | Sex | | | | | | |
| 2 | Males | 799 | 211 (26.4%) | | | 1.6 | |
| | Females | 835 | 155 (18.6%) | 14.4 | 0.0001* | 1.2-1.9 | |
| | History of diabetes mellitus | | | | | | |
| 3 | Present | 309 | 89 (28.8%) | | | 1.5 | |
| 3 | Absent | 1325 | 277 (20.9%) | 8.9 | 0.003* | 1.1-2.02 | |
| | History of Cardio vascular diseases | | | | | | |
| 4 | Present | 48 | 13 (27.1%) | | | 1.3 | |
| | Absent | 1586 | 353 (22.3%) | 0.6 | 0.429 | 0.6-2.4 | |
| | History of smoking | | | | | | |
| 5 | Present | 178 | 44 (24.7%) | | | 1.1 | |
| | Absent | 1456 | 322 (22.1%) | 0.6 | 0.432 | 0.8-1.6 | |
| | History of alcoholism | | | | | | |
| 6 | Present | 177 | 40 (22.6%) | | | 1.01 | |
| | Absent | 1457 | 326 (22.4%) | 0.005 | 0.946 | 0.7-1.5 | |
| | Body Mass Index | | | | | | |
| | Overweight & obese | 905 | 225 (24.9%) | | | 1.4 | |
| 7 | Normal & underweight | 729 | 141 (19.3%) | 7.07 | 0.008* | 1.08-1.7 | |

^{*}statistically significant at 95% CI

DISCUSSION

Though National and State programs are implemented to create awareness and screen NCDs like hypertension, the

burden of hypertension still persists in the community. It's time to catch hold of the population who are in the pre hypertensive stage and do appropriate interventions to prevent them from getting hypertension in the future. The

diagnosed hypertensive individuals should be appropriately managed and should be in regular follow up. This study carried out among adult population in an urban area shows that hypertension is prevalent among them and the burden of pre-hypertension is more in the community.

In this study the overall prevalence of hypertension was found to be 22.4%. The results were comparable to several other studies conducted elsewhere. In a study done in Bangaldesh by Zaman et al the prevalence of hypertension was 21%. In another study done by Bhadoria et al the prevalence was 21.4% in an urban area in Madhya Pradesh. In a similar study done by Praveen et al in an urban area in Trichy, the prevalence was found to be 30.56%. A study by Gupta et al that reports the prevalence of hypertension to range between 20% to 40% among Indian adult population. Another study conducted in Kancheepuram district showed that about 15.8% women and 18.1% men had hypertension.

Pre-hypertension is a precursor of hypertension associated with increased risk of major cardiovascular events independent of other risk factors. In this study the prevalence of pre-hypertension, stage I and stage II hypertension were 51.3%, 17.2% and 5.2%. In a study by Bhadoria et al, the prevalence was 20.5%, 10.9% and 6.1% respectively. If In another study by Savitha et al, the prevalence of pre - hypertension among adult population was 26.8%. Similar study by Prathaje et al shows that 55% of adult population had pre - hypertension and 30% had hypertension. Hence detection of pre hypertensive individuals and counselling them on healthy lifestyle modifications have a vital role in preventing them from becoming hypertensive and further get affected by its complications.

Regarding the association between hypertension and its determinants such as age, this study reveals that as age advances (>45 years) the prevalence of hypertension also increases (29.8%). This association was statistically significant (p value = <0.05) with an odds ratio of 2.2. Another study by Ismail et al also shows a statistical significance between hypertension and increasing age. Blood pressure increases as age advances in both sexes. Along with the environmental influences and genetically programmed senescence in body systems, a high calorie intake of food and salt intake more than the required level also contributes to it.³

Regarding the association between hypertension and gender, it was observed that there was a statistical significant association (p value = <0.05). Among the study participants, 26.5% of males were hypertensive compared to 18.6% of females with an odds ratio of 1.6. In a study done by Praveen et al, hypertension was prevalent among 35% of males and 33% of females. Another study by Kumar et al reported that prevalence of hypertension was more in males (19.1%) compared to females (17.5%). The risk factors among men and

women differ in complex ways. The risk factors like smoking are common among males and obesity is common among females. These risk factors alone cannot completely explain the gender differences for hypertension. There are several other unknown behavioural and socio cultural factors that plays a major role in determining the gender differences for hypertension that needs further research.²²

Regarding the association between hypertension and its co morbidity such as diabetes mellitus, 28.8% of those who were hypertensive were diabetic also. This association was statistically significant (p value = <0.05) with an odds ratio of 1.5. Similar findings were seen in another study done by Shrestha et al. ²³ Metabolic factors like diabetes and obesity increase the risk of complications of hypertension like heart disease, stroke and renal failure. ⁸

In this study there was a statistical significant association between hypertension and BMI of more than 25 (p value = <0.05). Among the study subjects, 24.9% of them who were hypertensive were found to be either overweight or obese with an odds ratio of 1.4. Similar findings were seen in studies conducted by and Bhadoria et al and Galav et al. ^{14,24} As the individual tends to gain more weight, greater is the risk of increasing blood pressure. Central obesity is one of the direct correlates of high blood pressure.³

Hence population wide approaches for preventing non communicable diseases like hypertension should address other co-morbidities also and the basic diagnostic technologies required for addressing hypertension include accurate BP measurement devices, weighing scales, fasting blood sugar tests, blood cholesterols tests and urine albumin strips.⁸

CONCLUSION

In this study, the prevalence of pre-hypertension and hypertension is found to be high among the study population in the community. For non-communicable diseases like hypertension every level of care plays a major role. Parents and teachers play a major role in implementing primordial prevention among school children to prevent the emergence of risk factors such as reduced physical activities and intake of unhealthy foods. As hypertension has a familial tendency, tracking of blood pressure from childhood as a part of school health programme may be used to identify the individuals under risk (primary prevention) for non-pharmacotherapeutic interventions. Since age and gender are non-modifiable risk factors contributing to occurrence of hypertension, regular screening programs should be conducted for the target groups so as to identify them for appropriate interventions (secondary prevention). The individuals should be screened for co-morbidities also like diabetes and obesity at the same time. Tertiary prevention can be done by providing appropriate management and follow up for identified hypertensive patients so that complications affecting various systems in the body can be prevented.

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Ethical approval: The study was approved by the

Institutional Ethics Committee

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