Research Article

Awareness and sociodemographic factors of prehypertension among adult cases attending rural health training center of a medical college

Sumitra Nandlal Tambare[1], Malangori Abdulgani Parande[2]

[1]Medical Officer, District Training Center, Solapur, Maharashtra, India, [2]Department of Community Medicine, BJ Government Medical College, Pune, Maharashtra, India

Correspondence to: Malangori Abdulgani Parande, E-mail: drparandemalan@rediffmai.com

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ABSTRACT

Background: Prehypertension elevates the risk of cardiovascular disease and that of end-stage renal disease. The objectives of creating such a category in the classification were to increase awareness of the importance of identifying individuals in whom early intervention by the adoption of healthy lifestyles could lower blood pressure (BP) and thus decrease the rate of progression to hypertensive levels. **Objectives:** The objectives of the study were to determine the proportion and sociodemographic factors and other risk factors of pre-hypertension among the cases visiting Rural Health Training Centre (RHTC) of a Government Medical College, to know the awareness about prehypertension, and to create awareness among them. **Materials and Methods:** The present hospital-based cross-sectional study was conducted in RHTC of a Government Medical College from January to February 2015 (2 months). The sample size was 200. All patients 18 years and above visiting outpatient department of RHTC were enrolled in the study. Data were collected using a predesigned and a pre-tested questionnaire. **Results:** A total of 210 patients were enrolled in this study. Overall, 101 (48%) had pre-hypertension and 109 (52%) patient had normal BP levels. Increasing age, marital status, occupation, excess salt intake, lack of fruits and vegetables in the diet, addiction, lack of regular exercise, and the presence of obesity (as per body mass index) were significantly associated with pre-hypertension. No study subjects were aware of the concept of prehypertension. **Conclusion:** Our study highlights the high proportion of prehypertension. The study gives important information regarding various risk factors associated with prehypertension. Simple lifestyle modifications such as low intake of salt and inclusion of fruits and vegetables in the daily diet, quitting an addiction, and regular exercise decreases overall BP. Education regarding lifestyle and dietary practices at individual and family level are needed to bring about effective changes.

KEY WORDS: Awareness; Prehypertension; Sociodemographic Factors; Adult; Rural Health Training Center

INTRODUCTION

Raised blood pressure (BP), i.e., hypertension is one of the common, modifiable risk factors for cardiovascular disease (CVD).[1] It disproportionately affects populations in low and middle-income countries where health systems are weak.[2] More than 1 in three adults worldwide have high BP, with the proportion going up to one in two for people aged 50 and above. The number of people with high BP rose from 600 million in 1980 to 1 billion in 2008.[2] Worldwide, raised BP is estimated to cause 7.5 million deaths, about 12.8 % of the total of all annual deaths. This accounts for 3.7% of total DALYS.[3] The overall prevalence of hypertension and prehypertension in Southeast Asia Region from the studies was found to be 27% and 29.6%, respectively.[4] In India, the prevalence of hypertension has been estimated to be between 20% and 40%; higher in urban areas than in rural areas.[1,5] There is a social cost to this problem too. In some countries,

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money spent on CVD alone can be one-fifth of the total health expenditure. Yet, millions of people forgot seeking care for high BP in the early stages because they cannot afford it. The results are devastating for both families and health systems. Early death, disability, personal and household disruption, loss of income, a diminished workforce, and medical care expenditures take their toll on families, communities, and national health budgets.[6] Recognizing the importance of this, the World Health Organization had given a world health day theme on controlling high BP. High BP is both preventable and treatable. Increasing public awareness is key, as is access to early detection.

Behind the statistics, it is a silent killer that can affect anyone; people often have no symptoms, and many are not even aware of their high BP and the associated health risks. The result is that many go undiagnosed. Many who are diagnosed do not have access to treatment, or their conditions are poorly controlled. Self-care – meaning actions or behaviors each person can take in his or her daily life – also plays an important role.[7]

The Seventh Report of the Joint National Committee (JNCVII) on Prevention, Detection, Evaluation, and Treatment of High BP, introduced the new category of prehypertension, defined as systolic BP (SBP) of 120–139 mm Hg and/or diastolic BP (DBP) of 80–89 mm Hg.[8] Prehypertension elevates the risk of CVD and that of end-stage renal disease.[8] The objectives of creating such a category in the classification were to increase awareness of the importance of identifying individuals in whom early intervention by the adoption of healthy lifestyles could lower BP and thus decrease the rate of progression to hypertensive levels, to reduce the risk of CVD. An additional rationale for the use of this terminology was the greater likelihood of the affected individual to follow health-care recommendations.[9] Prehypertension is very commonly prevalent in the general population. A recent study from an affluent urban population in Southern India found a prevalence of prehypertension as 33.7%.[7] Among urban residents >18 years living in Chennai, the prevalence of prehypertension was reported as 47%. Prehypertension was highest in the age group of 30–39 years (36%). Lifestyle modifications that lower BP reduces morbidity and mortality associated with cardiovascular events and are recommended for all patients with prehypertension.[10]

Very few studies have been reported from rural areas of India about the proportion and sociodemographic factors of prehypertension. Estimation of prehypertension in patients attending the clinic for some other symptoms and sensitizing them at an early stage can help in preventing hypertension.[11] This study aims to sensitize these adult patients about the role of lifestyle modifications in CVD so that they can benefit themselves. Hence, the present study was planned on prehypertension to know its proportion and associated risk factors as well as to create the awareness on the importance of lifestyle modifications among the adult patients visiting Rural Health Training Centre (RHTC) of a Government Medical College.

Objectives

The objectives are as follows:
1. To determine the proportion of prehypertension among the cases visiting RHTC of a Government Medical College.
2. To find out sociodemographic factors and other risk factors associated with prehypertension.
3. To know the awareness about prehypertension and to create awareness among them.

MATERIALS AND METHODS

The present hospital-based cross-sectional study was conducted in RHTC of a Government Medical College in Western Maharashtra. Total population under RHTC is 34,000. Specialist outpatient department (OPD) has been run by the specialists from tertiary care hospital of the Government Medical College on first Thursday of every month. The study was conducted from January to February 2015 (2 months). Based on a study of prehypertension in a rural area of Andhra Pradesh,[12] the sample size was calculated by considering the prevalence of prehypertension 30.1%, confidence level 95%, and absolute precision 7% and it was 165 and is rounded off to 200. All patients 18 years and above visiting OPD of RHTC were enrolled in the study. Daily adult OPD attendance of RHTC was 60–80 patients per day. By simple random sampling daily 4–5 patients were selected after taking written informed consent. The study was approved by the Institutional Ethics committee (IEC).

Inclusion Criteria

All patients ≥18 years attending OPD of RHTC and willing to participate in the study were included in the study.

Exclusion Criteria

The following criteria were excluded from the study:
1. Pregnant women.
2. Acutely ill.
3. Not willing to participate.
4. Diagnosed cases of hypertension who are taking antihypertensive treatment.

Data were collected using the following data collection tools:
1. A predesigned and a pre-tested questionnaire – it included the information of the patients regarding sociodemographic profile, i.e. age, sex, type of family, total family income, education, occupation, and marital status. It also included information about past or family

history of hypertension, diabetes mellitus, and CVD. The information about associated risk factors such as tobacco consumption, smoking, and alcohol intake was assessed. Dietary and physical activity assessment was done.
2. Clinical examination.
3. Anthropometric measurements by the use of electronic weighing scale, measuring tape.
4. Mercury sphygmomanometer, stethoscope.

Clinical examination

Clinical examination was done for anthropometric measurements such as weight, height, waist circumference, hip circumference, body mass index (BMI), and waist-hip ratio. Vital parameters, general health examination, systemic health examination, and BP examination were done. The selected patients were interviewed by trained residents, clinical examination and anthropometric measurements were done by trained interns with the help of residents working there.

Definitions and measurements used in study measurement of BP

BP readings were taken by a single observer for every patient with the same mercury sphygmomanometer throughout the study (Diamond, Industrial-Electronic and Allied Products, Pune). After taking informed consent from participants, total two readings were performed on each participant at 3 min interval in sitting position. Similarly, two readings were taken. The lowest reading is used for analysis purpose. When SBP and DBP fall into different categories, the higher category was selected to classify individual's BP. The readings are made of the close 2 mm of Hg mark on the scale.

Case definition of prehypertension

Prehypertension, i.e., SBP between 120 and 139 and/or DBP between 80 and 89 mm Hg were diagnosed as per the Seventh Report of the JNC (JNC VII) on Prevention, Detection, Evaluation and Treatment of High BP.[13]

Statistical Analysis

Microsoft Excel was used for data entry. Chi-square test has been used to test the significance of the proportion of prehypertension in association with various sociodemographic factors. The odds ratio (OR) along with confidence intervals has been used to find the strength of the relationship of various factors associated between prehypertensive and normotensive. Statistical software, namely epi-info version 7 was used for analysis of the data.

Awareness regarding prehypertension was assessed among the participants and to create awareness in prehypertensive cases health education was given.

All patients are educated regarding the good and harmful lifestyle factors and are counseled to quit harmful habits. They were educated about the regular exercise, adverse effect of excess salt in diet, etc. Health education was given by the principal investigators and trained interns in the local language and with the help of IEC material.

RESULTS

During the 2 months period, a total of 258 subjects were examined and 48 (18.6%) were diagnosed as new hypertensive and were referred to specialist care to the physician while 210 patients were enrolled in this study for further analysis.

Table 1 shows the distribution of study subjects according to sociodemographic characteristics. The ages of subjects were in the range of 18–80 years. Mean age of study subjects is 49.4 ± standard deviation 16.28 years. Out of 210 subjects, 111 (52.9%) were males and 99 (47.1%) were females. The mean age of the study subjects was 48.68 ± 16.79 for males and 50.61 ± 15.69 for females. Majority 208 (99.0%) subjects were from rural area. Furthermore, most of the subjects were Hindu by religion, i.e., 193 (91.9%) and 17 (8.1%) were Muslim and others as Jain, Christian.

Table 1: Sociodemographic profile of study subjects

Sociodemographic factors	*n*=210 (%)
Age in (years)	
<40	87 (41.4)
≥40	123 (58.6)
Sex	
Male	111 (52.9)
Female	99 (47.1)
Religion	
Hindu	193 (91.9)
Muslim and others	17 (8.1)
Marital status	
Married	177 (84.3)
Unmarried/divorced/widow/ widower	33 (15.7)
Education	
Illiterate and primary	90 (42.9)
≥Secondary	120 (57.1)
Occupation	
Working	110 (52.4)
Nonworking	100 (47.6)
Socioeconomic status	
Upper class (upper, upper middle, middle)	115 (54.8)
Lower class (lower middle, lower)	95 (45.2)
Type of family	
Nuclear	69 (32.9)
Joint/three generation	141 (67.1)

In all, 177 (84.3%) were married and 18 (8.5%) subjects were widow, divorcee, and separated. 15 (7.2%) were unmarried. Of the total subjects, 90 (42.9%) were illiterate or had some formal education up to primary. The subjects having secondary or more education were 120 (57.1%). Only 24 (11.4%) subjects were educated up to graduation or more. More than half were working 110 (52.4%) and out of this only 7 (3.3%) subjects were engaged in the semi-professional or professional occupation. Majority of subjects, i.e., 141 (67.1%) were living in a joint family or three generations. Majority belongs to upper SES class, i.e., 115 (54.8%).

Overall, 101 (48%) had prehypertension and 109 (52%) patient had normal BP levels [Figure 1].

Univariate analysis on factors associated with prehypertension, increasing age, marital status, occupation, type of family, excess salt intake, lack of fruits and vegetables in the diet, addiction, lack of regular exercise, and the presence of obesity (as per BMI and as per waist-hip ratio) was significantly associated with prehypertension. All those factors found that significant on univariate analysis was entered into the binary logistic regression model and except the type of family and central obesity (as per waist-hip ratio), all above-mentioned factors were found significant. Unadjusted and adjusted ORs are depicted in Table 2. The extent and strength of association were found to be similar to unadjusted and adjusted ORs.

Awareness of Prehypertension

In this study, we observed that no study subjects were aware of the concept of prehypertension. This was a new concept for them. The proportion of prehypertensive was 48.0% and none of them were aware of their BP had raised. Awareness was created in these study subjects on a fixed day with the help of health education. They were made aware of the importance of regular screening, salt restriction in diet, stress management, weight control, and regular exercise.

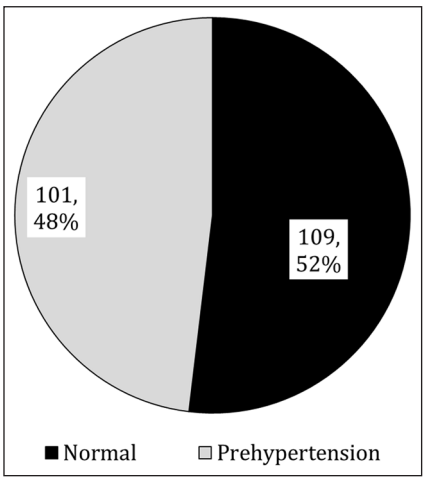

Figure 1: Proportion of prehypertension among the cases visiting Rural Health Training Centre of a Government Medical College

DISCUSSION

Prehypertension is likely to be important contributors to the epidemic of CVD and other complications of hypertension in the future. The current study showed the proportion of prehypertension to be 48%. Risk factors were analyzed with respect to the presence of normotension and prehypertension. Various risk factors such as increasing age, marital status, occupation, type of family, excess salt intake, lack of fruits and vegetables in the diet, addiction, lack of regular exercise, and presence of obesity (as per BMI and as per waist-hip ratio) were found to have significant association on univariate analysis. All these factors were entered into the binary logistic regression model and except the type of family and central obesity (as per waist-hip ratio), all above-mentioned factors were found significant. In this study, we observed that no study subjects were aware of the concept of prehypertension. This was a new concept for them. The proportion of prehypertensive was 48.0% and none of them were aware of their BP had raised. Awareness was created in these study subjects on a fixed day with the help of health education. They were made aware of the importance of regular screening, salt restriction in diet, stress management, weight control, and regular exercise.

Prehypertension is considered as a starting point for the cardiovascular and several other morbidities. However, it is a relatively less explored area in terms of prevention and management. This study documents a high proportion of prehypertension among the adult subjects attending RHTC. In a study done in the rural area of Andhra Pradesh demonstrated the prevalence of prehypertension to be 30.1%.[12] In a study among the urban population of North India demonstrated the prevalence of hypertension to be 31%.[14] A study in a rural population in Assam demonstrated the prevalence to be 54%.[15] Few other studies have demonstrated the prevalence of prehypertension to be >40%.[15,16] It is a cause for worry as these individuals are at high risk of progressing to hypertension and CVD in the future life. Data from NHANES II from the United States revealed that 90% of individuals with prehypertension had one or the other cardiovascular risk factor.[17] Studies from India have also indicated that increasing age, BMI, waist-hip ratio, and impaired glucose tolerance/diabetes were independent risk factors for prehypertension.[15,16] Similarly in this study, most of the individuals with prehypertension had one or the other risk factor such as extra salt intake, overweight, alcohol consumption, and others. In this study, age >40 years were had 2.92 (1.06–8.04) times more risk of developing prehypertension than individuals <40 years. The BP and the prevalence of prehypertension have consistently increased with age all over the world. Due to the aging process, atherosclerotic changes occur in the blood vessels which in combination with other factors may contribute to this. Madhukumar *et al.* also depict that

Table 2: Univariate and multivariate analyses (logistic regression) of determinants of prehypertension

Determinants of prehypertension	Total	Normotension (*n*=109)	Prehypertension (*n*=101)	OR (unadjusted) (95% CI)	OR (adjusted) (95% CI)	*P* value
Age in years (year)						
<40	87 (41.4)	56 (64.4)	31 (35.6)	Ref	2.92 (1.06−8.04)	0.03
≥40	123 (58.6)	53 (43.1)	70 (56.9)	2.38 (1.35−4.20)		
Sex						
Male	111 (52.9)	54 (48.6)	57 (51.4)	1.15 (0.86−1.53)	-	0.617
Female	99 (47.1)	55 (55.6)	44 (44.4)	Ref		
Religion						
Hindu	193 (91.9)	101 (52.3)	92 (47.7)	Ref	-	0.584
Muslim and others	17 (8.1)	8 (47.1)	9 (52.9)	1.23 (0.45−3.33)		
Marital status						
Married	177 (84.3)	98 (55.4)	79 (44.6)	Ref	4.29 (1.40−13.15)	0.02
Unmarried/ divorced/widow/ widower	33 (15.7)	11 (33.3)	22 (66.7)	2.48 (1.13−5.42)		
Educational status						
Illiterate and primary	90 (42.9)	41 (45.6)	49 (54.4)	0.64 (0.36−1.10)	-	0.868
≥Secondary	120 (57.1)	68 (56.7)	52 (43.3)	Ref		
Occupation						
Working	110 (52.4)	48 (43.6)	62 (56.4)	2.02 (1.16−3.50)	2.62 (1.10−6.23)	0.02
Nonworking	100 (47.6)	61 (61.0)	39 (39.0)	Ref		
Socioeconomic status						
Upper class (upper, upper middle, middle)	115 (54.8)	60 (52.2)	55 (47.8)	Ref	-	0.249
Lower class (lower middle, lower)	95 (45.2)	49 (41.6)	46 (58.4)	0.97 (0.56−1.68)		
Type of family						
Nuclear	69 (32.9)	47 (68.1)	22 (31.9)	Ref	2.40 (0.95−6.12)	0.06
Joint/three generation	141 (67.1)	62 (44.0)	79 (56.0)	2.72 (1.48−4.98)		
H/O other chronic diseases						
Yes	31 (14.8)	16 (51.6)	15 (48.4)	0.98 (0.46−2.11)	-	0.619
No	179 (85.2)	93 (52.0)	86 (48.0)	Ref		
Family H/O hypertension						
Yes	28 (13.3)	16 (57.1)	12 (42.9)	1.14 (0.72−1.79)	-	0.692
No	182 (86.7)	93 (51.1)	89 (49.9)	Ref		
H/O excess salt intake						
Yes	105 (50.0)	43 (41.0)	62 (59.0)	2.44 (1.40-4.25)	4.07 (1.65-	0.002
No	105 (50.0)	66 (62.9)	39 (37.1)	Ref	10.04)	
H/O fruits and vegetables in diet						
Yes	107 (51.0)	84 (78.5)	23 (21.5)	0.08 (0.04-0.16)	0.08 (0.03-	<0.000
No	103 (49.0)	25 (24.3)	78 (75.7)	Ref	0.23)	1
Addiction						
Yes	101 (48.1)	43 (42.6)	58 (57.4)	2.07 (1.19−3.59)	2.73 (1.18−	0.01
No	109 (51.9)	66 (60.6)	43 (39.4)	Ref	6.31)	

(Contd...)

Table 2: ***(Continued)***

Determinants of prehypertension	Total	Normotension (n=109)	Prehypertension (n=101)	OR (unadjusted) (95% CI)	OR (adjusted) (95% CI)	P value
Type of work						
Heavy	59 (28.1)	34 (57.7)	25 (42.3)	Ref	-	0.175
Moderate	59 (28.1)	29 (49.2)	30 (50.8)	1.40 (0.68−2.90)		
Sedentary	92 (43.8)	46 (50.0)	46 (50.0)	1.36 (0.70−2.62)		
Regular exercise						
Yes	53 (25.2)	35 (66.0)	18 (34.0)	0.45 (0.24-0.87)	0.18 (0.05-	0.003
No	157 (74.8)	74 (47.1)	83 (52.9)	Ref	0.55)	
Type of diet						
Vegetarian	91 (43.3)	48 (52.7)	43 (47.3)	Ref	-	0.273
Mixed	119 (56.7)	61 (51.3)	58 (48.7)	0.96 (0.79−1.33)		
Obesity						
Yes	72 (34.3)	24 (33.3)	48 (66.7)	3.20 (1.76−5.83)	3.15 (1.27−7.84)	0.01
No	138 (65.7)	85 (61.6)	53 (38.4)	Ref		
Waist-hip ratio						
Central obesity present	70 (33.3)	29 (41.4)	41 (58.6)	1.88 (1.05-3.37)	1.94 (0.82−4.59)	0.12
Normal	140 (66.7)	80 (57.1)	60 (42.9)	Ref		
Practice of meditation						
Yes	24 (11.4)	14 (58.3)	10 (41.7)	Ref	-	0.535
No	186 (88.6)	95 (51.1)	91 (48.9)	1.17 (0.71−1.92)		

the proportion of prehypertension increased significantly by age.[5] Similar to other studies, prehypertensive subjects had increased salt intake. It is well-recognized that higher salt intake is associated with higher BP and a reduction in salt intake lower BP.[5,16,17,18]

It might be due to the fact that excess salt in the diet causes water retention which releases a digitalis-like substance that increases the contractile activity of heart and blood vessels. Another is that the sodium itself penetrates the vascular smooth muscle cell, causing it to contract. This "salt sensitive" group of patients will definitely respond to salt restricted diet hence advised less salt in the diet. In the dietary approaches to stop hypertension trial, the diet emphasizing fruit and vegetable intake significantly reduced BP. In this study, lack of fruits and vegetables in daily diet had a significant association with prehypertension ($P < 0.001$). Fruits and vegetables are high in potassium, magnesium, and fiber, and they are low in sodium which helps to balance out the negative effects of salt. In a study conducted in Maharashtra found an association of addiction (alcohol and tobacco) with prehypertension.[19] This study also showed an association with addiction. It was said that some people commit suicide by drowning and many by smoking. The ingredient carbon monoxide induces atherogenesis; nicotine stimulation of adrenergic drive raises BP while alcohol consumption increases the risk of systolic BP. Regular physical activity is commonly recommended as an important lifestyle modification that may aid in the prevention of hypertension. This study demonstrates an association between lack of physical activity and prehypertension. Other studies supported these findings.[5,16-18] Regular physical exercise itself reduces the weight of patients, reduces BP levels, and increases protective high-density lipoprotein (HDL) levels in the blood. Our study showed that those who were obese as per BMI had significantly higher levels of prehypertension, similar to the findings of other studies. [5,15-17] Being overweight causes high BP because the more you weigh, the more blood that needs to supply oxygen and nutrients to your body and it increases BP. This study showed that quiet higher proportion of pre hypertensives was availing the health services and they did not at all know anything about prehypertension. This was the opportunity for the health services to identify such cases and suggest them lifestyle modifications.

Limitations of the Study

First, BP measurements were taken on a single day and did not repeat again for

- practical reasons. Hence, we may have overestimated prehypertension.
- Second, various other factors such as biochemical markers such as triglyceride, HDL, and hyperuricemia are not evaluated which are known to influence prehypertensive status.

- Third, this was a hospital-based study conducted on small sample size.

CONCLUSION

Our study highlights, the high proportion of prehypertension among the cases visiting RHTC of a Government Medical College. The study gives important information regarding various risk factors associated with prehypertension such as increasing age, excess salt intake, lack of fruits and vegetables in the diet, addiction, lack of regular exercise, and the presence of obesity. Simple lifestyle modifications such as low intake of salt and inclusion of fruits and vegetables in the daily diet, quitting an addiction, and regular exercise decreases overall BP. Education regarding lifestyle and dietary practices at individual and family level is needed to bring about effective changes.

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