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Research Article

Hypertension and associated risk factors in some selected rural areas of Bangladesh

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ABSTRACT

Background: Although, Bangladesh has the ninth highest rate of age-standardized rates of deaths due to chronic diseases, mostly due to cardiovascular diseases and diabetes. There is scanty literature on the estimated burden, and the determinants of hypertension in the rural areas of Bangladesh.
Methods: This facility based cross-sectional survey was conducted at sub-urban field research clinic from four unions of Araihazar upazilla of Narayangong district, Bangladesh. The analyses were based on 212 male and female respondents of more than 30 years of age. The prevalence of hypertension was the main outcome of interest.
Results: The study found that the prevalence of systolic hypertension among the respondents is 15.6% and that of diastolic pressure is 12.3%. Systolic pressure was found in an increasing manner with the increase of age and BMI. Tendency of increase systolic pressure was observed among those who took extra salt. Significant association was also found between increasing systolic pressure with the heart disease. No significant association was found between increasing systolic pressure with smoking habit, physical activity and vegetable intake and with the development of systemic diseases namely cardiovascular disease (CVD), diabetes mellitus and coronary obstetrics pulmonary disease.
Conclusion: Suggestion on regular periodical health check-up especially including blood pressure monitoring and restriction of taking extra salt to all the people of age more than 30 years is recommended.

Keywords: Hypertension, BMI, Salt intake, Heart disease, Bangladesh

INTRODUCTION

Hypertension is an important worldwide public-health challenge because of its high frequency and concomitant risks of cardiovascular and kidney disease.[1,2] It has been identified as the leading risk factor for mortality, and is ranked third as a cause of disability-adjusted life-years.[3] In 2002, the number of people worldwide afflicted with hypertension was about 600 million.[4] Hypertension is estimated to cause of 7.1 million deaths annually, which accounts for 13.0% of the total global deaths. This also accounts for 57 million Disability Adjusted Life Years (DALYS) or 3.7% of total DALYS.[4]

Bangladesh is in the midst of an epidemiologic transition. This country is starting to observe a shift in the major causes of death from mainly infectious diseases and nutritional deficiencies to those due to chronic diseases. The scant population-based data available indicate that the prevalence of hypertension in Bangladesh is

increasing, from less than three percent in 1975 to 9.0% in 1994.[5] However, more recent data is lacking. A recent Lancet review reported that 23 countries accounted for about 80.0% of the total burden of chronic diseases mortality in developing countries.[6] Amongst these 23 countries, Bangladesh is the ninth highest rate of age-standardized rates of deaths due to chronic diseases, mostly due to cardiovascular diseases and diabetes.

Moreover, in Bangladesh, about 85.0% of total population lives in villages. They are not interested to go to physicians when they become sick due to their poor socio-economic condition, life style as well as due to lack of awareness.[7] Therefore in villages undetected and untreated hypertensive patients are more. The proportion of hypertension among rural population is still undetected though this has strong impact on physical, mental and social burden. Increasing evidences in various international settings[8-15] have identified various socio-demographic, dietary, and life style related risk factors among hypertension patients. However, limited research carried out in Bangladesh, a country where highest rate of deaths occur due chronic diseases.

A rural community based survey in Bangladesh was conducted in the early 1990s in Dohar, Dhaka[16] among 1005 subjects >15 years of age, which revealed prevalence of hypertension (SBP ≥140 mmHg) was 10.5% with diastolic blood pressure (DBP >90 mmHg) was 9.0%. Another cross-sectional survey of 240 individuals was carried out of some selected urban areas of Bangladesh[17] to determine the prevalence and correlates of hypertension among the elderly population. This study revealed the prevalence of hypertension was 74.6%. There is therefore scanty literature on the estimated burden, and the determinants of hypertension in the rural areas of Bangladesh. Prompted by this relatively high prevalence of hypertension among outpatients, combined with the fact that currently there is limited information on the prevalence and determinants of hypertension in Bangladesh, we conducted a study to determine the prevalence, and identify factors associated with hypertension among patients attending rural health centre in Bangladesh.

METHODS

Study settings and participants

This data was collected from "Health Effects of Arsenic Exposure Longitudinal Study (HEALS)" field research clinic and participants were from four unions namely Fatehpur, Bhrammondi, Duptara, and Araihazar of Araihazar upazilla of Narayangong district, 25 km away from Dhaka city, Bangladesh. As of the 2001 Bangladesh census, Araihazar has a population of 331566.[18] Males constitute are 51.7% of the population, and females 48.3%. Araihazar has an average literacy rate of 37.4% (7+ years), and the national average of 48.8% literate.[18] The upazila consists of 12 unions, 182 mauzas, and 317 villages. The average population of each union, mauza and village are 27631, 1822, and 1046 respectively.

This facility based cross-sectional survey was carried out during September to December of 2009. Information was collected from 212 male and female of more than 30 years of age. Respondents who were physically and mentally handicapped were excluded. With a 95% Confidence Interval (CI) and a precision of 5%, and assuming prevalence of hypertension 15% the calculated sample size was 196. After increased the sample size was 212 by assuming 8% non-response rate. After subjects provided informed consent for participation in the study, we interviewed for 30 to 45 minutes using a pre-coded questionnaire.

The purpose of asking each question was explained to them, and they were told about the scope of the survey and the manner in which the answers were to be considered. From each respondent, the survey collected socio-demographic information on age, gender, occupation, religion, income, and housing type. Life style and dietary related information such as type of physical activity, vegetable consumption, extra dietary salt intake, and smoking habit was collected. Medical histories of some systemic diseases were also collected.

Outcome measures

The blood pressures was measured in the left arm with the respondent relaxed and in comfortable and sitting position using the following procedure: i) the sphygmomanometer cuff was wrapped around the upper arm with the inflation bag placed over the brachial artery; ii) the cuff was inflated until the arterial pressure exceeds and the radial pulse no longer palpable; iii) the diaphragm was positioned over the brachial artery just below the cuff; and iv) the cuff pressure was slowly reduced until sounds (Korotkoff sounds) could be heard. This was measures as the systolic blood pressure in mm of Hg. The pressure was then allowed to fall further until the Korotkoff sounds become suddenly muffled. The pressure was allowed to fall still further until the sounds disappeared. This was measured as the diastolic blood pressure in mm of Hg.

The total procedure was done following 10 minutes of rest, three readings was taken with approximately 3 minutes intervals between each measurement, and of the two closely matching measurements averaged systolic the and diastolic pressures were taken as systolic and diastolic blood pressures of the participants.

Explanatory variables

The variables included as possible determinants of hypertension were: age (≤40 years, 41-50, 51-60, and ≥61 years); sex (male versus female); religion (Muslim versus non-Muslim); occupation was categorized as daily labor, farmer, factory workers, housewife, business,

unemployed, retired, and others; housing condition (pacca, semi pacca, or kacha); monthly income (1500-3000, 3000-5,000, 5000-10000, or ≥10001 BDT). Body Mass Index (BMI) expressed in kg/m^2: underweight (<18.5), normal weight (≤18.5-24.9), overweight (25-29.9), and obese (≤30). Participant's height was measured using a measuring tape which was fixed vertically to a smooth wall with the zero keeping exactly 30 cm above the floor level measured height. The height was recorded in standing position of the participants without foot wear, feet together, knees straight and heels, buttocks and shoulder blades in contact with the vertical wall.

A bathroom weighing scale was weight of the participant. The participant was requested to stand on the weighing scale with minimum clothing, without shoes, any weight in hand or touching or catching other things. Several dietary and life style related determinates were included: smoking habit (no versus yes); physical activity (mild, moderate, or vigorous); vegetarian (no versus yes); and extra salt consumption (no versus yes). Binary variables were also created for each of the systematic diseases: heart disease, Cardiovascular Disease (CVD), Diabetes Mellitus (DM), and Chronic Obstructive Pulmonary Disease (COPD).

Statistical analysis

Prevalence estimates of both systolic and diastolic blood pressure were calculated for the total sample of participants. Socio-demographic, life style, systematic diseases, and distary differences in blood pressure measurement were assessed by $\chi 2$ analyses; significance for all analyses was set at $P < 0.05$. SPSS (Statistical Package for the Social Sciences) 18.0 software (Chicago, Illinois, USA) was used for data entry and statistical analyses. Before interviews, written informed consent was obtained from the participants about their willingness to participate in the study. The privacy and confidentiality were strictly maintained during data collection.

Ethical approval

Data collection for this study was approved by the institutional review board of State University of Bangladesh, Bangladesh. The approval number is 1123. The data was collected using "Health Effects of Arsenic Exposure Longitudinal Study" (HEALS) study research clinic. The HEALS was reviewed and approved by Bangladesh Medical Research Council (BMRC) and institutional review board of Columbia University, USA. All participants were asked to provide verbal informed consent after being read information about this study.

RESULTS

From the total sample population, a major part (46.2%) was between 41 to 50 years of age, and approximately 95.0% were Muslims (Table 1). By gender majority 52.8% respondents were female and rest 47.2% were male. Regarding their occupational status, 53.3% were housewives, 12.3% were engaged in agricultural work, and 13.2% were with business.

Table 1: Socio-demographic and life style, and blood pressure related characteristics of the respondents (n=212).

Characteristics	Frequency (n)	Percentage (%)
Age, years		
≥40	10	4.7
41-50	98	46.2
51-60	67	31.6
≥61	37	17.5
Sex		
Male	100	47.2
Female	112	52.8
Religion		
Muslim	201	94.8
Hindu	11	5.2
Occupation		
Daily labor	7	3.3
Farmer	26	12.3
Factory worker	6	2.8
Housewife	113	53.3
Business	28	13.2
Unemployed	14	6.6
Retired	6	2.8
Others	12	5.8
Housing condition		
Pacca	17	8.0
Semi pacca	57	26.9
Kacha	138	65.1
Monthly income, BDT		
1500-3000	38	17.9
3000-5000	62	29.2
5000-10000	85	40.1
≥10001	27	12.7
BMI[a]		
Underweight	54	25.5
Normal	111	52.4
Overweight/obese	47	22.2
Systolic pressure		
Less than 120 mm of Hg	145	68.4
120 - 139 mm of Hg	33	15.6
More than 140 mm of Hg	34	16.0
Diastolic pressure		
80 or less mm of Hg	141	66.5
81 - 89 mm of Hg	26	12.3
More than 90 mm of Hg	45	21.2

Note. BMI = body mass index (defined as weight in kilograms divided by the square of height in meters); [a]BMI categories were thin (<18.5), normal (18.5-24.9), or overweight-obese (≥25)

From the total sample population, 65.1% living in kacha house, followed by 26.9% in semi pacca house and rest 8.0% in pacca house (Table 1). A major portion respondent's (40.1%) monthly income was BDT 5000-10000.

Regarding nutritional status, 52.4% of the women were considered to be of normal weight, 25.5% were undernourished or thin (BMI <18.5), and 22.2% were overweight or obese (BMI ≥25) (Table 1). Among the respondents majority 58.4% had systolic pressure less than 120 mm of Hg, 16.0% had systolic pressure 120 to 139 mm of Hg, and the rest 15.6% had more than 140 mm of Hg. A substantial percentage of the respondents (66.5%) had diastolic pressure less than 80 mm of Hg, 21.2% had diastolic pressure more than 90 mm of Hg, and the rest 12.3% had 81 to 89 mm of Hg (Table 1).

The bivariate analyses revealed significant differences in the prevalence of hypertension across various socio-demographic and dietary groups (Table 2).

Specifically those who took extra salt, significantly, of those participants had a higher tendency of increased systolic pressure. Those respondents were of 40 years and below all of them had systolic pressure less than 120 mm of Hg, while systolic pressure was found more than 140 mm of Hg in an increasing manner with the increase of age (Table 2).

Significant association was observed with development of hypertension with heart disease (P <0.05). Increasing of systolic pressure was observed among the respondents with increase of BMI but statistically the difference was not found statistically significant (P >0.05) (Table 2).

Table 2: Descriptive statistics, according to socio-demographic, lifestyle, BMI, dietary, and systematic diseases with systolic blood pressure (n=212).

Characteristics	Less than 120 mm of Hg	120 - 139 mm of Hg	More than 140 mm of Hg	χ^2, P value
Age, years				
≥40	10 (100.0)	0 (0.0)	0 (0.0)	11.193, 0.043
41-50	72 (73.5)	11 (11.2)	0 (0.0)	
51-60	43 (64.2)	12 (17.9))	15 (15.3)	
≥61	20 (54.1)	10 (27.0)	12 (17.9)	
BMI[a]				
Underweight	44 (81.5)	4 (7.4)	6 (11.1)	8.356, 0.079
Normal	75 (67.6)	18 (16.2)	18 (16.2)	
Overweight/obesity	26 (55.3)	11 (23.4)	10 (21.3)	
Taking extra salt				
No	51 (55.4)	17 (18.5)	24 (26.1)	15.112, <0.001
Yes	94 (78.3)	16 (13.3)	10 (8.3)	
Smoking habit				
No	115 (66.1)	28 (16.1)	31 (17.8)	2.840, 0.242
Yes	30 (78.9)	5 (13.2)	3 (7.9)	
Physical activity				
Mild	83 (692.9)	23 (17.4)	26 (19.7)	7.109, 0.130
Moderate	51 (75.0)	10 (14.7)	7 (10.3)	
Vigorous	11 (91.7)	0 (0.0)	1 (8.3)	
Vegetarian				
Non-vegetarian	21 (61.8)	7 (20.6)	6 (17.6)	0.982, 0.612
Vegetarian	124 (69.7)	26 (14.6)	28 (15.7)	
Systematic disease				
Heart disease	11 (45.8)	6 (25.0)	7 (29.2)	6.471, 0.039
CVD	4 (50.0)	1 (12.5)	3 (37.5)	2.849, 0.241
DM	11 (55.0)	4 (20.0)	5 (25.0)	1.964, 0.374
COPD	20 (76.9)	2 (7.7)	4 (15.4)	1.503, 0.472

Note. BMI = body mass index (defined as weight in kilograms divided by the square of height in meters); [a]BMI categories were thin (<18.5), normal (18.5-24.9), or overweight-obese (≥25)

Notably, no significant differences were observed between increasing systolic pressure and smoking habit, with types of physical activity, and with vegetable intake. In addition, no significant association was observed between increasing systolic pressure and Cardiovascular Disease (CVD), Diabetes Mellitus (DM), and Coronary Obstetrics Pulmonary Disease (COPD) (Table 2).

DISCUSSION

Findings of this study revealed that 15.6% of the participants were suffered from systolic hypertension and 12.3% from diastolic pressure in the selected rural areas of Araihazar upazilla of Narayangong district, Bangladesh. The prevalence of hypertension based on the current survey was considerably higher than what has been reported in previous study conducted in other rural areas of Bangladesh.[17] Such a high prevalence represents a serious public health problem among the rural population in Bangladesh. These findings call for urgent improvements in hypertension prevention and control programs in rural Bangladesh.

Nevertheless, data from other populations in rural areas such as India, Philippine, and the China also show that the prevalence of hypertension is high among rural population. A two-year World Bank aided pilot project in two districts of Tamil Nadu, aimed at preventing cardiovascular diseases, has found that people in rural areas, especially those aged above 30 years, are becoming more prone to hypertension, resulting in heart ailments.[19] A community-based cross-sectional study carried out in rural Maharashtra, India found the overall prevalence of hypertension 7.2%.[20] Study from rural residents of San Antonio, Nueva Ecija, Philippines found hypertension prevalence 23.0% among population aged 30 and more.[21] Another study conducted among rural adults Liaoning province of China found that the prevalence of hypertension 44.1%; for men 48.7% and women 39.6%.[22]

The study observed that those respondents were of 40 years and below had systolic pressure less than 120 mm of Hg, while systolic pressure was found more than 140 mm of Hg in an increasing manner with the increase of age ($P < 0.05$). This is consistent with findings from several studies that have reported the risk of hypertension increasing with advancing age.[23-25] Study carried out in some selected rural and urban areas in Tanzania found that hypertensive men and women in tended to be significantly older compared to those who were not hypertensive.[23] Another study conducted among adults aged at least 20 years in Soussa, Tunisia found that hypertension was significantly higher for adults older than 40 years of age.[24,25] Advancing age increases the risk of exposure to the lifestyle risk factors for hypertension and hence the observed increase in hypertensive risk with aging.

Since a long time, extra salt intake has been considered to cause hypertension. This was proved true in this study and in other studies too. The hypertension prevalence was higher in participants following additional dietary salt intake compared to those who gave negative history of additional dietary salt consumption. Similar association between salt and hypertension has been observed by other studies.[26,27]

Consistent with previous other studies, significant association was observed with development of hypertension with heart disease.[28,29] Current smoking was not a significant risk of hypertension, which was also documented in other studies.[30,31] No association was observed with development of hypertension with physical activity and vegetable intake systemic diseases such as CVD, DM, COPD except heart disease ($P < 0.05$).

Limitations and strengths

There are a few remaining limitations that should be considered in this study. First, this study was a cross-sectional study design to identify factors associated with hypertension, and due to the long latent period between exposure to risk and the development of hypertension, it may be difficult for the study participants to remember exposures that preceded the disease from those that occurred after the disease had developed. Second, prevalent cases of hypertension may not be representative of all cases as some severe cases may die soon after developing the disease. We however we believe that the methods used in the conduct of this study enabled us minimize the possible effect of these limitations on the findings in this study. Finally, the study was confined to adults who were 30 years and old.

CONCLUSION

The study concludes that the prevalence of systolic hypertension among the respondents is 15.6% and that of diastolic pressure is 12.3%. Systolic pressure was found in an increasing manner with the increase of age and BMI. Tendency of increase systolic pressure was observed among those who take extra salt. No such significant association was found between increasing systolic pressure with smoking habit, physical activity, and vegetable intake and with the development of systemic diseases namely CVD, DM, and COPD except heart disease. On the basis of the findings of the study the followings are recommended; i) regular periodical health check-up specially including blood pressure monitoring should be suggested to all the people of age more than 30 years; ii) restriction of taking extra salt should be suggested and promoted. Further nationwide study should be conducted.

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