PREVALENCE AND CORRELATES OF HYPERTENSION IN THE ELDERLY : A COMMUNITY - BASED SURVEY IN RURAL BANGLADESH

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Dissertation submitted in partial fulfilment of the requirements for the award of the degree of Master of Public Health

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May 2000.

DECLARATION

I hereby certify that the work embodied in this dissertation entitled is the " PREVALENCE AND CORRELATES OF HYPERTENSION IN THE ELDERLY: A COMMUNITY- BASED SURVEY IN RURAL BANGLADESH" result of original research and has not been submitted for any degree in any other University or Institution.

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CERTIFICATE

Certified that this dissertation entitled ' PREVALENCE AND CORRELATES OF HYPERTENSION IN THE ELDERLY: A COMMUNITY- BASED SURVEY IN RURAL BANGLADESH' is a record of bonafide original research work undertaken by Anjan Kumar Nag in partial fulfilment of the requirements for the Degree of Master of Public Health, under our guidance and supervision.

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ACKNOWLEDGMENTS

I would like to express my deep sense of gratitude and profound thankfulness to my research guide **Dr. K.R. Thankappan** who extended the generous help in completing this venture. I also take this opportunity to convey my heart felt indebtedness to my co-guide **Dr. Mala Ramanathan** who offered the dedicated support in materializing this mission. I express my gratitude to **Dr. Sharma** and **Dr. Sabeena Jayapalan,** the other faculty members, for their timely help. **Professor Richard Cash,** the visiting faculty member also enriched this work with advice.

At the outset I am sincerely acknowledging the Founder Executive Director of BRAC, **Fazle Hasan Abed** the Ex-director, Heatlh and Population Division, **Dr Sadia A Chowdhury**, the Programme Coordinator Health and Population Division, **Mr. Milan Kanti Barua**, for giving me opportunity to undergo this course. I am very much obliged to Director HPD, BRAC, **Dr. Purbi Dutta** for her outstanding support to complete this course.

Dr. Mohandas, the Director of this institute who keeps special consideration for public health deserves special mention.

Mr. Sundar Jayasingh, the Assistant register, **Mrs. Jayaprabha**, in charge of the documentation center and **Mrs. Vasanthy** were cordial to students and deserve thanks.

All the staff members of BRAC, Muktagacha supported me in different ways. I am grateful to the participants, who assisted me in overcoming the challenges of the field survey.

Trivandrum — Anjan Kumar Nag

19-05-2000

CONTENTS

ABSTRACT

Objective: To study the prevalence and correlates of hypertension (HTN) in community-dwelling elderly in rural Bangladesh. HTN is an important cause of cardiovascular morbidity and mortality in the elderly. The prevalence of HTN in the elderly in Bangladesh is unknown.

Design: Cross-sectional survey of subjects aged ≥ 60 years, using a cluster sampling technique.

Setting: Rural Community in Mymensingh district, Dhaka.

Participants: 240 individuals (132 F, 108 M), mean age 71± 9 years.

Intervention: Measurement of blood pressure by physician and interview.

Main outcome measures: Prevalence of HTN (JNC VI/ WHO criteria), awareness of, treatment for, and adequacy of control of HTN.

Results: The overall prevalence of HTN was 52.50% (95% CI: 46.18%-58.82%). The prevalence was higher in women (59.1%; 95% CI: 50.7%- 67.5%) compared to men (44.4%; 95% CI: 35.1%-53.8%) and increased with age. Multiple logistic regression analyses identified female sex (OR= 2.4, 95%CI 1.2-4.8), higher BMI (OR=2.2, 95%CI 1.3-3.7) as important correlates of HTN. Level of education, smoking status and Physical activity were not related to prevalence of HTN. Among hypertensives, 22.2% were aware of and treated for the condition, but only 3% were adequately controlled. 63.2% of HTN subjects were unaware of their condition despite having at least one physician office visit in the previous year.

Conclusions: In our community-based rural sample of non-obese subjects (mean BMI 16.9), over half of all elderly subjects were hypertensive. Awareness of HTN was low despite physician office visits, and control of elevated blood pressure (BP) was

uniformly poor. Our findings emphasize the need for community-based measures to increase awareness of HTN in the general population, and to promote measurement of BP, and knowledge of current HTN guidelines among physicians in rural Bangladesh.

PART 1. INTRODUCTION

Hypertension or high blood pressure has been identified as the primary noncommunicable health problem throughout the developed and the developing world. The contribution of hypertension to the burden of disease is increasing. Hypertension can lead to heart attacks, congestive cardiac failure, stroke, renal diseases and even blindness It is estimated that there are 690 million people with hypertension worldwide. This accounts for almost 10% of the global burden of disease from both death and disability, and is expected to increase to nearly 15% by the year 2020.[1] A recent report of the Ad Hoc committee on Health Research refers to hypertension as an "emerging epidemic". [2] Data on the economic cost of hypertension in developing countries are limited, but in the USA, the direct and indirect costs of hypertension are already 3% of the gross national product.

Hypertension can occur in all socioeconomic groups. It is one of the most important causes of mortality and morbidity in the elderly.[3] Studies in developed countries have reported that between 60% to 80% of the elderly population has high blood pressure.[4-5] In India the prevalence of hypertension in individuals above the age of 60 is around 40% and there is no sex difference.[6] Representative data on the prevalence of hypertension in Bangladesh is lacking. A few studies with small sample sizes have been done and have estimated the prevalence of hypertension to be around 10%. [7-13] There is no data regarding the prevalence of hypertension among elderly in Bangladesh. In Bangladesh elderly individuals constitute about 5.9% of the total population of 123.8 million.[14]

In developing countries, hypertension is more likely to attack adults in their productive middle years than in developed countries. This has a profound and adverse impact on households, families, and society. It is now recognized that the control of

moderate and severe hypertension can effectively prevent complications including the premature death caused by the disease. It is well known that hypertension can be a silent killer. So it is important to routinely monitor blood pressure in the elderly. But hypertension is not being given importance from the government perspective. This may be because of lack of knowledge about the magnitude of the problem and the risk factors.

So, this study was conducted to find out the prevalence, awareness and treatment of hypertension in a sample of community-dwelling elderly subjects in the district Mymensingh in Bangladesh.

1.2.Objectives

Primary objective

To study the prevalence of hypertension among elderly rural people of Bangladesh.

Secondary objective

To study the relationship between hypertension and its risk factors.

To study the health seeking pattern for hypertension.

PART 2. LITERATURE REVIEW

2.1.Definition of hypertension:

The definition of hypertension or high blood pressure is somewhat arbitrary. As the blood pressure rises, long time risks for cardiovascular mortality also rises. There is no clearly identifiable threshold for potential danger. Some define hypertension as that level of blood pressure that is associated with a doubling of the long-term risks. Some define it as the level at which the benefits of action exceed the risk and cost of action. According to the Joint National Committee the normal value of systolic blood pressure is up to 139 mm Hg and diastolic blood pressure is up to 89 mm Hg. So any value above or equal to 140 / 90 mm Hg is considered as hypertension.[15] This is again classified into mild (140-159 / 90-99), moderate (160-179 / 100-109), severe (180-209 / 110-119), and very severe (≥ 210 / ≥ 120).

Classification:

Hypertension can be classified broadly into essential or primary hypertension and secondary hypertension. In primary hypertension there will be no definable cause. In secondary hypertension there will be a specific organ or structural gene defect. Now the distinction between primary and secondary hypertension is getting blurred. Labile hypertension or borderline hypertension is the term used when the diastolic blood pressure exceeds 90 mm Hg in one or other occasion.

2.2.Risk factors for hypertension:

The risk factors can be classified into non-modifiable and modifiable risk factors.

Modifiable risk factors:

2.3. *Obesity:*

Hypertension is more common among obese individuals. But obese hypertensives have lower rates of coronary mortality than lean hypertensives. In the Framingham offspring study, adiposity as measured by the subscapular skin fold thickness was the major controllable contributor to hypertension. Excess body weight-body mass index is correlated closely with increased blood pressure. The deposition of excess fat in the upper part of the body (visceral or abdominal) also has been associated with the risk for hypertension, dyslipidemia, diabetes, and coronary heart disease (CHD) mortality. Weight reduction as little as 4.5 Kg (10 lbs.), reduces blood pressure in a large proportion of overweight persons with hypertension.[16] Weight patients with hypertension, weight reduction enhances the BP-lowering effect of concomitant cardiovascular risk factors such as diabetes and dyslipidemia. Therefore, all patients with hypertension who are above their desirable weight should be prescribed an individualized, monitored weight reduction program involving caloric restriction and increased physical activity.

2.4. *Physical inactivity:*

Physical inactivity is strongly correlated with increased blood pressure. Increased insulin resistance with decreased physical fitness may be responsible for this. Regular exercise may prevent hypertension and there by protect against development of cardiovascular diseases. Regular aerobic physical activity, adequate to achieve at least a moderate level of physical fitness, can enhance weight loss and functional health status and reduce the risk for cardiovascular disease and all-cause mortality. Sedentary individuals with normal BP have a 20% to 50% increased risk of developing hypertension, When compared with their more active and fit peers.[17-18]

2.5. Alcohol:

Alcohol in small amounts provides protection from coronary mortality and atherosclusosis, but in larger amounts increases blood pressure and overall mortality. The reductions in coronary disease in person who ingest small amounts of alcohol reflect an improvement in the lipid profile (an increase in the high-density lipoproteins, which are protective), reduction in the factors that facilitate thrombosis and an improvement in insulin sensitivity. The presser effects of large amounts of alcohol are due to increased sympathetic nerve activity. Excessive alcohol intake is an important risk factor for high blood pressure and can cause resistance to antihypertensive therapy and is a risk factor for stroke. A detailed history of current alcohol consumption should be elicited from patients. Those who drink beverages containing alcohol should be counseled to limit their daily intake to no more than 1 oz (30 ml) of ethanol e.g., 24 oz (720 ml) of beer, 10 oz (300ml) of wine, or 2 oz (60ml) of 100-proof whiskey. Because women absorb more ethanol than men and lighter-weight people are more susceptible than heavier people to the effects of alcohol, these groups should be counseled to limit their intake to no more than 0.5 oz (15 ml) of ethanol per day. Such amounts do not raise blood pressure and have been associated with a lower risk for CHD.[19]

2.6. Smoking:

Cigarette smoking raises the blood pressure probably through the nicotine induced release of norepinepherine from adrenergic nerve endings. When smoker stops smoking trivial rise in blood pressure occur which may be due to a gain in weight. Smoking is a powerful risk factor for cardiovascular disease, and avoidance of tobacco in any form is essential. A significant rise in blood pressure accompanies the smoking of each cigarette. Those who continue to smoke may not receive the full

degree of protection against cardiovascular disease (CVD) from antihypertensive therapy. The cardiovascular benefits of discontinuing tobacco use can be seen within a year in all age groups. Smokers must be told repeatedly and unambiguously to stop smoking. The lower amounts of nicotine contained in smoking cessation aids usually will not raise BP; therefore, they can be used with appropriate counseling and behavior interventions. [20]

2.7. Salt intake:

Sodium, in the form of sodium chloride or table salt, is linked to levels of BP. Approximately only 60% of the hypertensives are responsive to the levels of sodium intake. Epidemiologic data demonstrate a positive association between sodium intake and the levels of blood pressure. Meta-analysis of clinical trials reveals that a reduction of 75 to 100 mmol in sodium intake lowers BP over periods of several weeks to a few years. These effects are greater for older persons and those with elevated pressures. Moreover, a variety of controlled and observational studies suggest that a diet with moderately reduced intake of sodium may be associated with other favorable effects on factors such as ability to reduce the need for antihypertensive medication, reduce diuretic-induced potassium wastage, possibly regress left ventricular hypertrophy (LVH), and protect from osteoporosis and renal stones through reduction in urinary calcium excretion.[21-23]

2.8.Sex:

Before menopause hypertension is less common among women than in men. This may reflect the lower blood volume due to menstruation. Women suffer less cardiovascular morbidity and mortality than men for any degree of hypertension.

2.9.Diabetes Mellitus:

Hypertension and diabetes coexists more commonly that predicted by chance. They feed on each other to markedly accelerate cardiovascular changes. In diabetes, hypertension is more persistent and the usual nocturnal fall in blood pressure is less. The most important factor leading to hypertension is the insulin resistance and the effects on the sympathetic system. [24]

2.10.Educational status:

An inverse association between socioeconomic status as measured by the years of schooling and blood pressure has been reported in a number of studies. However, two secular trends may have changed the nature of this relation, a higher mean level of education in the population and intervention for high blood pressure in the community. A study was initiated to examine the validity of education for predicting blood pressure among 11,554 examined persons aged 25-74 years from the Second National Health and Nutrition Examination Survey (1974-80) and the Hispanic Health and Nutrition Examination Survey (1982-84). [25] In univariate analysis, a consistent, inverse association between education and blood pressure was found for whites and blacks, but not for Mexican Americans. After adjustment for age and body mass, the effect persisted only for systolic blood pressure (SBP) in whites. The association of education and blood pressure was positive in Mexican-American females. Education was inversely related to hypertensive status in whites and black females.

2.11.Prevalence of hypertension:

The prevalence of hypertension depends on the racial composition of the population studied and the criteria to define the condition. In a white suburban population like that in Framingham study nearly 20% of individuals have blood pressure greater than 160 / 95 while almost 50% have pressure greater than 140/90. An even higher

prevalence has been documented in the non-white population. This may be due to the lower socio-economic status, lesser access to adequate health care, lesser drug for the pressure to fall during sleep, excessive sodium concentration and less intake of potassium. In females the prevalence was closely related to age, with a substantial increase occurring after age of 50. This may be due to hormonal change of menopause. The ratio of hypertension frequency women versus men varies from 0.6 to 0.7 at age 30 to 1.01 to 1.02 at age 65. By the usual criteria of hypertension, 54% of men and women aged 65 to 74 had hypertension and among elderly blacks the prevalence of hypertension was 72%. This is important because the risks are greater in the elderly than in the younger patients.

Many Studies in developed countries have reported that between 60% to 80% of the elderly population has high blood pressure. [4-5] One study " Prevalence and Social Correlates of Cardiovascular Disease Risk Factors in Harlem" by Ana V. Diez-Roux et al[26] pointed out that 33% men and women were hypertensive, 48% of the men and 41% of the women were smokers, 25% of the men and 49% of the women were overweight, and 23% of the men and 35% of the women reported no leisure-time physical activity over the past month. More than 80% of the men and women had at least 1 of these factors, and 9% of the men and 19% of the women had 3 or more risk factors. Income and education were inversely related to hypertension, smoking and physical inactivity.

In India the prevalence of hypertension in individuals above the age of 60 is around 40% and there is no sex difference (The Heart). [6] One study done by Kalavathy et al " Prevalence, awareness, treatment and control of hypertension in an elderly community-based sample in Kerala, India"[27] had pointed out the overall prevalence of hypertension was 51.8%(rural 45%, urban 59%, and coastal 52%)

which did not vary with sex but increased with age. Fewer than half of the hypertensive subjects were aware of their condition or were on treatment, and 25% of the treated hypertensives achieved adequate control of BP. Rural elderly subjects were especially less likely to be aware of, and on treatment for hypertension. Smoking status and rural residence (in men) and marital status (in women) were important correlates of hypertension.

One meta analysis on prevalence of hypertension was done in Bangladesh.[7] There were six prevalence studies out of which three were not analyzed because they were lacking of some important information.[9-11] The remaining three were included for analysis. Age group of that study was 18 years or older.[8, 12,13] The pooled estimate for the prevalence of hypertension in 13,288 adults (urban 8172, rural 5166) was 11.3%. [7]

A Prevalence study was done in rural villages in Bangladesh.[13] A cluster sampling of five villages were selected for screening of hypertension and diabetes in relation to age structure and BMI. All the subjects over 15 years of age were enlisted for investigation. The response rate was more than 70%. Height, weight, blood pressure were measured. Hypertension was defined as either systolic blood pressure (SBP) ≥ 140 mm Hg, and/ or diastolic blood pressure (DBP)≥ 90mm Hg, Results pointed out that increased age, high BMI and hypertension had significant association. The prevalence of SBP was 10.5% and DBP was 9%.

Relevance of the problem

This study was chosen due to three reasons.

1.Aging of population- The population demography worldwide has been changing dramatically in the past century. Life expectancy increased by more than 25 years, [32] the population of older people is expanding. In 1990, 9.2% of the world population was aged 60 years or older. The spectrum of disease in developing countries is changing from one of communicable disease, most notably cardiovascular disease (CVD) like hypertension. Bangladesh is also undergoing a development process since its birth in 1971. Life expectancy at birth has increased from 47 years to 59 years in past two decades.[14]

2.There were six published studies of prevalence of hypertension in Bangladesh. [7-13] A few studies with small sample sizes had been done which can not provide sufficient information due to their non-representatives of Bangladesh at large. Moreover, estimates for adults were lacking in most of the studies. Three of them did not describe the essential information like criteria for diagnosis of hypertension, sampling procedure, response rate, who measured BP, measurement reading etc.[9-11] Another three studies defined hypertension based only on diastolic blood pressure (DBP) $\geq$ 90 mm Hg. [8,12,13] None of the studies described about awareness, treatment, control and health seeking pattern.

3.There were no studies on prevalence of hypertension among elderly population in Bangladesh.

PART 3: MATERIALS AND METHODS

3.1. Target population

The target population was the elderly people residing in rural subdistrict of Muktagacha.

3.2. Study site

The study area was rural area of Muktagacha Thana, which is a sub-district in Mymensingh district. This is situated about 150 km east of the capital city of Dhaka. The

main economy of the area was agriculture. 95% of the population were Muslims and the remaining 5% Hindus. This site was chosen due to three reasons.

1) Bangladesh Rural Advancement Committee (BRAC) has been working in this place rendering services like rural credit program, non-formal primary education, and health care and nutritional service since1987 and has a good rapport with this community. The investigator worked with BRAC in this particular sub-district and was well known to the people there.

2) The percentage of migrating population was very low.

3) Another peculiar characteristic of this area was the high percentage of elderly (7.89) whereas for the whole country the percentage was 5.9. [14]

3.3. Type of the study

Cross sectional type of descriptive study.

3.4.Sampling methods:

Sample size was calculated by using the formula $\left\{ \frac{(Z\alpha)^2 PQ}{\Delta^2} \right\} d$

Here, Z= Confidence limit factor which is 1.96 for 95% confidence interval
P= Prevalence of hypertension, which was taken as 52% as reported in an elderly community based prevalence study done in Kerala, India. [27]

Q=1-P, Δ= Precision factor. (Difference between assumed prevalence and lowest expected prevalence). Here lowest expected prevalence was assumed 45 percent so

Δ=. 52-. 45=. 07. d=design effect =1.2(20% of the sample)

The formula we used here was for simple random sample.

For our study we used cluster sampling so in order to reduce the design effect 20% of the calculated sample was added to the sample size.

So the sample size was = $\frac{1.96^2 * (.52 * .48)}{(.07)^2} * 1.2 = 235$

So 235 was the sample size. Since we could plan to do a cluster sampling of 30 clusters, 8 individual per cluster. So my sample size was 240.

The sampling frame was 30 wards of the subdistrict with the 1991 census report (see table-1). According to 1991 census the total population of Bangladesh was 123.8 million. The population of Mymensingh district was 30,20,000. The population of the rural area of Muktagacha subdistrict was 3,01,325. The total population of men and women were 1,62,113 and 1,39,211 respectively. This subdistrict consisted of 10 unions and each union was made up of 3 wards. Average population of each ward was about 10, 044. The wards are the lowest administrative unit. Table 1 shows the details of the unions and wards in the Muktagacha rural subdistrict.

Table 1

Serial number and name of the Unions	Name of the Wards	Total population
1. Baragram	First ward	9,020
	Second ward	9,225
	Third ward	9,117
2. Basati	First ward	12,200
	Second ward	11,950
	Third ward	12,858
3. Daoganon	First ward	10,100
	Second ward	9,500
	Third ward	10,563
4. Dulla	First ward	10,100
	Second ward	9,500
	Third ward	10,563
5. Ghoga	First ward	7,200
	Second ward	7,425
	Third ward	7,560
6. Kashimpur	First ward	11,500
	Second ward	12,710
	Third ward	7,273
7. Kheruajani	First ward	9,750
	Second ward	11,250
	Third ward	10,217
8. Mankon	First ward	11,700
	Second ward	12,129
	Third ward	9,498
9. Kumarghata	First ward	9,235
	Second ward	10,313
	Third ward	8,930
10. Tarati	First ward	9,805
	Second ward	10,203
	Third ward	11,846
Total rural population	Thirty wards	3,01,330

3.5. Sampling methods

Cluster sampling was done from each ward. A total of 30 clusters were taken one cluster from each ward. One cluster consisted of 8 elderly (≥ 60) subjects. The investigator identified the middle point of the ward with the help of a female health worker from BRAC. After reaching the center of the ward the direction / road was

selected randomly using a currency note. The first household was identified after walking 5 minutes in the selected direction or road. If there was no elderly person in the home no information was collected from that house. Households were visited in a clockwise manner until 8 elderly subjects were identified. Similar method was followed in other clusters (wards) and the total number 240 elderly subjects were contacted for interview and clinical examination.

3.6. Duration of the study

The duration of the study was from 02-01-2000 to 21-02-2000.

3.7. Case definition

Hypertension was defined according to JNC six criteria as either Systolic blood pressure (SBP) ≥140-mm Hg, and / or diastolic blood pressure (DBP)≥ 90 mm Hg and / or treatment with antihypertensive medication. This definition excludes hypertensives who have reduced their BP to a normotensive range by non-pharmacological means.

3.8.Survey instruments

Questionnaire

The questionnaire was a pre-tested and structured one, which sought information on the socio-demographic characteristics, the past and the present medical history, dietary habits, addictions, physical activity, height, weight and blood pressure.

Sphygmomanometer

Blood pressure was measured by Diamond Company mercury sphygmomanometer standardized at SCTIMST.

Stethoscope

Double headed Panascopic Company (China).

Weighing machine

Weight was measured by standardized bathroom scale, Hansen Company, Ireland.

Plumb line

Graduated standardized Plumbline was used to measure height.

3.9. Study Variables

Dependent variable

The dependant variable was hypertension. This was defined as per JNC-VI criteria as SBP of 140 mm Hg or greater and or DBP of 90 mm Hg or greater and or taking antihypertensive medication.[15]

Independent variables

a) Age

b) Sex

c) Socio-economic characteristics

d) Religion

e) Marital status

f) Occupation

g) Educational level

h) Dietary habit

i) Smoking

j) Chewing

k) Alcohol

l) Body mass index (BMI)

m) Extra salt

n) Physical activity

3.10. Data collection

A house to house visit was done by the research team. The mode of transport for this investigator was a motor cycle. The team consisted of a doctor (investigator) and a lady assistant. This lady assistant was the female health worker appointed for every 225 house holds. As they are familiar to each and every member of the house it was easy for us to confront the members. Initially an idea about the study, its objectives and the importance of giving accurate answers were made very clear to the participants. The physician administered a pre-tested structured questionnaire which sought information on the following: The socio-demographic variables that were assessed were age, sex, marital status, religion, education, present and past occupation, details about the socioeconomic status and the household size. The past and the present medical history including history regarding major illness (hypertension, diabetes mellitus, renal disease, any medication for increased blood cholesterol, hypertension and the details regarding the medications) and visit to a doctor in the past one year and the details of it were taken. The dietary habits included questions regarding the details of the type of diet and intake of extra salt. The personal habits that were looked into were smoking (present and past), tobacco chewing (present and past) and consumption of alcohol (present and past). The investigator himself asked the questions. The participant answered these questions with out any hesitation.

Age

The participants were enquired about their actual age (year of birth). If they couldn't remember the actual age effort was made to get actual age by relating to famous

incidents like The Great Bengal famine-1943, Independence of India and Pakistan from British-1947.

Educational level

Number of years of formal school education was taken in to consideration here. Then based on number of years of schooling the educational status was divided into 4 groups: illiterate, 1-4 years of schooling, 5-10 years of schooling and 10 and above. These groups were given score from 1-4 respectively.

Housing

This was assessed based on following criteria

Kutcha- the roof was thatched, wall was bamboo or mud and floor was mud.

Semi-pucca- the roof was tin or steel, wall was tin or cement and floor was mud or cement (brick).
Pucca- roof, wall and floor were cement.

Socio-economic status(SES)

The subjects were classified into lower, middle, and upper SES groups based on a subjective assessment by the investigator.

Physical activity

Based on the current occupation the subjects were divided into three groups: light, moderate and heavy physical activity and these groups were given scores from 1-3 respectively

Extra salt

This was assessed by asking the subjects whether they take extra salt during their meals in addition to the salt used for cooking.

Blood pressure

The physician obtained two measurements of blood pressure on each study participant during the interview with a mercury column sphygmomanometer using a standardized technique. [28-29] The first measurement was recorded after obtaining demographic information from the subject while the second measurement was recorded after a brief clinical examination. Both blood pressure measurements were taken after the subject was resting for at least 5 minutes in a seated position. Thirty minutes prior to measurement it was mandatory that the patient should refrain from smoking or ingesting tea. BP measurements were done on that arm were the pulse could be palpated well. Using a cuff of appropriate size and the instrument at the level of the heart, the cuff pressure was inflated to 30 mm Hg above the level at which the radical pulse disappeared and then deflated slowly at the rate of 2mm/second and the reading was recorded to the nearest 2 mm. The first and the fifth Korotkoff sounds were taken as indicative of the systolic and the diastolic BP, respectively. The average of the two readings of systolic and diastolic blood pressure was taken as the blood pressure of the participant. In exceptional cases where the two readings differed by more than 10 mm Hg, then additional BP measurements were taken and the mean of these measurements were taken as the BP of this subject.

After measuring the blood pressure, the hypertension status of study participants was classified by using the standard criteria formulated by the World Health Organization (WHO) [30] and the US Sixth Joint National Committee on detection, evaluation and treatment of hypertension (JNC). [15]

Awareness of hypertension

A subject was supposed to have awareness of hypertension if he reported a prior diagnosis of hypertension made by a health professional. [31]

Treatment of hypertension

In our study treatment of hypertension was defined as the current use of a prescription medication for lowering elevated blood pressure among hypertensive subjects. Only treatment with pharmacological drugs was considered as treatment. [31] In order to avoid misclassifications of normotensive individuals on cardiovascular medications for indications other than hypertension (e.g. congestive heart failure or angina), a diagnosis of treated hypertension was made only if the subject had a prior diagnosis of hypertension and was on antihypertensive agents.

Control of hypertension

Control of hypertension was defined as pharmacological treatment associated with SBP less than 140 and DBP less than 90 mm Hg.[31] Control rates were calculated separately for all hypertensive subjects and for the subgroup of hypertensives who were being treated with antihypertensive medications, as awareness and treatment were prerequisites for the definition of control of hypertension.

Weight

Weight was measured with the help of a bathroom scale. Each time the weight was measured it was made sure that the pointer was at the zero mark. The scale was placed on a flat smooth surface and subject was allowed to wear only minimum clothing during the weight recording.

Height:

Height was measured by graduated plumb line in centimeters (cm).

BMI:

BMI was calculated by the formula: weight in Kg/ height in square meters.

Before leaving the house questionnaire was checked to know whether the entire questionnaire was correctly recorded or not. This was once again checked carefully after returning home.

3.11. Data analysis

The data was entered in the Excel Software by the investigator himself. The descriptive as well as the analytical statistics was done by SPSS program. Chi- square and t-test was done for univariate analyses and for multivariate analysis logistic regression method was used. The level of significance was set at $P \leq 0.05$. The 95% confidence interval was also calculated.

3.12. Ethical considerations

The objectives of the study were clearly explained to all the participants by the researcher. So, the participants were fully aware of the study and its objectives before giving consent to participate in the study. The participants who were in need of some kind of medical intervention, were given advises accordingly. Those who were in need of preventive and curative advises were also given those services.

3.13. Field of application of study results

The primary health care system in Bangladesh is not well established. Even now most of the primary care is provided through organizations like BRAC. They mainly concentrate on family planning, immunization, reproductive health, and family life and tuberculosis and leprosy program. These results can be useful for BRAC to direct their interest on hypertension, its prevention, detection, evaluation and treatment etc.

PART 4. RESULTS

Descriptive statistics

4.1. Prevalence of hypertension

The overall prevalence of hypertension was 52.50% (95% CI 46.20%-58.82%). The prevalence of hypertension in male was 44.44% (95% CI: 35.06-53.81) and female was 59.10% (95% CI: 50.7%- 67.5%). Out of the 126 subjects who were hypertensive, 48 were men and 78 were women. The mean SBP was 138.23 mm Hg (for men the mean SBP was 134.82 mm Hg and for women it was 141.02 mm Hg). The mean DBP was 83.32 mm Hg (for men mean DBP was 80.29 mm Hg and for women it was 85.80 mm Hg).

Table 2
Hypertension according to JNC-VI classification

Male n=108		**Female n=132**		**Total n=240**	
No	%	No	%	No	%
48	44.44	78	59.10	126	52.50

4.2. Sex distribution

Out of the 240 subjects, 132 were women and 108 were men. The sex ratio of the sample was 1.22.

4.3. Age distribution

Majority of the participants was in the 60-64 year age group (Table-3). The median and mean age was 70 and 71 respectively and SD was 8.82. The oldest subject age was 100 years old.

Table-3

Age distribution

Age group in years	Male	Female	Total	Percentage
60-64	15	43	58	24.16
65-69	18	26	44	18.33
70-74	24	23	47	19.58
75-79	15	24	39	16.25
80 ≥	36	16	52	21.7
Total	**108**	**132**	**240**	**100**

4.4. Socio- economic distribution

Table-4 shows socioeconomic status (SES) of the sample. 48.3%(116 cases) belonged to lower SES group, 44.6%(107 cases) middle SES and 17%(17 cases) belonged to upper SES group. This was based on subjective assessment.

Table-4

Socio- economic distribution of the sample

SES	Male	Female	Total	Percentage
Lower	42	74	116	48.3
Middle	58	49	107	44.6
Upper	8	9	17	7.1
Total	**108**	**132**	**240**	**100**

4.5. Distribution of educational levels

Table 5 represents the true picture of the literacy in Bangladesh, nearly 60-80 years back. So a major proportion of the elderly were illiterate. Women were more illiterate than men.

Table-5

Level of education of study sample.

Education	Male	Female	Total	Percentage
Illiterate	68	115	183	76.3
1-4th	14	12	26	10.8
5-10th	22	5	27	11.25
Above 10th	4	0	4	1.66
Total	**108**	**132**	**240**	**100**

4.6. Type of household

All the participants were staying in their own house. Majority was staying in semi-pucca houses 75.41%(181). This was followed by pucca house 0.4%(1) and Kutcha houses 24.16% (58) Previously in Bangladesh kutcha houses were more. But now BRAC, Grameen Bank and a number of NGOs are giving loan (15000 taka without interest) for constructing semi-pucca houses. Also mud floor with tin roof was considered as semi-pucca. The cost of constructing and maintaining a thatched house is more than a semi-pucca house. This explains the more number of semi-pucca houses in the study.

Table 6

Type of households

Type of household	Male	Female	Total	Percentage
Kutcha-	20	38	58	24.16
Semi-pucca	88	93	181	75.41
Pucca	0	1	1	.40
Total	**108**	**132**	**240**	**100**

4.7. Religion profile

The majority of the subjects were Muslims 92.50%(222 cases) followed by Hindus 4.16%(10 cases) and Christians 3.33%(8 cases). The proportion of Muslims, Hindus and Christian and Buddhists in Bangladesh as a whole was 87%, 11% and 1% respectively.

Table 7

Religion profile

Religion	Male	Female	Total	Percentage
Hindu	6	4	10	4.16
Muslim	101	121	222	92.50
Christian	1	7	8	3.33
Total	**108**	**132**	**240**	**100**

4.8. Marital status

39.16% of the males were currently married whereas only 24.16% of the females were married. 30.83% of the females were widows whereas only 5.41% of the males were widowers.

Table 8

Marital status

Marital status	Male	Female	Total	Percentage
Married	94	58	152	63.3
Widowed	13	74	87	36.3
Never Married	1	0	1	0.4
Total	**108**	**132**	**240**	**100**

4.9. Habits

There was a striking difference in rates of smoking between men (18.33%) and women (1.12%). The proportion of men who had smokeless tobacco was 38.33% and the proportion of women was 50.83%. Compared to smoking only, 1.3% were alcoholic and all of them were females. These females belonged to Tribal groups.

Table-9

Distributions of habits like smoking, alcohol and other forms of tobacco

Habits	Male	Female	Total	Percentage
Smokers	44	3	47	19.58
Non-smokers	64	129	193	80.41
Past-smoker	53	2	55	22.90
Smokeless tobacco	92	122	214	89.17
Non-users smokeless tobacco	16	10	26	10.83
Past-smokeless tobacco	8	4	12	5
Alcohol use	0	3	3	1.3
Past alcohol use	1	0	1	.4

4.10. Dietary habits

70% of the subjects used to take extra salt. 99.6% were non-vegetarian. Out of this, 99.6% had fish regularly, 75% had eggs and 85.4% had meat in their diet. But eggs and meats were not taken regularly, only once in a week.

Table-10

Dietary habits of the sample

Dietary habits	Male	Female	Total	Percentage
Extra salt	80	88	168	70
Vegetarian	0	1	1	0.4
Non-vegetarian	108	131	239	99.6
Egg	88	91	179	75.2
Fish	108	131	239	99.6
Meat	95	110	205	85.4

4.11. BMI

The mean and median BMI were 17.30 and 16.86 respectively. The minimum and maximum BMI were 11.39 and 27.55 respectively. The median was taken as the cut off for dividing into those with low and high BMI .The nutritional level of rural Bangladesh people were very low because of the lower consumption of foods, housing conditions, and lower socio-economic status.

4.12. Physical activity

Physical activity was classified into 3 groups based on the current occupation. 46.7% were retired subjects, 27.7% were housewives and 16.3% were farmers. Majority (51.52%) engaged in light physical activity. 30.41% engaged in moderate physical activity and 18.33% engaged in severe physical activity.

Table 11

Physical activity

Physical activity	Male	Female	Total	Percentage
Light	61	62	123	51.25
Moderate	6	67	73	30.41
Severe	41	3	44	18.33

4.13. Reported Morbidity

28 (11.7%) subjects reported hypertension but the observed morbidity was 52.50% (126 cases). Only one subject reported of diabetes mellitus. This lower reported morbidity may be due to the asymptomatic nature of the disease and lack of awareness regarding hypertension and DM.

Table 12

Reported Morbidity of the sample

Morbidity	Male	Female	Total	Percentage
Hypertension	6	22	28	11.7
Diabetes mellitus	1	0	1	0.4
Asthma	11	7	18	7.5
Joint pain	1	4	5	2.08
Others	37	23	60	25

4.14. Awareness of hypertension

Out of the 126 hypertensives, 12.5% of the males were aware of their elevated blood pressure and was on treatment at the time of study. 28.2% females were aware of their elevated blood pressure and were also on treatment at the time of study. While

the blood pressure of all the men who were taking treatment were controlled, the blood pressure of only 5.13% of women were controlled according to the current JNC-VI recommendations for adequate blood pressure control.[15]

Table-13

Awareness, treatment and control of hypertension.

Table-13. Number and percentage of persons with hypertension who were aware, treated and controlled.

Gender	**Aware(%)**	**Treated(%)**	**Controlled(%)**
Male (n=48)	6 (12.50)	6(12.50)	0
Female (n=78)	22 (28.20)	22 (28.20)	4 (5.13)
Total (n=126)	28 (22.22)	28 (22.22)	4 (3.17)

Out of the 126 hypertensives, only 68 (53.9%) had at least one physician within the last one year. Out of the 68 patients only 25(36.76%) were aware of their hypertension status.

63.24% (43) were not aware of their hypertensive status.

4.15. Univariate analysis

Table-14: Hypertension according to gender

Sex	Hypertension	
	Yes	No
Male	48	60
Female	78	54
Total	126	114

The chi-square is 4.54 and p value 0.033*. The odds ratio with 95% CI is 0.55 (0.32-0.97). There was a significant gender difference in the prevalence of hypertension. Females have 1.8 times [95%CI (1.3-3.13)] for developing hypertension.

Table-15: Hypertension according to age groups

Age	hypertension		OR(95%CI)	chi-square	p value
	Yes	No			
60-64	28	30	1		
65-69	28	16	1.88(0.78-4.5)	1.8	0.17
70-74	28	19	1.58(0.68-3.71)	0.92	0.33
75-79	17	22	0.83(0.34-2.03)	0.06	0.80
80+	30	22	1.46(0.64-3.33)	0.63	0.42
Overall chi-square for 4 df is 4.96					
P value 0.291					

This table shows there was no significant difference in the hypertension status among different age groups. Even when each age group was compared to the lowest age group, there was no significance.

Hypertension and SES

Table 16

SES	Hypertension		OR
	Yes	No	
Low	63	53	1
Middle	54	53	0.86
High	9	8	0.95
Chi-square for trend		0.178	
P value		0.6733	

This table shows that there was no relation between hypertension and SES in my study sample.

Hypertension and education

Table 17

Years of Schooling	Hypertension		OR
	yes	No	
0	100	83	1
1-4	15	11	1.13
5-10	9	18	0.41
> 10	2	2	0.83
Chi-square for linear trend 2.563			
P value 0.109			

There was no relationship between hypertension and educational status.

Hypertension and household type

Table 18

Household type	Hypertension		OR
	yes	No	
Kutcha	28	30	1
Semi-pucca	97	84	1.24
Pucca	1	0	NA
Chi-square for linear trend		0.752	
P value 0.386			

There was no relationship between the type of household and hypertension status.

Hypertension according to BMI

Table19

BMI	Hypertension		OR (95%CI)	chi-square	P value
	Yes	No			
<16.86	53	67	0.51(0.29-0.88)	6.03	0.014*
≥16.86	73	47			

This table shows that those having a BMI of ≥ 16.86 has increased risk of developing hypertension. The median BMI of the total population was 16.86. The median BMI of the male was 16.845 and the median BMI of the female was 16.87. Even when either of the above values were taken at cut off, there was no difference in the numbers.

Hypertension according to physical activity

Table 20

Physical activity	Hypertension Yes	No	OR (95%CI)	chi-square	p value
Light	74	49	2.35(1.1-4.9)	5.15	0.023
Moderate	34	39	1.36(0.6-3.10	0.37	0.54
Severe	18	28			

Overall chi-square for 2 degrees of freedom – 7.20 P value - 0.027

This table shows that Physical activity influenced the hypertension status. Those who had only light physical activity had 2.35 times risk of developing hypertension than those who had severe physical activity. Those who had moderate physical activity had 1.36 times risk for developing hypertension, when compared to those with severe physical activity. But the P value was not significant. Even though the P value was not significant for the 2nd group. There was a trend in risk reduction from light to severe physical activity.

Hypertension according to extra salt

Table 21

Extra salt intake	Hypertension Yes	no
Yes	86	82
No	40	32
OR	0.84 (0.46-1.52)	
Chi-square	0.23	
P value	0.63	

There was no relation between extra salt intake and hypertension status

Diet and hypertension

Table 22

Diet	Hypertension		OR(95%CI)	Chi-square	p value
	Yes	No			
Egg					
Yes	90	89	0.74(0.39-1.4)	0.69	0.41
No	34	25			
Fish					
Yes	125	114	0(0-19.26)		1
No	1	0			
Meat					
Yes	107	98	0.92(0.42-2)	0	0.96
No	19	16			

In this study there was no relation between diet and hypertension.

Habits and hypertension

Table 23

Habits	Hypertension		OR(95%CI)	chi-square	p value
	Yes	No			
Alcohol					
Yes	1	2	0.45(0.02-6.4)		0.60
No	125	112			
Current Smoking					
Yes	21	26	0.67(0.34-1.33)	1.14	0.29
No	105	87			
Past Smoking					
Yes	22	32	0.52(0.27-1.01)	3.3	0.067
No	104	82			
Smokeless Tobacco					
Yes	111	103	0.79(0.32-1.93)	0.12	0.72
No	15	11			

Smoking, past smoking, alcohol and chewing did not influence the hypertension status in this sample.

4.16. Stratified analyses according to sex

Hypertension according to age and gender

Table 24

Age	Sex	Hypertension		OR(95%CI)	chi-square	p value
		Yes	No			
60-64	Male	3	12	0.18(0.03-0.84)	5.04	0.02
	Female	25	18			
65-69	Male	11	7	1.83(0.46-7.48)	0.45	0.50
	Female	12	14			
70-74	Male	15	9	1.28(0.34-4.85)	0.01	0.90
	Female	13	10			
75-79	Male	2	13	0.09(0.01-0.60)	7.19	0.0073
	Female	15	9			
≥80	Male	17	19	0.21(0.04-0.98)	3.95	0.046
	Female	13	3			

Crude OR for all strata 0.55 Mantel Haenzel weighted OR 0.47

95% CI 0.25-0.82 Mantel Haenzel chi-square 7.04

P value 0.0079

Hypertension according to BMI and sex

Table 25

BMI	Sex	Hypertension		OR (95%CI)	chi-square	P value
		Yes	No			
16.86	Male	21	33	0.68(0.31-1.49)	0.75	0.385
	Female	32	34			
≥16.86	Male	27	27	0.43 (0.19-0.98)	4.04	0.044
	Female	46	20			

Crude OR 0.55 Mantel Haenzel OR 0.55

95% CI 0.31-0.95 Summary chi-square 4.63

P value 0.0311

BMI was not influencing the difference between risk in males and females.

Hypertension according to physical activity and sex

Table 26

Physical Activity	Sex	Hypertension yes	Hypertension no	OR(95%CI)	chi-square	pvalue
Light	Male	28	33	.30(0.13-0.67)	9.12	0.0025
	Female	46	16			
Moderate	Male	2	4	0.55(0.06-3.84)	Fisher exact	0.67
	Female	32	35			
Severe	Male	18	23	undefined		0.26
	Female	0	3			

Crude OR 0.55 MH corrected 0. 41

95%Ci 0.20- 0.83 Summary chi-square 6.34

P value 0.0117

When the effect of physical activity was removed by doing stratified analysis the odds ratio for males decreased further.

Hypertension and salt intake according to sex

Table 27

Extra salt	Sex	Hypertension		OR(95%CI)	chi-square	P value
		Yes	No			
Yes	Male	35	45	0.74(0.42-1.31)	0.92	0.33
	Female	86	82			
No	Male	13	15	0.69(0.26-1.82)	0.36	0.54
	Female	40	32			

Crude OR 0.72 Mantel-Haenszel weighted OR 0.73

CI 0.45-1.18 MH chi-square 1.55 P value 0.213

There was no relation between extra salt intake sex and hypertension.

4.17. Multivariate Analysis

All the variables in the univariate analysis that had a P value < 0.10 and those variables that were clinically significant were used for multivariate analysis logistic regression, forward likelihood ratio method was used. The entry criteria was P= 0.10. The default was set at P < 0.05. The variables that were taken were sex, BMI, Physical activity, education and past smoking. Only BMI and sex were significant. The OR for female was 2.4 (95% CI 1.2-4.8) and OR for higher BMI was 2.2 (95% CI 1.3-3.7).

Table-28

Variable	Beta	SE	OR (95% CI)	P value
Sex (Male)	-.8808	.3465	.4145(0.21-0.82)	.0110
BMI group 1 (<16.88)	-.7795	.2762	.4587 (0.27-0.79)	.0048

PART. 5: DISCUSSION

A natural course of aging of the population in Bangladesh will be an increase in the prevalence of chronic degenerative diseases. Most important among the chronic degenerative diseases will be the burden of hypertension and related cardiovascular diseases. This study was conducted to find out the burden of hypertension in the elderly and the correlates of hypertension.

The overall prevalence of hypertension in my sample was 52.50% (95% CI 46.18%-58.82%). The prevalence in developing countries ranged from 40- 60%[6] and in developed countries ranged from 60 –80%. [4-5] Mean SBP was 138.23 mm Hg (men were 134.82 mm Hg and women were 141.02 mm Hg). Mean DBP was 83.32 mm Hg (men were 80.29 mm Hg and women were 85.80 mm Hg).

The proportion of females having high blood pressure was more than the proportion of males and this difference was statistically significant (p – 0.033). Females had 1.81 times risk (95% CI 1.03- 3.18) for developing hypertension than males. This was similar to another study where the odds ratio for females was 3.30. [27] Studies from other parts of the world shows that the ratio of hypertension frequency in women to men increases from 0.6 before menopause to 1.22 by the age of 65. Our study also showed a similar result. Here the ratio of hypertension frequency was1.33.

There was no significant association between age and hypertension. But when each age group was categorized into male and female, there was a statistically significant increased risk of developing hypertension in females in the age group 60-64,75-79 and those above 80 years.

Studies show that education is inversely related to hypertension.[25] In our study there was no linear trend in decrease in the hypertension status with increasing

education. The odds ratio of those with higher education was less when compared to those with lesser education but this difference was not statistically significant.

There was no statistically significant relationship between socioeconomic status and hypertension even though the proportion of those with hypertension in the middle and higher income groups was less. Other studies quote-inverse relationship between hypertension and SES, but most of these studies have taken education as the marker for socioeconomic status.[25]

Many studies have shown that as the BMI increases the risk for hypertension also increases.[13] In our study we took median (16.86) as the cut off for dividing into those with lower and higher BMI. Those subjects with a higher BMI had 1.96 times risk (95%CI 1.14-3.44, p value- 0.014) of developing hypertension.

Among our subjects those individuals who had light physical activity had 2.35(95%CI-1.1-4.9, p value-0.023) times risk of developing hypertension when compared to those with severe physical activity. There was no significant difference between those with moderate and severe physical activity. Studies show that sedentary individuals with normal blood pressure have a 20-50% increased risk of developing hypertension.[17-18]

There was no significant relationship between extra salt intake, diet, alcoholism and smoking in our study unlike other studies which shows positive association with these risk factors. [16,19,21-23]

In the final multivariate analysis the significant variables were Sex (P= 0.011), and BMI (P= 0.0048). The adjusted OR for female sex was 2.4 (95% CI 1.2-4.8) and adjusted OR for higher BMI was 2.2 (95% CI 1.3-3.7). Physical activity, which was significant in the univariate analysis, was not significant in the logistic model.

The awareness, treatment and control of hypertension:

12.50% subjects were aware of their elevated blood pressure and were also on treatment. However, only 5.13% of the hypertensive subjects satisfied current JNC-VI recommendations for adequate blood pressure control.[15] Awareness, treatment and control differed between men and women. Women were more aware. Out of the 126 hypertensives, only 68 (53.9%) had at least one physician within the last one year. Out of the 68 patients only 25(36.76%) were aware of their hypertension status.

63.24% (43) were not aware of their hypertensive status.

Interpretation of data regarding awareness, treatment and control of hypertension was complex in developing countries because it reflects an intricate interplay between availability, accessibility and affordability of physician services and pharmacological medication. Education and SES of patients, awareness of guidelines among practitioners and individual physician thresholds for treatment of high blood pressure also have an effect on the treatment and control of hypertension. Low awareness of hypertension indicate that physicians in the region surveyed currently pay inadequate attention to measuring blood pressure and treating hypertension in elderly subjects. Contrary to most reports from surveys conducted in the developed countries, there was no gender-related differences in hypertension awareness, treatment or control in my study.

5.2. STRENGTHS AND LIMITATIONS

Strengths

1. The study sample was reasonably representative of elderly subjects in Bangladesh with regard to the demographic characteristics.
2. The use of a community-based sample of modest size was one of the strengths of my investigation.

Limitations

Despite these strengths, it was important to acknowledge my limitation.

1. The survey from 9 AM to 5 PM. Some males who were full actively working outside have been missed. The female to male ratio of the sample was 1.22. As the prevalence of hypertension was more in female, the overall prevalence of hypertension may be an overestimate.
2. The study was conducted in winter, so weight was taken with clothes on.
3. The actual age was take with the help of some famous incidents. Example- The Great Bengal famine in 1943 and freedom of India and Pakistan from British in 1947.

4.The method of recording blood pressure twice in one sitting was also not usually recommended. This was not feasible in this study due to time and budgetary constraints. It was also possible that prevalence of hypertension may be overestimated in the elderly because of the phenomenon of pseudohypertension.

5.3. CONCLUSION

1. The prevalence of hypertension was 52.50%.

2. The correlates of hypertension were sex, BMI.

3.Only 12.50% were aware of their hypertensive status and were also on treatment. Only 3.17% of them were controlled.

4. Hypertension was detected in only 36.8% of the patients who had at least one physician visit in the past one year.

5.4.Policy implication

Hypertension or high blood pressures can leads to heart attacks, congestive cardiac failure, stroke, renal diseases even blindness. Total population of Bangladesh 123.8 million of them 5.9% is above the age 60. In our community-based rural sample of non-obese subjects (mean BMI 16.9), over half of all elderly subjects were hypertensive. Awareness of HTN was low despite physician office visits, and control of elevated blood pressure (BP) was uniformly poor. Our findings emphasize the need for community-based measures to increase awareness of HTN in the general population, and to promote measurement of BP, and knowledge of current HTN guidelines among physicians in rural Bangladesh.

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APPENDIX-1

Date: Code number: Name: Age: Sex: M/F

Ward number: Address:

1. **Total household size :**
2. **Information on SES:**

a) What is your (household) expenditure in the last month? Tk:

b) Type of the house: Kucha/Semi-pucca/Pucca

c) Assets: Bike/Car/TV/ AC/Fridge/VCR/Phone/Computer/Washing Machine/Gas/Stove/Others specify:

3. **Religion :** Hindu/Christian/Muslim/Others
4. **Marital status :** Married/Divorced/Widowed/ Never Married
5. **Occupation:**

a) Current: Duration:

b) Past: Duration :

6. **Educational status:**
7. **Past Medical History:**

a) Any major illness: DM/ HTN/ASTH /REND/Others

b) Did you visit a doctor in the last one-year? Yes/No

c) If yes, the doctor you visited belong to which system of medicine: Allopathic/Ayurveda/ Homeopathy/Naturopathy/Siddha/Others

d) d. Did he/she measure your blood pressure? Yes/ No

e) Are you on any pills for lowering blood cholesterol? Yes/No

f) Did you undergo a blood test for identifying DM or Cholesterol status? Yes/No

g) Have you been told to have heart failure by a doctor? Yes/No

8. **Hypertension:**

a) Do you have hypertension? Yes/No

b) Are you on treatment for hypertension? Yes/No

c) System of medicine used for treatment to hypertension Allopathic/Ayurveda/ Homeopathy/Naturopathy/Others:

d) Currently used anti-hypertensive allopathic drugs :

9. **Dietary habit:**

a) Veg/Egg/fish/meat

b) Frequency: Egg: Fish: Meat:

c) Use of extra salt: Yes/No

10. Smoking :

a. Do you smoke? Yes/NO b. If yes, since how long?

c. Type: Cigarette/Beedi, d. Frequency: /1, /7, /30

e. If No: Did you ever smoke? Yes/No

f. If yes: How long did you smoke? g. Type: Cigarette/Beedi,

h. Frequency: /1, /7, /30 i. Reason For Quitting:

j. Duration of quitting.

11. Chewing:

a. Do you chew tobacco? Yes/No b. If yes, since how long?

c. Type: Khaini/Betel quid/Panmasala, d. Frequency: /1, /7, /30

e. If No: Did you ever chew? Yes/No f. If yes: How long did you chew?

g. Type: Khaini/Betel quid/Panmasala, h. Frequency: /1, /7, /30

i. Reason for quitting? j. Duration for quitting

12. **Alcohol:**

a. Do you drink alcohol? Yes/No b. If yes, since how long?

c. Brand: Whisky/Brandy/Rum/Vodka/Toddy/Arrack

d. Frequency: /1, /7, /30

e. If No: Did you ever drink alcohol? Yes/No

f. If yes: How long did you drink?

g. Type: Brand: Whisky/Brandy/Rum/Vodka/Toddy/Arrack,

h. Frequency: /1, /7, /30

i. Reason for quitting? j. Duration of quitting

13.**Physical activity:** Vigorous/ Moderate/ Light

ACTIVITY CATEGORIES		
1 .Vigorous activities	**2. Moderate activities**	**3 .Light activities**
Agricultural work	Home maintenance of garden	Walking
Pulling Riksha	Maintenance of cattle	Walking to office
Pulling Cart	Fetching water	Desk work at office
Digging	Fetching Wood	Cooking
Breaking stone	Others specify:	Washing cloths
Exercise: By bicycle rowing (bicycling more than 10 mph)		Others specify:
Carpentry work		
Masonry work		
Others specify:		

14. Any other relevant information:

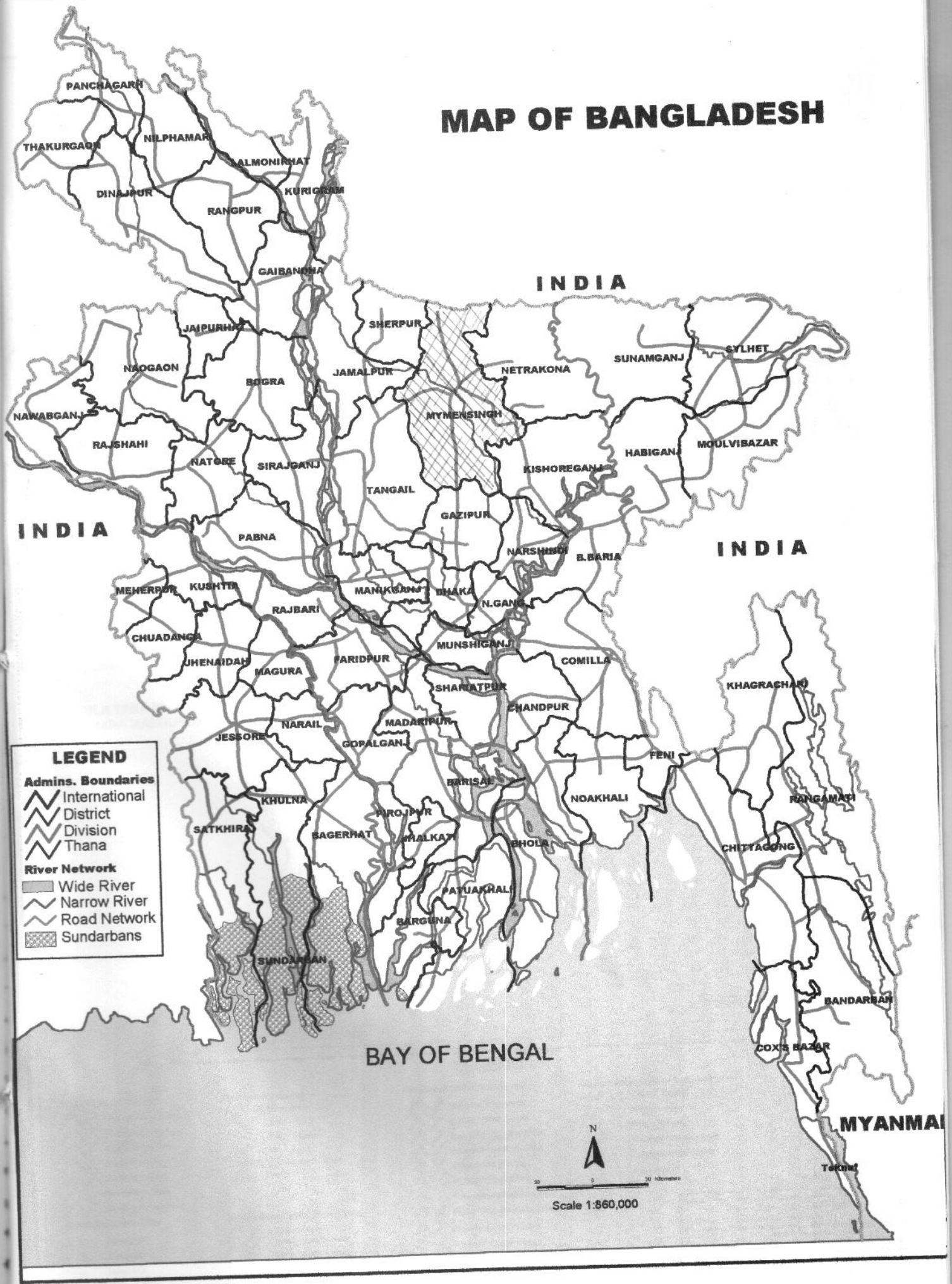
Measurement:

Body Weight (Kg):

Height (cm):

Blood Pressure (mm of Hg):

Blood Pressure	SBP(mm of Hg)	DBP(mm of Hg)	Arm
1st Measurement			
2nd Measurement			
3rd Measurement			


MAP OF BANGLADESH
PANCHAGARH
THAKURGAON
NILPHAMARI
LALMONIRHAT
DINAJPUR
KURIGRAM
RANGPUR
GAIBANDHA
INDIA
JAIPURHAT
SHERPUR
SUNAMGANJ
SYLHET
NAOGAON
JAMALPUR
NETRAKONA
BOGRA
NAWABGANJ
MYMENSINGH
RAJSHAHI
HABIGANJ
MOULVIBAZAR
NATORE
SIRAJGANJ
KISHOREGANJ
TANGAIL
GAZIPUR
INDIA
PABNA
INDIA
NARSHINDI
B.BARIA
MEHERPUR
KUSHTIA
MANIKGANJ
DHAKA
N.GANJ
RAJBARI
CHUADANGA
MUNSHIGANJ
JHENAIDAH
FARIDPUR
COMILLA
MAGURA
KHAGRACHARI
SHARIATPUR
CHANDPUR
NARAIL
MADARIPUR
JESSORE
GOPALGANJ
FENI
BARISAL
KHULNA
NOAKHALI
RANGAMATI
PIROJPUR
SATKHIRA
SAGERHAT
BHALKATI
BHOLA
CHITTAGONG
PATUAKHALI
BARGUNA
SUNDARBAN
BANDARBAN
COX'S BAZAR
BAY OF BENGAL
MYANMAR
Teknaf
LEGEND
Admins. Boundaries
International
District
Division
Thana
River Network
Wide River
Narrow River
Road Network
Sundarbans
N
Scale 1:860,000

LEGEND

Muktagacha Thana
- International Boundary
- Divisional Boundary
- District Boundary
- Thana Boundary
- Union Boundary
- Mouza Boundary
- Municipal Boundary

Administrative HQs
- District HQ
- Thana HQ
- Union HQ

Natural Features
- Wide River
- Khal
- Water Bodies
- Tank/Pond
- Sandy Land / Char
- Forest

Agricultural Infrastructures
- Embankment
- Road Embankment
- Sluice Gate/ Regulator

Physical Infrastructures
- National Highways
- Feeder Road Type-A
- Feeder Road - B (Pucca)
- Feeder Road B (Katcha)
- Rural Road (Pucca)
- Rural Road (Katcha)
- Telecommunication line
- Power Transmission Line
- Railway (Meter Gauge)
- Railway (Broad Gauge)

Socio-Economic Infrastructures
- Growth Centre
- Small Bazar
- Police Station
- Thana Health Complex
- Family welfare Centre
- Post Office
- College
- High School
- Primary School
- Madrasa
- Mosque
- Historical Place
- Graveyard
- Settlement

Compiled from : SPOT Image 1989-90, Aerial Photgraph 1983-84, Topographic Maps, Thana Maps, B.B.S and Field Checking.
Projection : Lambert's Conformal Conic

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