

**Behavioral and life style risk factor analysis for
pre-hypertensive and hypertensive population in
urban Dhaka**

**THIS THESIS IS SUBMITTED TO THE UNIVERSITY OF DHAKA AS
A REQUIREMENT FOR THE FULFILMENT OF THE DEGREE OF
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SUBMITTED BY
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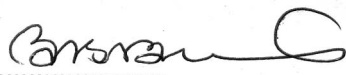
**DEDICATED TO MY
BELOVED ELDER DAUGHTER ESHIKA FOR BEING THERE FOR
ME AND MAKING ME THE PERSON I AM TODAY.**

Declaration by the Supervisor

This is to certify that the thesis title '**Behavioral and life style risk factor analysis for pre-hypertensive and hypertensive population in urban Dhaka**' submitted by Dr. Jannatul Ferdousi, registration no. 038, session 2010 – 2011 for the degree of Master of Philosophy, from the University of Dhaka, is a record of original research work. Dr. Jannatul Ferdousi has carried out this piece of research work under our direct supervision and guidance at the Institute of Nutrition and Food Science, University of Dhaka. The results or any part of the work of the thesis has not been used elsewhere for the award of any other degree.

This thesis is worthy for the award of the degree of 'Master of Philosophy' in accordance with the rules and regulation of University of Dhaka.

Signature.....



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Abbreviation

AHA=American Heart Association

BMRC=Bangladesh Research Council

BMI=Body Mass Index

BP=Blood Pressure

CHD=Coronary Heart Disease

CHF=Coronary Heart Failure

CVD=Cardiovascular Disease

DASH=Dietary Approaches To Stop Hypertension

DBP=Diastolic Blood Pressure

DM=Diabetes Mellitus

GHQ=General Health Questionnaire

HDL=High Density Lipoprotein

HTN=Hypertension

ISD=Ischemic Heart Disease

JNC=Joint National Committee

LDL=Low Density Lipoprotein

MI=Myocardial Infarction

mmHg=Millimeter Of Mercury

MONICA=Monitoring of Trends and Determinants of Cardiovascular Diseases

NCD=National Institute Of Cardiovascular Disease

NGO=Non-Governmental Organization

PHTN=Pre-Hypertension

SBP=Systolic Blood Pressure

SPSS=Statistical Package for Social Science

WHO=World Health Organization

VLDL=Very Low Density Lipoprotein

TG=Triglyceride

Abstract

Background:

Prevalence of hypertension is on rise silently and slowly in Bangladesh. This quasi experimental type of interventional study was conducted aiming at evaluating reversible of blood pressure through reduction of body weight in overweight or obese, individual avoidance of table salt intake, increment of physical activity and cessation of smoking, changing of food habit in an urban committee. The study also aimed at finding out the socioeconomic and demographic profile for pre hypertension and stage-I hypertensions and evaluating outcome of behavioral risk reduction contributing to maintenance of reversal of hypertension.

Objective:

The study was conducted to analyze if modification of life style and behavioral risk factor can reduce pre-hypertension and stage-I hypertension.

Material and method:

This intervention study was conducted during the period August 2013 to October 2015 on respondents aged 18 years or above in Sutrapur thana of Dhaka city including an intervention period of 6 Months. Non-probability type of judgement sampling was used to collect 150 respondents with pre-hypertension and stage-I hypertension. The respondent had neither any complications nor any Co-morbidity. The Intervention was given person-to-person. Intervention included physical activity enhancement, dietary advice, avoidance of extra table salt intake and smoking cessation. Global standard tools were used to collect data through person-to-person interview and clinical assessment. Data analysis and interpretation done through SPSS.

Result:

Mean systolic blood pressure of the respondents was 130 ± 7.09 mm Hg and mean diastolic blood pressure was 83.51 ± 7.39 mm Hg. Normal blood pressure was found only 45% cases. While 30% had pre-hypertension, 19% had stage-I hypertension and 6% had stage-II hypertension according to the JNC-7 criteria. Among the study group, after 6 months mean change of systolic blood pressure was -9.35 ± 1.75 mmHg and mean change of diastolic blood pressure was -4.20 ± 1.94 mmHg. Both systolic and diastolic blood pressure was significantly reduced from baseline, after 6 months of behavioral risk reduction intervention. For sBP ($p < .05$) and for dBP ($p < .001$).

At beginning, 58.7% took extra salt. After 6 months intervention it was 1.4%. Avoidance of extra salt intake was significantly related to change of both systolic blood pressure and diastolic blood pressure ($p < 0.001$). There was no significant

changes of smokers with blood pressure. Mean BMI reduction $-1.62 \pm 1.8 \text{ kg/m}^2$ ($p < 0.05$). At the baseline of the study mean physical activities were 230.80 ± 224.40 minutes/week and 518 ± 275.70 minutes/weeks respectively after 6 months. Significant correlation of both systolic and diastolic blood pressure increment of physical activities ($p < 0.001$).

Conclusion:

Reversal of pre- hypertension and stage-I hypertension was possible by structural behavior risk reduction meaning intake of balance diet with exclusion of extra salt intake, increment of physical activity along with reduction of body weight. Combination of all these parameter recommending to be used by the physicians while treating and caring patients with pre-hypertension and stage I hypertension.

Chapter 1

- 1.1. Introduction
- 1.2. Justification of the study
- 1.3. Objectives
- 1.4. List of key variable
- 1.5. Limitations of the study
- 1.6. Operational Definition

INTRODUCTION

Raised blood is an alarming concern in modern societies, because high blood pressure shortens the life, increases hospitalization rate, results more occupancy of hospital issue for high blood pressure is that it affects individuals during their most important issue for high blood pressure is that it affects individuals during their most productive and contributing peak mid life years interrupting the future of the depending families and undermining the development of nations by deriving valuable human resources. Health burden arises out of blood pressure is now not confined to the developed world rather it is spreading more rapidly in the low or middle-income generating communities as well. Control of blood pressure by risk reduction intervention at early stage is the question and demand of developing communities. Developing countries especially lower middle-class and lower socio-economic income generating communities are threatened to be the worse sufferers in the coming future. Therapeutic care for high blood pressure and cost of the antihypertensive drugs require involvement of huge amount of money and other resources including infrastructure. Treatment cost and social burden (DALY) for hypertension diseases and their consequences demand primordial or primary prevention. Global research outcome are revealing the facts that hypertension can be halted and its complication can be limited or prevented if proper care is taken at the Prehypertension or stage-I hypertension level. Studies also suggest life style modification from unhealthy to healthy behavior can limit the disease progress and rather reduce the level of hypertension even sometimes without application of pharmacological products. This reduces the cost of treatment and ensures the better quality of life for the hypertensive patients. High blood pressure

exerts a major share in the global burden of disease, and it is unduly higher in low income countries than in the high income countries. More specifically elevated blood pressure is responsible for approximate 60% of stroke and over 50% of ischemic heart disease¹ pre-hypertension is associated with CVD mortality, specifically stroke mortality² and stroke morbidity³.

Pre-hypertension is now recognized as a potential candidate for cardiovascular intervention or risk reduction. The people with high normal blood pressure (systolic blood pressure from 120 to 139 mmHg and/or diastolic blood pressure from 80 and 89 mmHg) developed by hypertension faster and in an increased risk of cardiovascular disease^{4,5}. The seventh report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of high blood pressure (JNC7), introduced the new category of “pre-hypertension”, defined as systolic BP of 120 to 139 mmHg and/or diastolic BP of 80 to 89 mmHg⁶. Recent studies found an association between pre-hypertension and increased risk of Coronary Artery Disease^{7,8}. Follow up studies also reported that pre-hypertension is an independent risk factor for cardiovascular and cerebrovascular disease⁹.

Global population is in the midst of a true cardiovascular disease (CVD) epidemic responsible for about 60% of worldwide deaths and 47% of the global burden of diseases each year. In South East Asia Region (SEAR) NCDs accounts for 51% of all deaths and 44% SEAR nationals^{10,11}. CVD includes hypertension, coronary heart disease (CHD), cerebrovascular diseases. Coronary heart disease includes myocardial infarction (MI), angina pectoris, coronary insufficiency, and coronary death. Cerebrovascular disease includes stroke and transient ischaemic attack. High blood pressure is considered as a very pertinent pre-determinant for these overwhelming diseases or clinical conditions¹² WHO reports that about 15%-37% of the adult

population worldwide is affected with hypertension. The prevalence is as many as one-half in those older than 60 years age. As a whole urban population suffer more from hypertension than rural people. In 1997, an assessment commissioned for the WHO Ad Hoc Committee on Health Research estimated the percentage of global deaths - associated with common risk factors. WHO also reports smoking and hypertension as the major causes of global mortality for 1990 AD¹³. Prevalence of non-communicable disease is also a focused area for research in vegetable eating food habit leading physically active life style. But economic transition, under-planned urbanization, disproportionate brought about lifestyle changes among this population. Peoples over here started to interface more sedentary jobs and consumption of more fatty fast fried foods. Such social and dietary changes along with no physical activity contribute increasing prevalence of high blood pressure in Bangladeshi society.

In Bangladesh comprehensive population based community studies on CVD are still inadequate in respect of the magnitude of the disease problem. In Bangladesh, few studies were done on pre-hypertension. In 2009, Alamgir AKM¹⁴ find prevalence of HTN was 20.1% and pre-hypertension was 34.3% between 18-64 years of age group in Urban Dhaka.(14) Mallik¹⁵ (1975) about. 33% prevalence of coronary artery disease while Haque (1985)¹⁶ reported a prevalence of 1.4% among peoples in Bangladesh. Hussain¹⁷ (1984) performed a study on 5,000 samples in Tangail district of Bangladesh for 1 yr 6 month period between 1981-83 to find about 2.1% people having CHD.¹⁷ All (1987) worked on prevalence of cardiovascular diseases among different levels of teachers working in Dhaka University and the rate was alarming during that time comprising about 12.1% through ECG tracing¹⁸. Wali Ullah (1976) described 2.68% prevalence of hypertension, above 20 years age, among students and

staff of Agricultural university Mymensingh¹⁹ Islam et al (1979) studied on a 8,172 fixed community samples in Dhaka Secretariat to find the prevalence of prevalence of 13.3% ²⁰ Dasherbandi project study in a village by Chowdhury et al (2001) found a prevalence of 5.3% hypertension among 663 respondents (response rate 67.5%) non-adjusted for age²¹. In another study published in BMRC Bulletin, Islam (1983) described the prevalence of 6.7% hypertensives in rural Bangladesh. They studied 5,026 samples comprising 75% of the total population²² Begum et al (1984) published article in JOPSOM describing hypertension prevalence study on 1,119 peoples of Dhamrai Upazilla Health Complex, 5,026 peoples at Tongi Health Complex and 7,972 peoples at Mohakhali area. They found the prevalence of hypertension to be 7.1%, 6.7% and 13.7% in these areas respectively²³. The community based study by Sayeed et al (2002) of BIRDEM reported the hypertension prevalence and related risks among 2,361 native Bangladeshis over 20 years of age. Overall prevalence rates of systolic and diastolic hypertension in the study population were 14.4 and 9.1 percent respectively²⁴. Cross-sectional survey on 2,625 subjects (male 1,277; 48.6% and female 1,348; 51.4%) by Haque and Ali (2007) from May to November 2007 in urban Dhaka found about 23.8% people to have hypertension (5.8% stage II hypertension and 18% stage I hypertension or with medication) according to JNC-7 criteria. Mean age of the respondents was 35.8 ± 12.7 years with mean weight 60.7 ± 11.3 kg and BMI 23.2 ± 3.9 kg/m². Mean sBP was 122.9 ± 16.1 mmHg and mean dBP was 79.1 ± 10.3 mmHg.²⁵ Important modifiable behavioral risk factors for high blood pressure comprise smoking tobacco, physical inactivity, increased salt intake and overweight or obesity. Both population and laboratory studies indicated the association of dietary and lifestyle factors with the chronic and progressive increase in blood pressure. Increasing number of publications of different reports and experiences from different

parts of the world depict more about reductions in blood pressure in persons with hypertension following management with a number of different non-pharmacological interventions. Such observations and laboratory inferences created interest in the possibility of the primordial or primary prevention of hypertension through non-pharmacological intervention on factors related to the development of high blood pressure. There is increasing number of observations from clinical or community trials that high blood pressure can be controlled or lowered to an acceptable limit by lowering the behavioral risk factors. Results of MHLBI-supported Hypertension Detection and Follow-up Program (HDFP) in the USA and the Multiple Risk Factor Intervention Trial (MRFIT) put concerns about drug related effect, cost of treatment and safety of antihypertensive drugs.²⁶ The Hypertension Prevention Trial (HPT) in the USA studied the effectiveness of primordial intervention in a non-hypertensive population and recommended the importance of further work in this area addressing in some non-pharmacologic intervention and primary feasibility.²⁷ Risk of hypertension as the necessary and sufficient causal factor has been established and predicted in many overseas studies²⁸⁻³¹. There are well documented studies on hypertensive risk and consequences in Bangladesh highlighting the gradually rising burden of hypertension for causation of other cardiovascular morbidities and mortalities.³²⁻³⁴ Regarding management of hypertension WHO, British Hypertension Society, and Joint National Committee (JNC-7) on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure agreed upon non-pharmacological approaches of behavioral risk reduction interventions for first 6-12 month in case of uncomplicated stage-1 hypertension patient having no second risk factor.³⁵⁻³⁸ PREMIER Collaborative Research Group trial and DASH or DASH PLUS^{26,39,40} trial demonstrated the benefit of a combination of behavioral steps to control and prevent

hypertension. After six months of intervention with lifestyle modification, a significant decrease in blood pressure and hypertension control was noted. One of the key findings was the prescription of the application of the DASH diet and weight loss.

.British National Institute for Clinical Excellence (NICE) of United Kingdom National Health Services encourages multiple lifestyle interventions to achieve a reduction in systolic blood pressure of 10 mmHg or more in the short term, up to 1 year in about 25% trial peoples.⁴¹ Adopting WHO MONICA modified protocol an intervention study was effectively performed in Jamaica by Duff and Wilks (2003) over 80 patients having high blood pressure (>140/90 mmHg) to assess the long term impact of educational and monitoring intervention on blood pressure control. Data were collected on 73 (91%) patients, 40 (95%) cases and 33 (87%) controls by clinic records or by direct measurement of blood pressure and weight. Three (7.5%) cases and two (6%) controls had died. About 28% (11/39) cases and 22% (8/36) controls at the end of the six-month intervention could significantly reduce the blood pressure.⁴²In Bangladesh a quasi-experimental study was performed in Dhaka Medical College Hospital during the period January 2004 to July 2004 by Shaheen (2004) on 110 study subjects with stage-I hypertension. The approach was non-pharmacological intervention to reduce high blood pressure. The author reported reduction of 11.22 ± 12.68 mmHg systolic BP and 4.46 ± 8.58 mmHg diastolic BP as a result of three month intervention.⁴³Based on all these study outcomes this intervention study was performed to address quantitative answers about amount of blood pressure can be reduced in Bangladeshi urban perspective through behavioural risk reduction, up to how many months this reversal can be sustained and the extent of successful reduction through life style modification programmes.

Basic About Blood Pressure

Blood Pressure is the lateral force of running blood that is exerted on the arterial wall while flowing through it. When the pressure on the wall of blood vessel remains persistently high over time, it is called High Blood Pressure or Hypertension in the clinical word. Maintenance of proper or normal blood pressure is a vital function of the body system. Change of blood pressure directly or indirectly affects most of the vital body organs through different mechanisms or systems resulting to various grades of morbidities and sufferings. In many ways high blood pressure is injurious to health and survival.

Significant fall in blood pressure may be incompatible to life and vitality. On the other hand high rise of blood pressure may cause life threatening morbid conditions like hypertensive heart diseases, cerebrovascular accidents, different degrees of heart failure, kidney diseases and blindness. These are the leading causes of death globally. Heart is the propeller of blood throughout the body and has to work very hard with change in blood pressure gradients. Grading of blood pressure and labeling into normal or high needs careful considerations of several subjective and objective issues. Consequences of low or high blood pressure at microvascular or macrovascular level, subjective feeling of sickness, associated co-morbidity states and pathological changes are the important issues to consider for defining hypertension for a particular individual. Because of causal relationship of blood pressure with many end-organs in the body, functioning as well percentage of damages or malfunctioning of those end-organs should be considered well while grading or classifying blood pressure.

Regulation of Blood Pressure

Blood pressure needs to be regulated within an optimum range for normal functioning of the human body and to keep vitality of organs. The body maintains a dual set of regulatory mechanisms to work for keeping blood pressure within normal range. These regulatory mechanisms might be neuronal controlled or humeral regulations.

Nervous mechanism comprises- short term regulation (Mechanism works within seconds.)

Baro-receptor feedback mechanism, Chemoreceptor feedback mechanism, Central Nervous system ischemic mechanism or the Mechanism that works within minutes- Renin- angiotensin vaso-constrictor mechanism, Capillary fluid shift mechanism. Stress relaxation changes in vasculature) and the Long term regulation- (Renal body fluid mechanism and Renin angiotensin mechanism). Humeral regulation is done by- Epinephrin-norepinephrin mechanism. Vasopressin vasoconstrictor mechanism (ADH) and the Renin angiotensin aldosterone mechanism. Baroreceptors or pressuroceptors, stretch spray-type nerve endings extremely abundant in the wall of arch of aorta and in the carotid sinus, can control both increase and ease of blood pressure, and hence this control system is known as pressure buffer system. With rise of arterial blood pressure baroreceptors get stimulated, with BP above 60 mmHg. and send impulses inhibitory to vasomotor centre (VMC) or excitatory to cardio-inhibitory centre through the glossopharyngeal and vagus nerves. This results in decreasing heart rate due to cardio inhibitory effect and vasodilatation due to release of the stimulatory effect of vasomotor centre. And blood pressure is controlled with decreased cardiac output and peripheral resistance. The reverse events occur when to fall blood pressure.

The chemoreceptors, chemosensitive cells, are sensitive to oxygen lack or hydrogen and carbon di-oxide excess not stimulated strongly until the arterial pressure falls below 80mm Hg. With decreased arterial pressure, blood supply to the chemoreceptors are reduced causing excess carbon di-oxide which results receptor stimulation. This stimulation reaches the vasomotor centre to cause vasoconstriction raising blood pressure.

Decreased blood flow to the vasomotor centre in lower brain causes nutritional deficiency. Neurons in that area become stimulated and help for elevation of the blood pressure. When blood pressure falls, juxta glomerular cells of kidney secrete rennin, a glycoprotein. To convert angiotensinogen (AGT), mainly synthesized in the liver and released into circulation, to angiotensin 1 (Ang-I). Ang-I is then converted into octapeptide angiotensin- II within the lungs by the carboxypeptidase angiotensin converting enzyme (ACE) mostly present in the endothelial cells. This angiotensin plays roles in vasoconstriction which is one of the mechanisms of short time regulation of blood pressure through retaining sodium and water at renal tubules resulting to stimulate aldosterone release from adrenal glands.⁴⁴

When capillary pressure falls, fluid is absorbed by capillary osmosis from tissue into circulation which ultimately raises the blood pressure by increasing fluid volume. Conversely, the opposite action occurs in case of increased blood pressure.

With high pressure the vessels become stretched more and more with increase in blood volume (increased strain) increases pressure (increased stress). However, pressure does not remain steady, but declines a small amount over time. This decline in pressure (stress) over time at a constant volume (strain) is termed stress relaxation. And once it becomes normal, is termed as stress relaxation mechanism. When there is increase in

blood pressure. The renal glomerular filtration rate (GFR) also increases resulting in decrease of the extracellular fluid (ECF) volume. As a result there is decrease blood pressure which ultimately decreases the blood pressure. The opposite action is found in case if decreased pressure.

Decreased arterial pressure stimulates the sympathetic nervous system and adrenal gland which causes secretion of epinephrine-norepinephrine secretion. These causes increased peripheral resistance and thus increase the blood pressure.

Decreased blood pressure increases the plasma osmolality which stimulates the receptors in the hypothalamus to secrete vasopressin or ADH from posterior pituitary gland. This vasopressin causes increased water reabsorption from renal tubule which increases blood pressure. Moreover, in higher concentration vasopressin causes vasoconstriction which also helps in increasing blood pressure.

Risk Factors for Blood Pressure

Hypertension is an emerging epidemic for developing countries. The prevalence and incidence of hypertension in developing countries is rising very rapidly. Previously incidence and prevalence of high blood pressure was supposed to be happened only in the developed or industrial countries. But now the paradigm has been shifted from the developed to the developing world, from the rich and affluent socioeconomic settings to middle class or low- economic settings.

The determinants for these changes are urbanization, changes in occupation and many global influences. Economic transition, urbanization, industrialization and globalization bring about lifestyle changes that promote cardiovascular diseases like hypertension. Traditional risk factors include tobacco use. Physical inactivity and unhealthy diet. Life expectancy in developing countries is rising and people are exposed to these risk factors for longer periods. Newly emerging hypertensive risk factors like low birth weight, foliate deficiency and infection are also more frequent among the poorest in low and middle-income countries. The transition equally affects both adults and children. Cause of high blood pressure is neither uni factorial nor can be explained with single disease agent. Many risk factors are supposed to be associated with the occurrence of high blood pressure. Risk factor are conditions or behaviors that increase chances of developing a disease. Risk of developing hypertension or heart disease greatly multiplies when there is more than one risk factor present in one individual. Some of these risk factors are modifiable while others are non-modifiables.⁴⁵

Non-Modifiable Risk Factors Include

Age of the patient has linear progressive relationship with high blood pressure. Age reflects an accumulation of environmental influences and the effects of genetically programmed senescence in the body system. Population studies have shown that systolic pressure rises steadily with age.

- Sex differentiates before and after developing menopause in women, female hormone is considered to have significant protective effect against development of cardiovascular diseases.
- Family history and heredity contributes probability of developing hypertension. Based on twin and family studies BP levels appear to be genetically determined with polygenic inheritance. The children of two normotensive parents have a 3% possibility of developing HTN whereas this possibility was 45% in children of two hypertensive parents. Almost one half of respondents reported a family history of heart disease.⁴⁶
- Genetic predisposition has been established for monogenic hypertensive syndromes. Genome scanning and contemporary gene expression assays in model organisms could identify- candidate genes related to hypertension, Liddle's syndrome, Glucocorticoid-remediable aldosteronism (GRA) apparent mineralocorticoid excess (AME) are good examples.⁴⁴
- Race is found to have role in CVD development. South Asians have more (CVD) prevalence in England and Canada the domestic whites there.⁴⁷⁻⁴⁸

Modifiable risk factors for hypertension include-

Smoking causes inhalation or ingestion of nicotine that stimulates adrenergic drive of the human body system resulting high trend of blood pressure. Carbon monoxide causes atherogenesis while inhaled during smoking.

- *Overweight or obesity*- Positive correlation exists between obesity and high blood pressure. Weight gain is considered to stimulate sympathoadrenal system causing hyperinsulinaemia and precedes elevation of leptin level. Salt sensitivity may also work over here.^{49,50}
- lack of optimum *physical activity* causes reduced mobilization of body fat and carbohydrate with also reduced utilization resulting hypertension through different mechanisms.
- ***Dyslipidaemia*** comprising altered ratio of beneficial to harmful or total cholesterol level and also isolated elevation of the low density lipoprotein or triglycerides is usually associated with rising blood pressure level
- Diabetes Mellitus or Impaired Glucose Tolerance is a known individual risk factor for hypertension
- Unhealthy *dietary habit and food preferences*- Consumption of saturated fat and red meat is injurious to health and is a known risk factor for CVD especially hypertension
- ***Salt intake-There*** are increasing evidences that high salt intake (more than 5 g/day) increases blood pressure while reducing salt intake can lower BP.⁴⁴
- *Psychological factors* - HTN is a disorder initiated by tension, *stress, anxiety, depression or anger* through mental processes.
- Personality Pattern - Persons with personality type A are more prone to develop

hypertension. Personality is the “integrated organization of the physical and psychological characteristics of an individual, including intelligence, emotionality and social behaviour, in the way that the individual presents himself to other.”⁵¹ Type A individuals possess any or all of three characteristics like-

- Competitive achievement orientation: individuals become very self-critical and strive towards goal with challenge towards accomplishments.
 - Time urgency: Type A individuals often struggle against clock, become impatient with delay or unproductive time, make tight work schedules and try to do more than one thing at a time.
 - Anger or hostility: These individuals become angry quickly and very reluctant to suppress emotions.⁵²
-
- Alcohol- High alcohol intake is associated with an increased risk of high BP. It appears that the systolic pressure is raised more than the diastolic.
 - Presence of other diseases- Those having other diseases like diabetes mellitus, obesity, hormonal disorders, and nephropathies are at higher risk of high BP.
 - Environmental factors- Industrialization and urbanization are supposed to be associated with more prevalence of high blood pressure in the community. Several environmental pollutants like lead poisoning causes rise of BP.
 - Occupational factors- Work stress like night duties, odd hour or odd-day duties, lack of job satisfaction and poor employment conditions are responsible for hypertension in many settings.⁵³

WHO Philosophy about Blood Pressure

Strategic priorities and philosophy of WHO on Cardiovascular Disease program

NCDs are in an overwhelming majority in the European, American and Western Pacific regions. In the South-East Asia, Africa and Eastern Mediterranean regions NCD prevalence is in transition. Disease burden by NCDs is going to be more significant as public health problem than infectious diseases during the recent years in spite of the reality that in many of these countries communicable diseases are still predominate. Different strategic analyses and studies explained tire risk factors responsible for this growing pandemic from different points of view and clearly pointed out the stepwise approaches needed to reduce their impact. World health reports show high blood pressure to be the major contributing factor to most deaths in the world.⁵⁴

WHO Program on Cardiovascular Diseases (CVD) is concerned with prevention, Management and monitoring of CVD globally. It aims to develop global strategies to reduce the incidence, morbidity and mortality of CVD through the-

- effective reduction of CVD risk factors and their determinants
- development of cost effective and equitable health care innovations for CVD management
- monitoring of the trends of CVD and their risk factors

WHO identified that majority of CVDs are preventable and controllable. However, millions are dying in middle age. WHO fixed following working policies on key work areas to control CVD risk factors effectively and to reduce the burden of the fast growing cardiovascular disease (CVD) epidemic particularly in developing countries-

- Reduction of major CVL) risk factors and their social and economic determinants through community based programmes for integrated prevention of NCDs.

- Development of standards of cure and cost-effective case management for CVD
- Global action for capacity building of countries to meet the CVD health care needs
- Developing feasible surveillance methods to assess the pattern and trends of major CVDs and risk factors and to monitor prevention and control initiatives.
- Developing effective inter-country, interregional and global networks and partnerships for concerted global action.

A multi-center WHO hypertensive study group work in India and Bangladesh identified that health perceptions (health changes are a natural consequence of aging, constructs of acute versus chronic illness), socioeconomic factors (increased dependence, burden of drug costs), reduced physical mobility, attitudes towards pill taking, and a low level of overall general education (particularly health education) possibly contributes to the W level of awareness, treatment and control of hypertension in Bangladesh.⁵⁵

South Asia mainly focuses on communicable diseases and reproductive health issues Seeping behind non-communicable diseases. Since the cost of secondary and tertiary healthcare facilities is tremendously high and practically less accessible by the general community, preventive approaches are gold-standards for emerging non-communicable epidemics. Focus points for such events are the three prime target areas like diets not healthy inactivity and usage of tobacco. Pragmatic solutions are combined co-ordinated approaches for screening for these diseases.⁵⁶

Justification

Hypertension is a Global health problem now a days it has been an epitome in every part of the world irrespective of color, creed. The occurrence of Pre-hypertension is increasing day by day in every class of society at an alarming rate in both developed and developing countries. But most of the important risk factors of Pre-hypertension and Stage-I Hypertension are preventable if screened properly and proper action is taken at primordial or primary level.

The factors for these problems are gradually developing because of less walking habits, sedentary life, consumption of fast food, tobacco and table salt consumption.

The functional evaluation of the hypertension in people acts as a predictor of cardiovascular events such as myocardial infarction, arterial aneurism and may even lead to stroke and increase mortality and morbidity. So knowledge about magnitude and distribution of hypertension and the factors causing these are necessary for preparation and control of hypertension to provide a healthy and happy heritage for upcoming generation.

In Bangladesh comprehensive population based community study is still inadequate in respect to magnitude of the disease problem. Every year the incidence of PHTN and HTN is increasing. This is really alarming for a developing country like us with limited resources for specialized clinical care for hypertension and heart diseases which is costly, prolonged and inaccessible for most of the peoples divert direct costs to the scarce family and societal resources to medical care.

Hypothesis

Prehypertension and Stage-I Hypertension can be manage by reducing the behavioral risk factors and life style modifications.

Objective

General Objective

The study was conducted to analyze if modification of life style and behavioral risk factors can reduce prehypertension and stage-I hypertension.

Specific Objective

1. To find out prevalence of high pressure among peoples with age more than 18 years.
2. To analyze socio-economic and demographic profile of selected respondents with pre-hypertension and stage-I hypertension in the urban community of old Dhaka City.
3. To intervene pre-hypertension and stage-I hypertension in term of reduction of body weight in over weight or obese peoples, reduction of extra salt intake, increment of physical activity and cessation of smoking.
4. To compare the outcome of risk reduction intervention for hypertension with baseline study.

Conceptual Framework

Independent Variable

Independent Variable

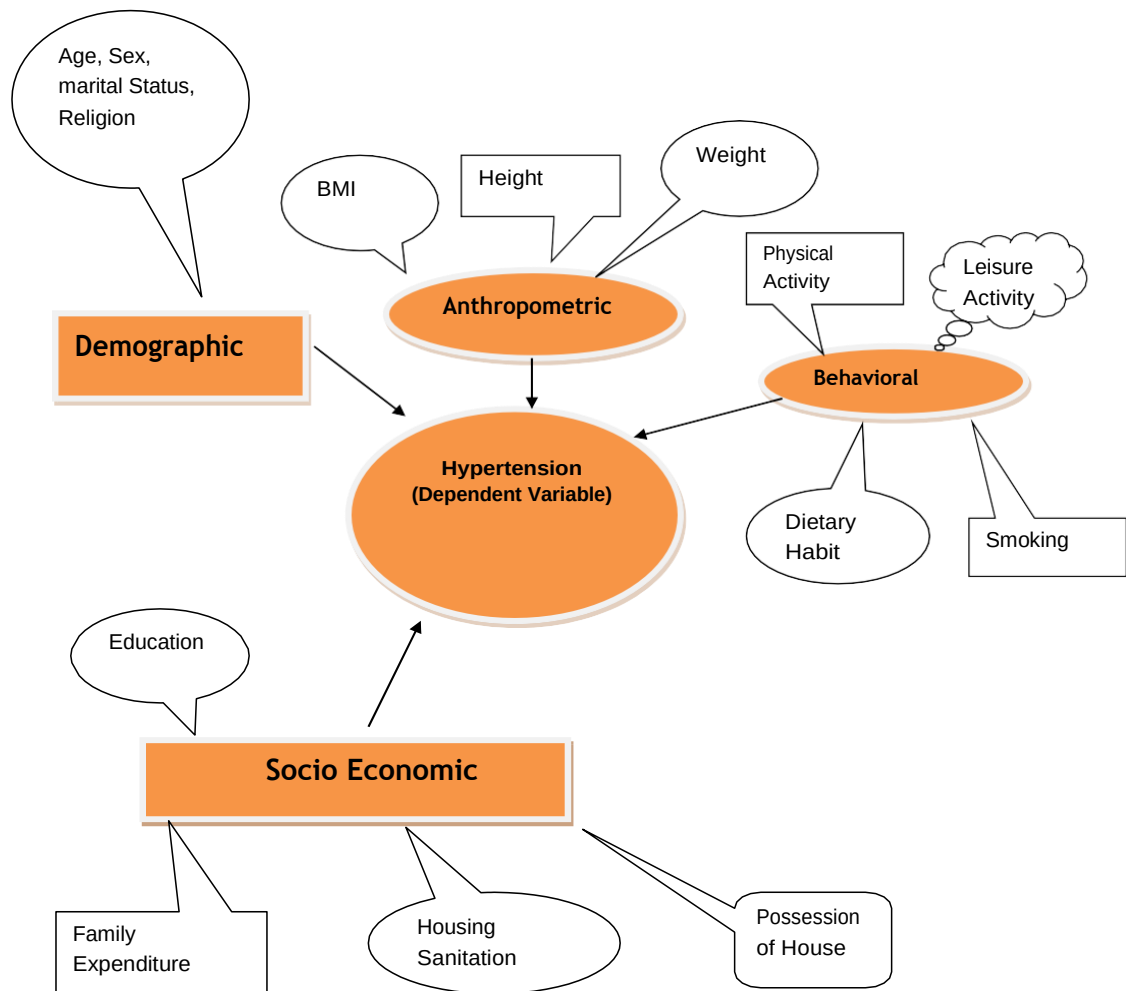


Fig: Conceptual framework for variables

Key Outcome Variables

Dependent Variable

-Blood Pressure

-Systolic Blood Pressure

- Diastolic Blood Pressure

Independent Variable

Anthropometric

- Height
- Weight
- Body Mass Index (BMI)

Demographic

- Age
- Sex
- Marital Status

Behavioral

- Dietary Habit
- Smoking
- Physical Activity-Work time and leisure time

Socioeconomic Status

- Education
- Family Expenditure
- Occupation

Operational Definition

AGE : Similar to MONICA data analysis, age has been defined as the age in full years on the data of examination. National ID card was the endorsed document. If the year of birth was unknown, the observation was correlated with national or social events and testified with ages of relatives or other family members. If the month was unknown, the day and month were replaced by 30-06. If the day was unknown, it was replaced by 15.

HYPERTENSION : Systolic blood pressure ≥ 140 mmHg or diastolic blood pressure of ≥ 90 mmHg or patient with antihypertensive medication.

STAGE-I HYPERTENSION: Systolic blood pressure 140-159 mmHg or diastolic blood pressure of 90-99 mmHg without medication.

PRE – HYPERTENSION : Systolic blood pressure of 120 -139 mmHg or diastolic blood pressure of 80-89 mmHg and patient without antihypertensive medication.

PHYSICAL ACTIVITY : Modified Baecke model was followed with average activity more than 10 continuous minutes at sport, leisure score and work score and WHO approved model of hypertension group I.e. sedentary, mild level of physical activity and moderate or greater level of physical activity^{57,58,59}

BMI : Body mass index (BMI), an index for weight for height, is defined as weight in kilograms divided by height in meters squared. Global classification of BMI, with normal range 18.5 to 24.9 kg/m², for universality of the study finding. But the range for acceptable, normal or optimum BMI Asian population has been narrowed to 17.5 – 22.9 kg/m² by WHO except committee⁶⁰ has been considered in this study.

Limitation

Community level study is always challenging for the researcher in developing countries. Door to door data collection was very tedious job. Peoples of this area are mostly out door job oriented. Hence in many cases male adult members were not available at home. On Fridays peoples had guests at their home or they became guest themselves elsewhere while on week days they were naturally tired with day long office job and did not expect any body to share their relax time at home after office work.

A very difficult variable was the monthly income. Most of the people hesitate to provide any data because of the apprehensive of data transfer to the income tax department hence the variable was replaced by annual expenditure variable which was little bit better.

Data collection regarding tobacco consumption was again a very difficult issue. The reason varied in different cases. But common causes were :

- a) In Bangladeshi culture, smoking is not taken as a good behavior and hence many persons normally do not want to share history.
- b) This Data were taken at the home setting youngsters at home did not admit smoking in front of other members of the family.
- c) The promulgation of anti-smoking act peoples tried to decline to talk on it scaring any legal connection of this study .
- d) Waist Hip Ratio measurement is another important variable that the researcher had to exclude from the questionnaire (after pre-testing) because of low and

negative respondent compliance during pre-testing . Use of hormonal contraceptives data as person using contraceptive was not included in the study.

- e) The sample size of the study might not hear very big and operated in a single centre but met WHO criteria for intervention study. .Another option for a better model would be if a control group could be taken. However, in spite of all the limitations, the study was try to make epidemiologically more valid and more reliable.

Chapter-2

Literature Review

Literature Review

Rational staging of blood pressure is very essential to assist early case identification and management before occurrence of any catastrophe. Blood pressure staging into mid, mature and severe hypertension according to the degree of blood pressure elevation makes less sense if the total scenario is considered. These terms do not truly represent the severity of the overall risk to the patient, rather reflects simply to the extent of the blood pressure elevation at the very time of the assessment. Rate of progression of organ damage like hypertrophy of the cardiac chamber (s), heart failure, retinal changes, disease of arteries cerebrovascular disorders, and nephropathies varies individually depending upon many still in complete understood factors. The risk factors include tobacco consumption physical inactivity and unhealthy habit. Emerging hypertensive risk factors like low birth weight, folate deficiency and infection are also more frequent coming from the economically compromised people in low and middle income generating countries like Bangladesh. This way the prevalence and influence of hypertension in developing countries is rising rapidly.^{10,11,20,21}

World Health Organization international Society of Hypertension Grading.

World Health Organization international Society of Hypertension (WHO-ISH) previously defined for diagnostic purposes as a systolic pressure equal to or greater than 160 mm Hg and or a diastolic pressure ≥ 95 mmHg. In 1999 AD WHO-ISH amended the definition and changed the sensitivity level of the diagnostic criteria for hypertension WHO-ISH redefined hypertension as a level of systolic blood pressure of 140 mm Hg or above and/or a level of diastolic blood pressure of 90 mmHg or above. It is externally important to confirm the diagnosis by repeated, accurate measurements over a period of time the duration of which is influenced by repeated, accurate measurements over

period of time the duration of which is infect by the perceived risk to the patient. WHO recommended that blood pressure is to be measured at least trice before declaring hypertension. If the difference beaten the two measurements exceeds more than 10 mm Hg a third measurement is required to confirm the diagnosis.³⁶

Blood pressure grades are describes as-

Table-1 : WHO grading of blood pressure for adults (18 ≥ years)

Classification of BP	Systolic BP (mmHg)		Diastolic BP (mmHg)
Optimal Blood pressure	< 120	and	< 80
Normal Blood pressure	120 – 129	and/ or	80 – 84
High Normal Blood pressure	130- 139	or	85 – 89
Grade-I Hypertension (Mild)	140-159	or	85 – 89
Grade-II Hypertension (Moderate)	160-179	or	100 – 109
Grade-III Hypertension (Severe)	≥180	and	≥110
Isolated Systolic Hypertension	≥ 140		< 90

Joint National Committee (JNC-1) Seventh Report

The seventh report of the Joint National Committee (JNC-7) on prevention, Detection, Evaluation and investment of High Blood pressure under auspices of the US Department of 110th and human services has given a new dimension to the classification. Cost Emory and treatment approach to high blood pressure in this report, a new group pre-hypertension has been introduced. This classification before to the population 18 years of age or older based on two or more properly measured, seated blood pressure reading on each of two or more setting³⁹

Table-II JNC-1 Classification of blood pressure of adults' ≥ 15

Classification of BP	Symbolic BP		Diastolic BP
	mm Hg		(mmHg)
Normal	< 120	and	< 80
Pre hypertension	120-139	or	80-89
Stage I hypertension	140-159	or	90-99
Stage II hypertension	≥ 160	or	≤ 100

Measurement of Blood Pressure

Principle of Measurement

Blood pressure is usually measured indirectly with a small, portable instrument called sphygmomanometer measures pressure. The instrument measures blood pressure using the impulse of pulse beat. It consists of an air pump a pressure gauge and a relive cuff. The instrument registers the blood pressure in units called will inciter of mercury (mm Hg)

The cuff is placed around the upper arm and inflated to block the flow of blood in the brachial artery travelling through the arm. Then the air in the cuff around the arm is gradually released. With deflation of the cuff, the first appearance of pulsation is heard with stethoscope put over the brachial artery. This is the systolic blood pressure when pulsation sound becomes inaudible through stethoscope it is called diastolic blood pressure.

Mercury sphygmomanometers are one ideal after standard digital devices. Aneroid devices are cheap and portable, but answers need to be trained in the auscultator technique. They are read sphygmomanometers need to be calibrated every six months regardless the type of sphygmomanometer used-mercury, aneroid or automated the inflatable bladder has to be selected to suit the circumference of the arm in which blood pressure is being measured. Inappropriate small bladder will give falsely high reading, and inappropriately large bladders will give falsely low blood pressures. The width of the bladder should be 80% of the arm.

World Health organization international Society of Hypertension (WHO-ISH) recommends blood pressure to be recorded on right arm two times after a brief rest of

five minutes sitting e legs uncrossed. Arm cuff size specification entails small, medium, large and extra large size for 17-22 mm, 22-32 mm, 32-42mm >42mm arm circumferious respectively.⁶¹

Blood pressure recording recommendation for national institute of clinical excellence in the United Kingdom is very cam did and precise. The recording environment is maintained as much patient friendly as possible with the patient seated relaxed with arm out stretched and supported in line with mid-sternum. The cuff is then wrapped correctly around the upper arm with an appropriate sized bladder to a monoester. Brachial pulse palpated in the ante cubital fossa of that arm.

The cuff is inflated rapidly 20 mmHg above, disappearance of brachial pulse. The cuff is the deflate and approximate systolic pressure is noted when the pulse re-appears. The cuff is re-inflated 20 mmHg above the point at which the brachial pulse disappears seethes cope is placed one the brachial arty with no intervening clothes between skin and cuff. Cuff is slowly deflated at the rate of 2-36 mmHg per second listening for karat cuff sounds. For repeating the measurement, deflate the cuff when the sounds disappeared. When possible, readings are taken at the beginning and end of consultations.⁴¹

Prevalence of Hypertension

WHO-life course perspective

Poor nutrition at different stages of gestational or fetal life is linked with increased rates of cardiovascular disease and non-insulin-dependent diabetes as adults. Many of these babies may have intrauterine growth retardation, some are small for date, some may be thin at birth, and some fail to gain weight in infancy. When these babies get thick at adult age they are more prone to suffer from high blood pressure. In addition to low adult socio-economic position, low childhood socio-economic position, too, has often been found to be associated with high blood pressure in later life. In developing countries, blood pressure patterns are tropically assumed and found to show marked rural-urban differences with levels considerably higher in urban populations and among higher socio-economic groups. CRISIS study coronary Risk of Insulin sensitivity in Indian subjects in India found hypertension prevalence to be highest among urban middle class population 12-14% much lower prevalence in urban slum dwellers 3.87 and the lowest prevalence in rural populations 2.4%. Evidence from Nigeria, Tanzania and the Gambia, similarly shows significantly higher levels of hypertension in urban compared to rural areas and in the higher socioeconomic groups. In urban China, for example blood pressure was found to be highest among those with lowest socio-economic positions. In South Africa similarly, blood pressure levels were not found to simply rise with degree of urbanization. Rather, the highest levels were found among newcomers to cities living in informal settlements. The lowest levels were in fact, found in the most urbanized group.⁶²

Multicentre meta-analysis of survey in North America and Europe with sample size ranging from 1800 to 23100 response rates 87.51 were analyzed to provide age specific and age adjusted estimates of BP and hypertension prevalence. Average BP Was found 130/83mm Hg in the European courtiers and 127/77 mmHg in Canada and the united status among man and women combined who were 35 to 74 years of age. In the analysis age and sex adjusted prevalence of hypertension was 28% in the North America countries at the 140/90 mmHg there hold⁶³.

National health survey 2006 shared the prevalence of high blood pressure to 33.5% among male and 28.8% among females. Proportion with high blood pressure is similar among men but decreased⁶⁴.

Prevalence study in Bangladesh.

Several studies were done by researchers' Hague Ali Islam and Malik indifferent perspective and geographical locations indifferent times to find out the magnitude of CUD in Bangladesh. ^{15,16,17,18}Hugue and Ali it al 2008 conducted a cross sectional server on 2,625 subjects male 1,277,48.6%; 1,348,51.4% between may 2007 and November in urban Dhaka. Mean age of the respondents was 35.8 2.7 years with mean weight 60.7 +_ 11.3 kg and BMI 23. _+ 3.9 kg2m2 Mean systolic blood pressure was 79.1 _+ 10.3 mmHg. About 23.8% people were found to have hypertension 5.8% stage 1 hypertension and 18% stage 1 hypertension on with medication according to Jn-7 criteria.²⁵

In Bangladesh karim et al July 2004 study the prevalence of hypertension among 230 low income group fourth class employees of or their family members Dhaka medical college and hospital campus. The study was done during the period may to June 2000. The mean age of the respondents was 31.62 years. The overall prevalence of hypertension Blood pressure more than 140/90mmHg was found to be 13.04% In 15.65% people isolated diastolic blood pressure was above 90 mmHg. About 91.3% hypertension did not practice physical exercise, 8.64% took extra table salt during meal and 36% of respondents were found to be habituated with betel leaf and chewing tobacco. About 73.91% people were found to be suffered from differ grades of anxiety and tension⁶⁵ among women compared with scenario of 2003 34.3% to 33.5% among male vs 30.1% to 28.8% among female proportion of untreated hypertensive's decreased from 2003 to 2006 22.6% to 20.4% among male and 16.5% to 13.8% among female while proportion of controlled hypertension increased for both sexes (5.2% to 6.4% in male vs 5.6% to 7.6% In female)⁶⁰.

About prevalence of hypertension quite a large number of studies were done in India in different time and geographical setting. Chopra 1942 Performed one of the earliest studies in the general population. Since then number of studies have been published. There serial epidemiological studies during 1994, 2001 and 2003 criteria $\geq 140/90\text{mmHg}$ to demonstrate rising prevalence of hypertension 30% 36% and 51% respectively among males and 34% 38% among 51% among females in Jaipen Hazarika et al 2002 reported 61% prevalence among adult aged ≥ 30 years in Assam⁶⁶. Another study in 2000 AD among the ≥ 40 years urban Chennai population reported a high prevalence of hypertension 54% among low income groups monthly income $<\text{Rs } 30000/\text{annum}$ and 40% prevalence among high income group monthly income $>\text{Rs } 60000/\text{annum}$ ⁶⁷.

A cross sectional study was conducted by Alamgir et al 2004-2005 among randomly selected 493 peoples of aged 18-64 years to find the mean blood pressure of the community to be $124/80\text{mmHg}$. Prevalence of hypertension was 27.6% according to JNC 7. Mean body weight of the while study subject was 60.6 ± 11.3 kg. while mean height was $161.5\text{cm} \pm 8.7$ mean body mass index BMI was 23.23 prevalence of smoking, tobacco was 13.8% Blood pressure was found to relate with increasing age. Blood pressure was found to rise with increment of body weight BMI and high blood pressure were related significantly. Quantity of tobacco intake less affected blood pressure to rise⁶⁵.

Intervention of Hypertension

Life style modification WHO-ISH recommendation

WHO ISH recommended certain universal guidelines in 2003 where importance has been given on lifestyle modification unanimously for every individual for management of hypertension. In different clinical trials lifestyle modification sleight loss in the overweight physical activity moderation of alcohol intake, diet wealth increase and fresh fruit and vegetables and reduce saturated fat contest, reduction of dietary salt intake, and increased dietary potassium intake, have been showmen to lower BP and to reduce the incidence of hypertension.

The overall untidy extensive effect of life style interventions varied with the patients adherence to therapy which adherence is optimal systolic blood pressure has been reduced by more than 10 mmHg. Trials to evaluate the effect of lifestyle interventions on levels of blood pressure home not been designed or powered to evaluate reduction in overall or conidia scalar mortality or morbidity.

In addition to their possible influence on blood pressure, observational studies home found that other lifestyle modifications, in particular cessation of smoking reduce cardio vascular disease mentality further more unlike drugs therapy, which may cause adverse effects and reduce the quality of life in some patients, non pharmacological therapy has no known harmful effects rather it improves the sense of well being of the patient and is often less expensive⁶⁸.

USA Joint National Committee- 7th Report 2003

All the authorized schools of hypertension study recommends lifestyle and behavioral risk factor intervention as the first step intervention before and along with application of pharmacological preparation for inter citing progress of high blood pressure. Joint notional commission recon needs intervention like

Table III recommended approach to manage BP in adults' ≥ 18 years (adopting JNC-7)

Classification of High Usage	Systolic BP	Diastolic BP	Lifestyle	Drug
BP	mm Hg	mm Hg	Modification	
Normal	<120	and <80	Encourage	
Pre hypertension	120-139	or 80-89	Yes	
Stage I Hypertension	140-159	or 90-99	Yes	
Stage II Hypertension	≥ 160	or ≥ 100	Yes	

JNC-7 Categorically describes the positive beneficial effects of lifestyle modification for reducing blood pressure and thus decreasing cardiovascular risks in hypertension patients major events of lifestyle modification related to reduction of blood pressure are reduction of body weight in overweight or obese individuals adaptation with recommended Dietary Approaches to stop hypertension eating plan as per locally available pendent diet rich in potassium and calcium, reduction of datary sodium intake, increment of physical activity and moderation of alcohol consumption³⁸.

JNC-7 report also highlighted study results in favor of quantitative reversal of blood pressure with reduction of extra body weight through dietary control in conformity to the Dietary Approach to stop hypertension regime.

Recommended life style modifications to manage hypertension (from JNC-7)

Modification	Recommendation	Approximate sBP reduction
Weight reception	Maintain normal body weight BMI 18.-24.9	2-20 mm Hg 10 kg weight 055
Adopt DASH eating plan	consume a diet rich in fruits vegetables and low fat dairy products with a reduced content of started and total fat	8-14 mmHg
Dietary sodium Reduction	Reduce dietary sodium intake to no more than 100 Meg/L 2.4t sodium or 6g sodium chloride	2-8 mmHg
Physical activity	Engage in regular aerobic activity such as brisk we liking cat least 30 min body most days of the week	4-6 mm Hg
Moderation of Alcohol	Limit consumption to no more than 2 drinks/ day(1 oz or 30 ml ethanol, e.g 24 oz beer, 10 oz wine or 3oz 80- proof whiskey in most men and no more than tan 1 drink/day by women and lighter-weight men.	2-4mmHg

In all cases cessation of smoking is recommended because of its multi-organ ill- effects.

British National Institute for clinical Excellence NICE of United Kingdom.

British National Institute for clinical excellence NICE of United Kingdom National health services published clinical guideline 18 Hypertension to provide a uniform effective and efficient care to patients. The guidelines animals at reduction of CVD complications. It encourages healthy low calories diets form hypertensive patients and thus about 5-6mmHg of systolic and diastolic blood pressure could be reduced in trails. Almost 40% of patients were estimated to be able to reduce systolic blood pressure of 10 mm Hg or more in the short term period of year multiple lifestyle interventions were estimated to achieve a reduction in systolic blood pressure of 10 mmHg or more in the short term up to yeas in about 25% trial peoples. The guideline recommends that a healthiest lifestyle may reduce, delay or remove the need for long term drug therapy in certain proportion of patients by lowering blood pressure and thus reducing risk of cardiovascular disease⁴¹.

British Hypertension Society

British Hypertension Society Guideline for hypertension management describes clearly about the pattern of hypertension case management with also the predicted outcome and further interventions strategies. The guideline recommends non-pharmacological advice to all hypertensive people. This measure may delay or remove the need of drug treatment or at least reduce the dose or number of pharmacological preparations to control blood pressure. Such measure is recommended to continue during the initial 4-6 months period in patients with mild (stage-I) hypertension but with no complication

or end organ damage. Good evidence from trials shows lowering of blood pressure with such lifestyle modifications^{34,35}.

Life style modification American Heart Association model

Life style modification refers to certain specific recommendations for changes in dietary habit and doing exercise such modifications can lower the blood pressure as well as improve the patients well being and response to blood pressure medications. Dietary changes include restricting salt, planning healthy diet and avoiding excess alcohol intake.

The American Heart Association recommends that the consumption of dietary salt should be less than 6 grams of salt per day in the general population and a lower level for example, less than 4 grams for people with hypertension. To achieve a diet containing less than 4 grams of salt, a person should not add salt to their food or cooking. Also, the amount of natural salt in the diet can be reasonably estimated from the labeling information provided with most purchased foods^{40,63}.

Steps for life style modification intervention

Life style modification has been found effective by research of department of community and family medicine in the university of Missouri Kansas city, USA for the prevention and treatment of hypertension³¹.

Life style modification can reduce the blood pressure by observing certain steps. The intervention can be given by ascertaining patients diet and exercise, patterns because a healthy diet and regular exercise can reduce blood pressure. Appropriate guidance and written or audiovisual materials are offered to promote lifestyle changes, education about life style on its own is unlikely to be effective.

- In overweight individuals with raised blood pressure, healthy low calorie diets was found to reduce blood pressure on average by about 5-6 mmHg in trials. About 40% patients could achieve systolic blood pressure reduction ≥ 10 mmHg up to 1 year.
- Doing aerobic exercise like brisk walking jogging or cycling for 30-60 minutes 3 to 5 times week can reduce 2-3 mm Hg blood pressure. About 30% of patients could achieve systolic blood pressure reductions ≥ 10 mm Hg up to 1 year.
- Combined exercise and diet reduced 4-5 mmHg blood pressure in trials. About 25% patients receiving multiple lifestyle interventions could achieve systolic blood pressure reduction ≥ 10 mmHg. up to 1 year.

Relaxation therapies could reduce blood pressure and individual patients may like to adapt these as part of their treatment .

Chapter 3

Methodology

Method & Materials

Case selection for study :

The selection was done as per inclusion and exclusion criteria.

Inclusion criteria :

1. Living in these area (Laxmibazar, and Kaltabazar,) of old Dhaka city at least for last 6 years and having no plan to leave within next 2 year.
2. Having age between 18 years at last birthday to 64 years old.
3. Presenting with pre-hypertension &stage-I hypertension ; but taking no medicine.
4. Willing to participate into the study with informed consent.
5. Regular follow up possible.

Exclusion criteria :

1. Stage-II hypertension.
2. Hypertension already on medication.
3. Family history of premature CVD
4. Pregnant mother
5. Patients having features or history of any CVD, cardiac or renal complication
6. Having any evidence of end organ damage eg-kidney, heart etc.
7. Any sever life threatening diseases unrelated to hypertension.
8. Any clinical suspicion for secondary hypertension due to renal, endocrine or other reasons like medication etc.

Study Design :

The quasi-experimental study (before-after type) was carried out by dividing into 03 destine phases. These phases were discrete in nature but very much interdependent in respect of total methodology. The phases were-

Phase-I - Case identification of survey phase-

This passé of research was dedicated to find out hypertension respond dents of age (18-64) years from the community through home to home visit in the study area. Their blood pressure was measured following WHO recommendation for MONICA available in website for general use. They were screened for any audience of end organ damage. Respondents with any co-morbidity were not selected for intervention.

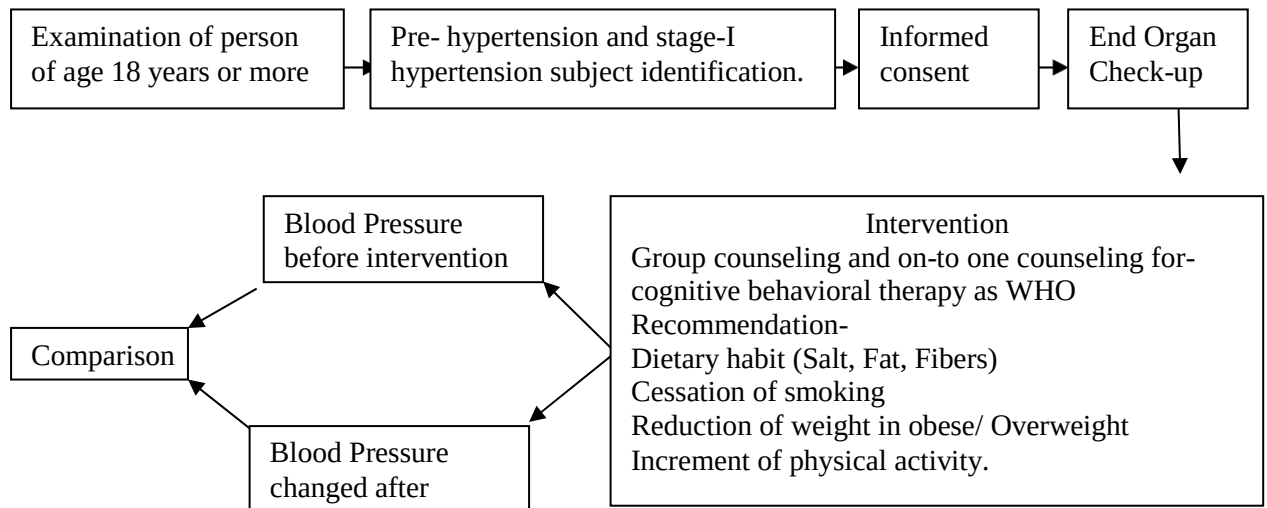
Phase-II - Intervention phase

This phase was designed to give one to one counseling to the pre-hypertension included into the study through prefixed criteria an comprised of health educations session for reduction of salt intake, increment of physical activity and cessation of tobacco consumption. Study or intervention end points meant drop out, migration of study subject or entering any point noted into the exclusion criteria. No incidence of death happened during study period.

Phase-III- Evaluation phase

It was a factorial design to monitor and test statistically the outcome of interest i.e. change of blood pressure, individual impact of physical wellbeing as expressed by the patients, weight reduction, increment of the duration of physical activity and cessation of tobacco consumption. Evaluation was done 6 months after starting the counseling intervention

Study Design



Study Type :

The study was a community Trial type of intervention study. A true intervention design has three criteria to fulfill-randomization, manipulation & control. This study has no match control group. This was rather a before after model of Quasi-experimental study type with non-pharmacological approach as the intervention or manipulation.

Study area :

The place of this study were laxmibazar, and Kaltaabaar, under Sutrapur thana of old Dhaka city of Bangladesh.

Study Period :

The total study period was August 2013 to October 2015 .

The sampling technique :

Sample were collected by Judgment or purposive sampling technique.

Study population :

Age between (18-64) of both sexes.

Sampling size : $150 (n = Z^2 pq/d^2)$

Data collection tools :

Data collection tools were semi-structured questionnaire , check list and informed consent form & equipment for anthropometrical measurement of relevant clinical examination like-

- Littman classic-II stethoscope
- Aneroid sphygmomanometer
- Measuring Tape
- Weight measure ling machine.

Data Collection methods :

Face to face interview was taken with the study subject, clinical & anthropometric examination was done

Methods of measurement :

Procedure of BP Measurement :

Measurement of Blood pressure was done as per WHO protocol. Machine was calibrated at the beginning of the day. Blood pressure was measured at the home setting with comfortable room temperature without background noise, without tension of muscles or bladder. Respondent was advised to take rest on a chair for 5 minutes immediately before readings. Blood pressure was not taken if respondents consumed nicotine or alcohol within half an hour before recording. The person's legs uncrossed without talking. Back of her/his arm had support in such position that middle of the cuff on the arm was at the level of the right atrium^{65, 66}. Respondent the cuff area of the arm. Proper size cuff was wrapped around arm above antecubital fossa. The cuff bladder was inflated rapidly, with 3 fingers on radial pulse, up to 20mm of Hg above the level when pulse could not be felt. The cuff was deflated at the rate of (2-3) mm of Hg per second. Approximate systolic pressure was noted when the pulse re-appeared. The cuff was re-inflated 20mm of Hg above that point putting the stethoscope on brachial artery as much inner of the cuff as possible. Korotkoff sound phase-1 was considered for systolic Phase-V for diastolic blood pressure. Blood pressure was measured initially at both arms. A second reading on right arm was taken after 5 minutes. If the difference between the two readings were more than 5 mm of Hg, a third reading was taken again

at right arm after another 5 minutes of relaxation. The mean value of the right arm readings were taken as the blood pressure of the individual up to 2 mm of Hg. In case of any confusion, a second day visit was scheduled to measure BP again; Blood pressure was also measured in standing posture if required. If BP fall was more than 20/10 mm of Hg on standing from sitting, that case was excluded from study and was referred to consultants.

Validation of BP machine

The blood pressure machine and other parameter was tested for accuracy before every measurement. This was in conformity to the globally accepted protocol. Devices were recommended for approval if BP reading was within 5 mmHg difference for at least 50% of reading. Validation of aneroid machine was done by comparing the reading with a standard machine with the needle set at zero point before the cuff is inflated and returned instantaneous at zero after deflation⁶⁵.

Height Measurement protocol

The study subject was asked to-

1. Remove shoes socks, slippers & any head wear (hat, cap etc)
2. Stand on the board facing forward with feet put together, heels, against the black board and knee straight.
3. Look straight ahead in the Frankfurt plane (the eyes are the same level as the ears) & not to look up.
4. Height in cm was recorded to the top of head.

Weight measurement protocol:

The scale was placed on a firm & flat, surface after calibration at the beginning of the day (not on a car mat or a sloping surface)

Measuring weight using the measuring scale.

1. The respondent was inquired and re-understand to make the bladder and bowel empty.
2. She/he was then asked to remove footwear and socks.
3. She/he requested to put off dressed as much as possible.
4. She/he was to step on a scale putting one foot on each of the foot prints.
5. The respondent was asked to stand still facing forward and arms on the side and wait until told to step off.
6. The weight was recorded in kilograms.

Measuring Physical activity as continuous Score as per IPAQ Scoring protocol.

Expressed as MET-min per week; MET level x minutes of activity x events/ weeks.

Table-Physical activity conversion to MET

Activity Type MET : Formula Code		
Light (Walking)	3.3 : 33x Min of activity x no. of days/ weeks	LMET
Moderate	4.0 : 40 x min. of activity x no. days / weeks	MMET
Vigorous	8.0 : 80 x min. of activity x no. days/ weeks	VMET
Total (LMT+MMET+VMET)= MET-MIN/WK		

Data analysis and interpretation :

The collected data were checked to exclude any error statistical by using SPSS 20.0 programmed.

Chapter-4

Results

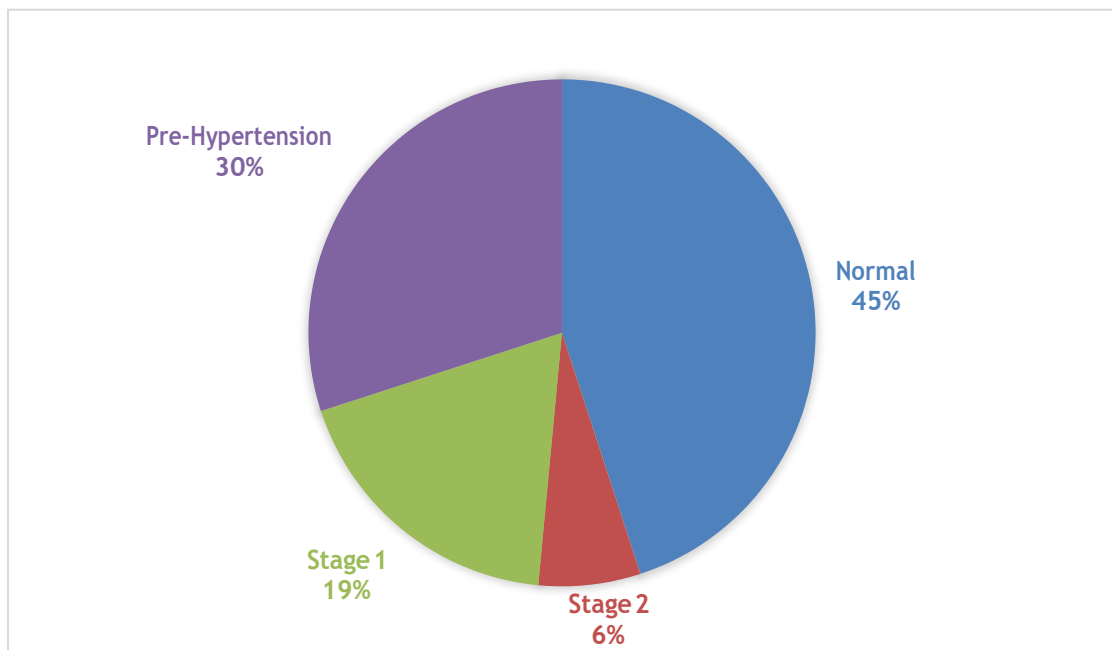
Pattern of Blood Pressure at baseline study

Blood Pressure measurement catering is done among 310 adults population. Among them 45% Respondents are found to be normal according to JNC-7 Criteria (Fig1).

30.0% Respondent suffer from Prehypertension and 19% suffer Stage-I

Hypertension. Rest of 6% suffer stage-II Hypertension or they take antihypertensive drug. Intervention was given on 150 respondents with Pre-hypertension and Stage-I hypertension .

Figure 1: Distribution of respondent by Blood pressure n=500



Age and sex of the respondents.

Data analysis shows maximum 37 male developed PHTN and Stage-I HTN between (35-44) age group & 21 female developed between (25-34) age group.

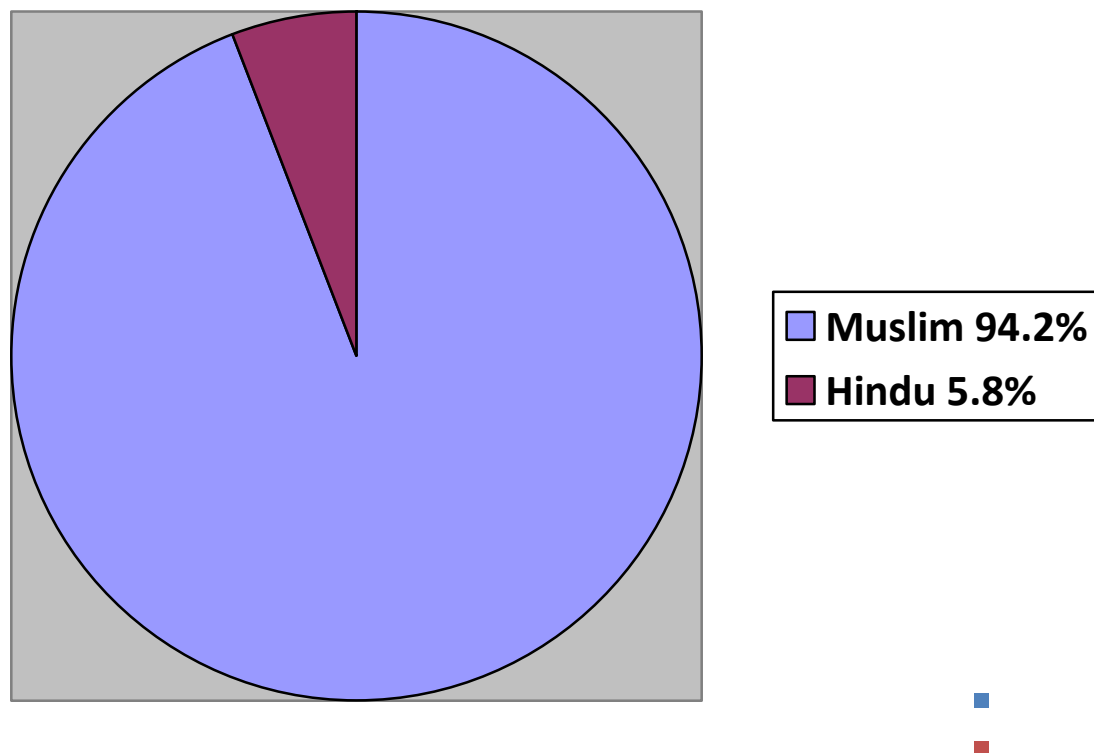
Table-1: Age and Sex of the respondents by age and sex

Age	Male	Female	Total
18-24	21	6	27
25-34	36	21	57
35-44	37	18	55
45-54	5	0	5
55-64	5	1	6
Total	104	46	150

Religion

Data analysis reveals 141 (94.2%) Islam; 9 (5.8%) Hindu of the Pre-hypertensive and Stage-I Hypertension respondents.

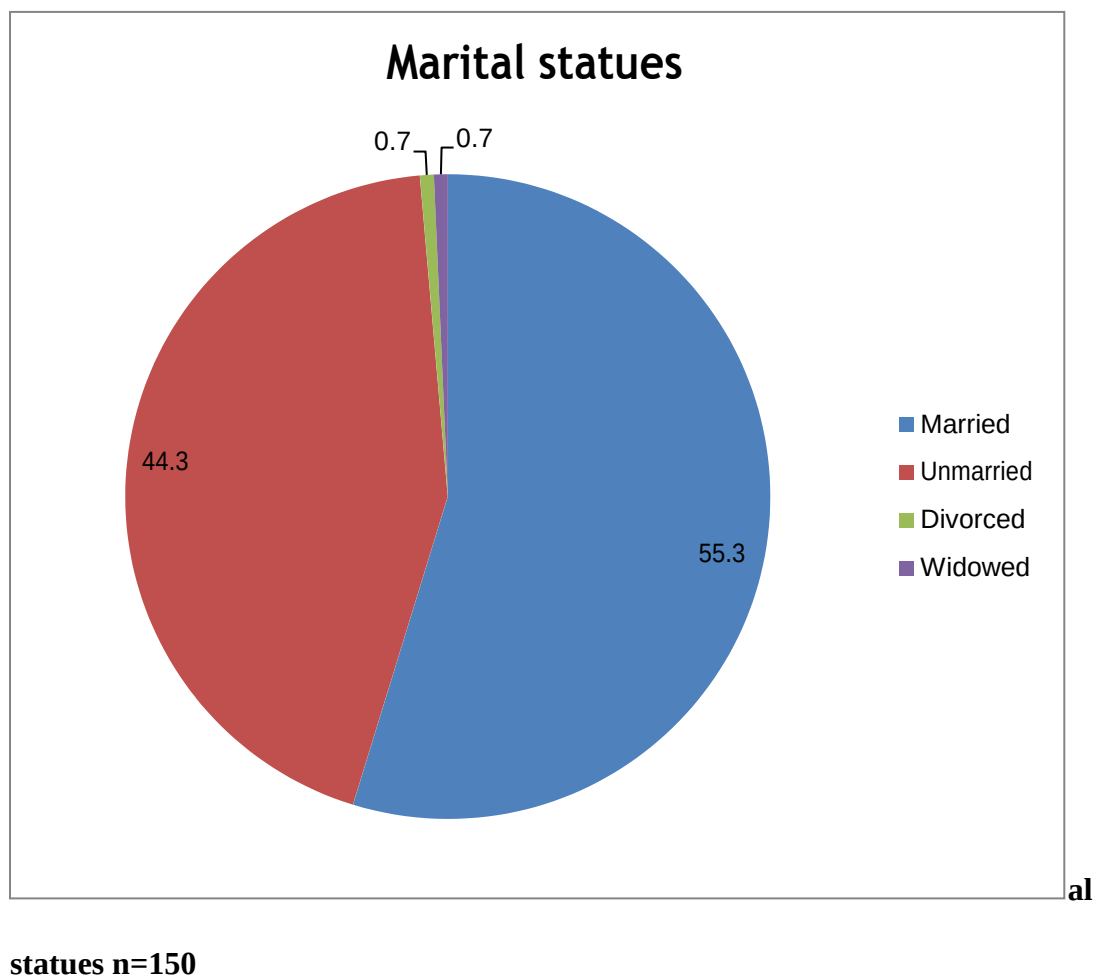
Figure-2: Distribution of PHTN and HTN by religion



Marital Statues

Data analysis reveals Married 83 (55.3%), Unmarried 65 (44.3%), Divorced 01 (0.7%), Widowed 01 (0.7%) for marital statues.

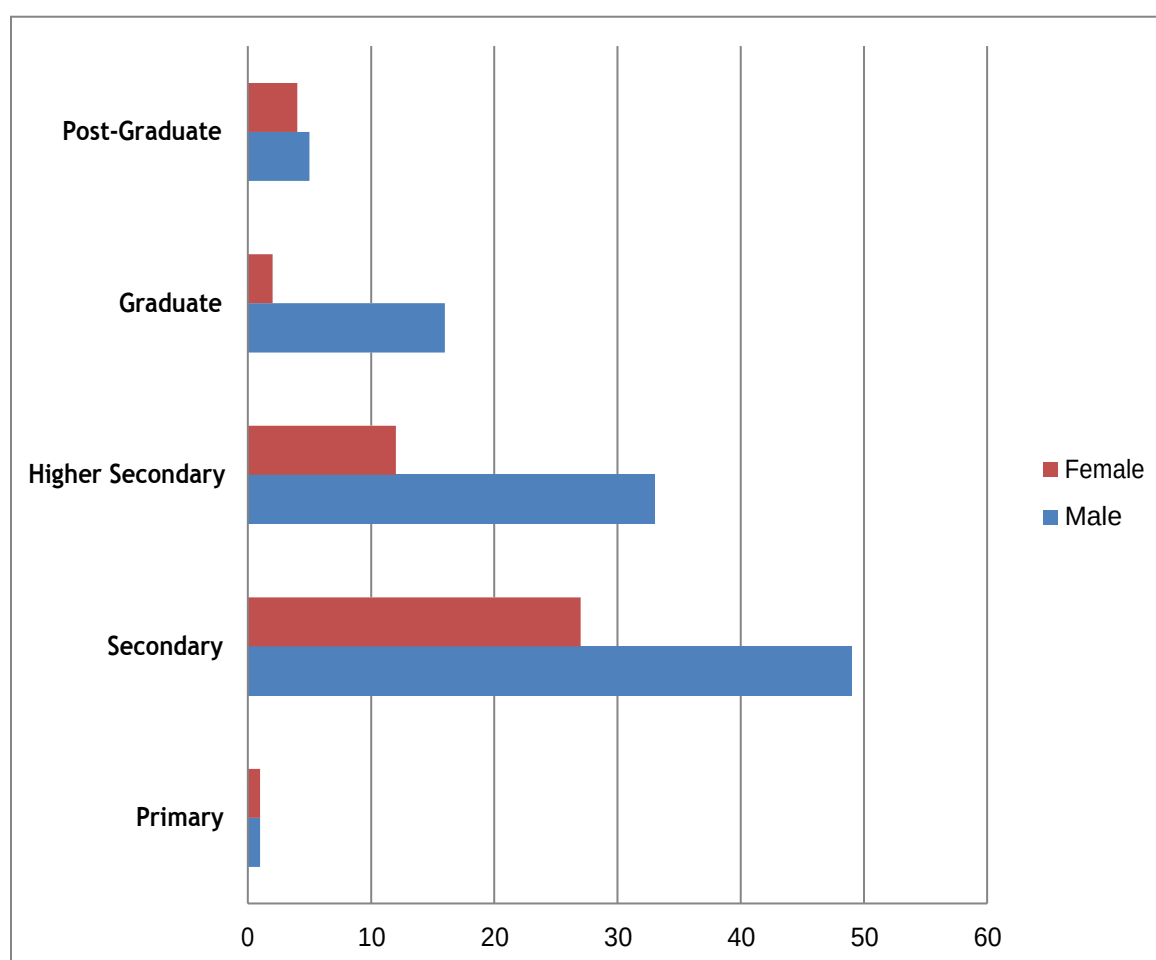
Figure-3: Distribution of PHTN & Stage-I HTN by Marital status



Education-sex

Regarding educational statue Primary Male (01);Primary Female (01), Secondary male (49); Secondary female (27), Higher secondary male (33); Higher secondary female(12); Graduation male (16); Graduation female (02), Post graduation male (05); Post graduation female (04).

Figure-4: Distribution of PHTN &Stage- I HTN by Education-sex.



Annual expenditure

Mean of annual expenditure of the respondent. Tk. 400000-600000 is found in 45.3% of the cases as yearly expenditure. Annual expenditure of <2 lakh-5(3.3%), 2-4 lakh-18(12%), 4-6 lakh-68(45.3%), >6 lakh-59(39.3%)

Table-2 : Distribution of PHTN &Stage- 1 HTN by Annual expenditure n=150

Annual Family Expenditure (Tk.)	Number	Percentage (%)
<2,00,000	5	3.3
200000-400000	18	12
400000-600000	68	45.3
>600000	59	39.3

Main Occupation

Distribution of the frequency and category of the main occupation is shown in the table. It shows that Business were more sufferer from PHTN & Stage I HTN comprising 51 (34%), after businessman service holder were sufferer 40 (26%) Labor 05 (3.5%), Housewife 26 (17.3%), Student 24 (16%), Other For occupation 04 (2.7%).

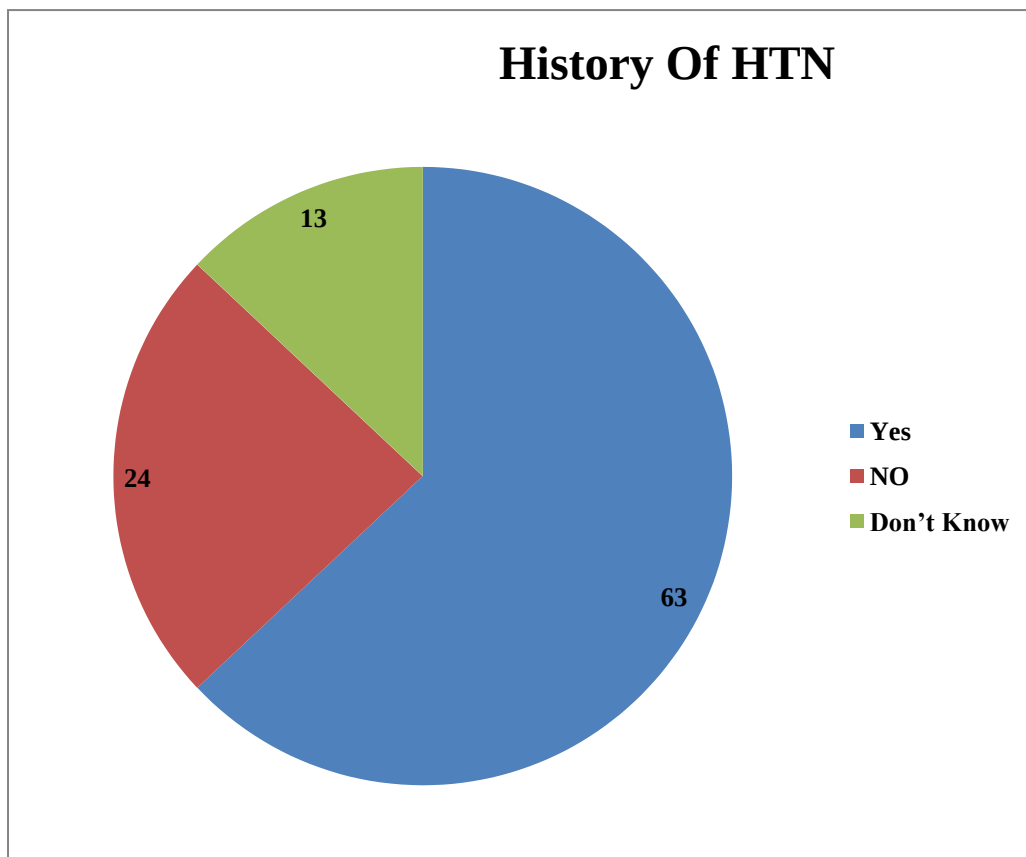
Table-3: Distribution of Respondents by Occupation n=150

Parameter(Occupation)	Frequency	Percentage
Business	51	34
Labourer	5	3.3
Service	40	26.7
Housewife	26	17.3
Student	24	16
Other	4	2.7
Total	150	100

History of hypertension

Positive History of High Blood Pressure among first degree family member is found among 63% (94) . Respondent with PHTN & Stage- 1 HTN at baseline study where no relation is found among 24% (36) Respondent. 20 respondents (13%) could not reply definitely. One sample T test results shows significant ($t=19.61$, $df=281$ and $p > 0.001$) between positive and negative response for family history.

Figure-5: Distribution of Respondents by History of Hypertension n=150



Food habit

Data analysis reveals rich fast food and soft drinks intake preference of 55 (36.6%) , vegetable 33 (22%), Homemade food 31 (20.7%) and mixed preference 31 (20.7%) for food habit.

Table-4: Distribution of Respondents by food habit and preference

Criteria	Number	%
Rich Fast Food	55	36.6
Mixed Food	31	20.7
Vegetable Preference	33	22
Homemade food	31	20.7

Note : More than 99% of people use soya been oil

Food Preference

Among 150 pre-hypertensive and stage-1 hypertension respondents 86.7% liked carbohydrate, 70% liked protein, 72.7% liked fat, 48.7% vegetables and 53.3% liked fruits.

Table-5: Type of food mostly liked by the respondents

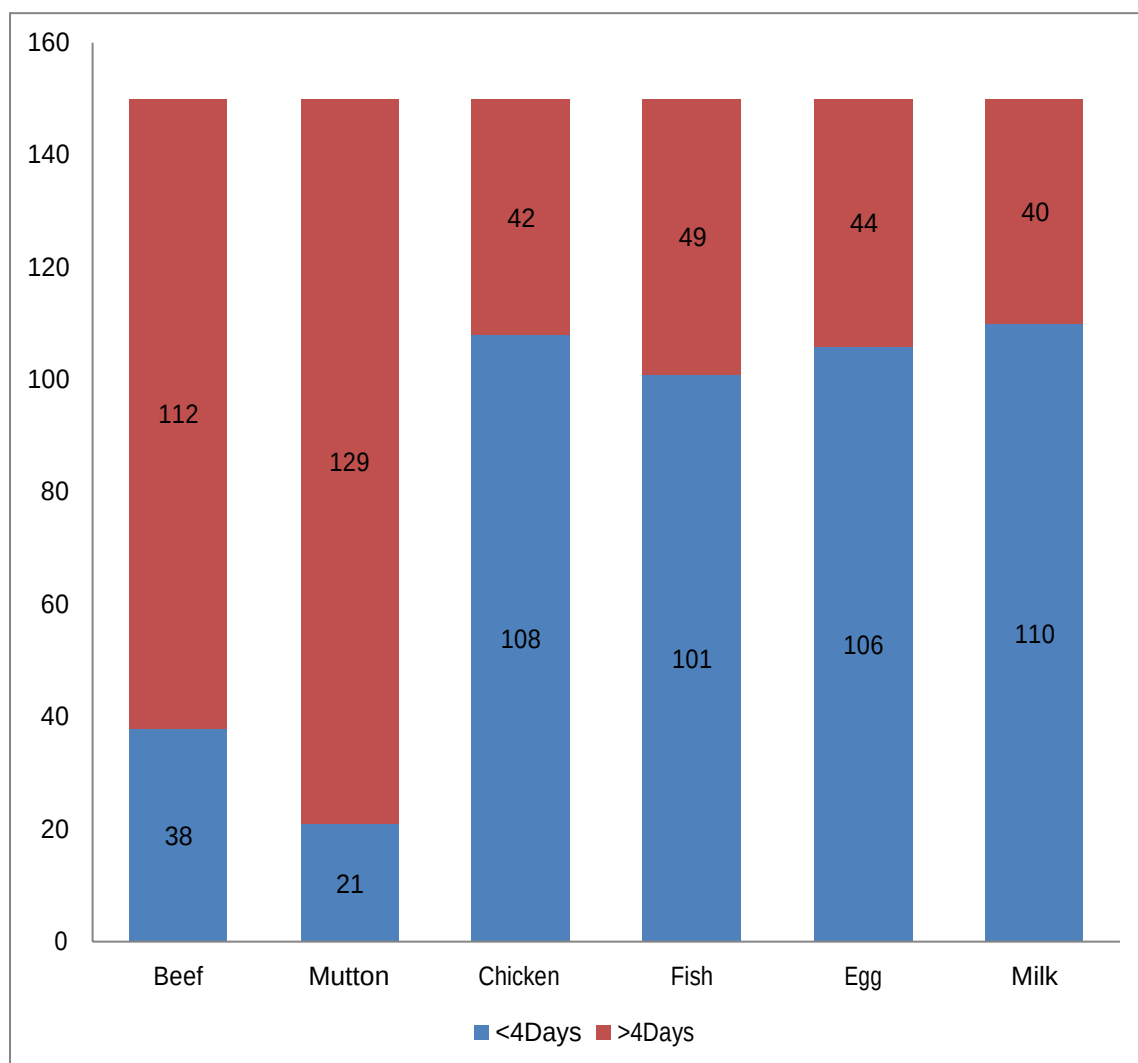
Type of food	Frequency	%
Carbohydrate	130	86.7
Protein	105	70
Fat	79	72.7
Vegetables	73	48.7
Fruits	80	53.3

Note-Multiple Response

Food habit

In an average week 25.3% take beef < 4 times and 74.6% take beef >4 times a week accordingly Mutton 14% and 86%, Chicken 72% and 28%, Fish 67% and 32.6%; Egg 70.6% and 29.3%; Milk 73.3% and 26.6%.

Figure-6: Distribution of PHTN Stage-1 HTN by Food habit



Salt intake

Data analysis reveals no use of extra salt intake 62 (41.3%), use of extra salt 88 (58.7%) at the beginning of the study.

Table-6: Distribution of PHTN & Stage-I HTN by extra salt intake

Trait	Number	Percent
No use of extra salt	62	41.3
Use of extra salt	88	58.7
Total	150	100

Change of salt intake before and after intervention 88 (58.7%) and 2 (1.4%).

Table-7: Distribution of Respondents by Changes in salt intake

Trait	Before	After
Use of extra salt intake	88(58.7%)	02 (1.4%)
No use extra salt	62 (41.3%)	140 (98.1%)
Missing	0	8(5.3%)
Total	150	150

Smoking Habit

Smoking comprise that 22.7% (n=34) Respondent 9.2% (n=13) Respondents are not smoking tobacco 20 respondents (13.5%) they smoked tobacco in the past & stop at least 6 months back. Among the respondent 116 (77.3%) that presently not smoking tobacco.

Table-8: Distribution of Respondents by Smoking habit

Description	Number	%
Presently not smoking tobacco	116	77.3
Presently smoking tobacco	34	22.7
Previous taking smoking	20	13.5
Non Smoking tobacco consumption	13	9.2

Physical Activity

Before and after intervention

Among the respondent with PHTN & Stage- I HTN, Mild physical activity was before intervention 51 (33.3%) after intervention 04 (2.6%); Moderate before intervention 83 (54.2%) after intervention 135 (88.2%); Severe before intervention 16 (10.5%) after intervention 3 (2%).

Table-9: Distribution of Respondents by Physical activity

Description	Before	After
Mild	51(33.3%)	4(2.6%)
Moderate	83(54.2%)	135(88.2%)
Severe	16(10.5%)	3(2%)

Mean of Physical activity

Analysis of physical activity indicates significant contribution of physical by more mobility hours for heavy, moderate & light physical activity before intervention all type of type physical activity mean value is found 230 ± 224.4 min/week. Association of METs mean is tested with systolic & diastolic pressure . Both Systolic Pressure and Diastolic Pressure are found to be significantly depend on Physical Activity ($p < 0.001$)

Table-10: Distribution of PHTN & Stage-I HTN by Mean of Physical activity

Description	Before	After
Number of participant	150	142
Mean value	230 ± 224.4	$518 \pm 518 \pm 275.7$
Mean change		$-288 \pm -288 \pm 51.3$
Paired T test		4.048
P value		.001

Body Mass Index (Baseline)

Baseline Data reveals that, Underweight 2 (1.4%), Normal 52 (34.9%), Overweight 60 (42.8%), Obese 36 (20.9%).

Table-11: Distribution of PHTN & Stage-I HTN by BMI

Score of BMI	Description	Frequency	%
Less than 17.5	Underweight	2	1.4
17.5-22.9	Normal	52	34.9
23-27.9	Overweight	60	42.8
28.0 and above	Obese	36	20.9
	Total	150	100

Body Mass Index (After Intervention)

Data reveals that, Underweight 5 (3.3%), Normal 61(40.87%),
Overweight 48 (32.13%), Obese 28 (18.32%)

Table-12: Distribution of Respondents by BMI

Score of BMI	Description	Frequency	%
Less than 17.5	Underweight	5	3.3
17.5-22.9	Normal	61	40.87
23-27.9	Overweight	48	32.13
28.0 and above	Obese	28	18.32
	Missing	8	5.3
	Total	150	100

BMI changes mean baseline body weight of the respondents

Mean Baseline of BMI of the respondent with PHTN & Stage-I HTN is 26.45 ± 4.43 kg/m² respectively. After 6 month intervention mean values become 25.83 ± 4.29 respectively. The Mean change of BMI is $1.62 \pm .14$.After 6 month respectively mean BMI changes the baseline and after 6 month intervention is found statistically significant .

Table-13: Distribution of BMI changes mean baseline body weight of the respondent

Description	Before	After
Number of participant	150	142
Mean value	26.45 ± 4.43	25.83 ± 4.29
Mean change		$-.62 \pm .14$
Paired T test		11.75
P value		.001

Blood Pressure changes after Intervention

Table 14 shows mean systolic blood pressure is 130 ± 7.09 mm Hg at beginning of survey after 6 month mean systolic blood pressure becomes 118 ± 8.84 respectively . Rate of Changes of BP is pronounced in sBP and dBP is relatively gradual in dBP significantly reduces after intervention it shows a negative mean change of systolic - 9.35 ± 1.75 /dBP -4.2 ± 1.94 mm Hg after 6 month for sBP/dBP

Table-14: Changes of BP after intervention

	Systolic Blood Pressure		Diastolic Blood Pressure	
	Baseline	After	Baseline	After
Sample	150	142	150	142
Mean Value	130 ± 7.09	118.65 ± 8.84	83.51 ± 7.39	79.31 ± 5.45
Median	129	118	84	78
Mode	125	120	85	78
Change Of BP		-9.35 ± 1.75		-4.2 ± 1.94

Test of significant for change of BP

Paired Sample T test shows significant change of both Systolic & Diastolic BP at the end of 6 months . Value of t is found 10.9, df 141 ,value P is >0.05. These value for diastolic blood pressure are t=5.5, df 141 , respectively with p value >0.001.

Table-15: Test of Significant for change of Blood Pressure after intervention

	Systolic Blood Pressure		Diastolic Blood Pressure	
	Baseline	After	Baseline	After
Sample	150	142	150	142
Mean value	130±7.09	118.65±8.84	83.51±7.39	79.31±5.45
Change Of BP		-9.35±1.75		-4.2±1.94
STD error	.835	.848	.825	.758
Paired t Test		10.9		5.5
t value		df 141		df 141
P value		.05		.001

Combined effect of risk factor on BP

Multiple regression analysis is done food testing individual role in physical activity expressed in METs, changes of body weight in kg, salt intake and change of smoking habit ,after removing the effect of age, sex, level of education, yearly expenditure and intake of beef. BP reduction of salt intake is found to be best prediction ($t=14.084$, $p<0.001$). Role of the reduction of BMI is also found to have significant role ($t=1.979$, $p<0.05$) and smoking contributing no significant reduction ($t=2.268$, $p=0.001$) followed by increment of physical activity reduction best prediction ($t=4.048$, $p<0.001$) followed by METs increment .

Table-16: Combined effect of risk factor on BP

Sl no	Description	t	p
1	Salt reduction	14.084	0.001
2	BMI	1.979	0.05
3	Physical activity	4.048	0.001

Chapter-5

Discussion

Discussion

There was a Quasi Experimental Study done in old Dhaka City from August 2013 to October 2015.

Prevalence of prehypertension

Our study has demonstrated that prevalence of prehypertension was 30.0% among the respondent. This prevalence rate reflected a similar finding by AKM¹⁴ who studied in Mohammadpur area and also by Khanam et al (2015)⁶⁹. This is constant with a study done in southern China 32.3%⁷⁰. However, the rate is higher than the prevalence of prehypertension in India 60%⁷¹. So the prevalence of prehypertension is increasing day by day, indicating that the risk factors are prevalent in urban population, Bangladesh being a developing country is controlling communicable diseases but on the other hand the non-communicable diseases are also increasing which is a matter of threat to the health status of the whole population.

Prevalence of Hypertension

According to our study the prevalence of hypertension (JNC-7 criteria) was found to be 25.0% in urban population. Among them 18.5% were stage-I HTN and 6.5% were stage-II HTN. The result reflected a similar finding with the study done in Kathmandu the prevalence being 32.5%⁷² and in United States the prevalence being 30%⁷³ and also with Kenya 23%⁷⁴.

Though the prevalence of HTN is lower than that of prehypertension. It is also a risk of our lives. These differences indicate that in our country many people who are at risk of HTN are not aware of the situation.

Demographic Profile

Prehypertension was found to be more prevalent at the most productive age group . Most of the respondent of prehypertension & stage-I hypertension was found to be more among the age group between 25 to 34 years (38%) and between 35 to 44 years (36.7%). The result is similar with the prevalence of age in a study done in Peru , the mean 36years age group respondent are hypertensive⁷⁵. Also with a study in Kenya the age group over 18 years being 32.67%⁷⁶ In this study male dominance was markedly high (104 & 46) 1:2:2. Female were found very enthusiastic at the beginning but during consent they declined more than male. Pregnancy, lactation & other maternal morbid causes to reduce number of women in this study. The prevalence of HTN was 69.3% in male and 30.7% in female. The prevalence is close to the prevalence of Poland male (68.9%)⁶⁶ Prevalence of prehypertension and HTN was found more in male before the age 45years. Also it is observed the married people have higher prevalence 55.3% than that of unmarried people 44.3%. The reason could be OCP in case of female , also anxiety, depression etc in married case. It may be related to increasing age and also menopausal might be to increased anxiety, tension and social burden after marriage. Married male showed more prevalence than female. Family history of hypertension , in first degree family members was found positive among people which is in conformity to other studies^{77,36}.

Socio-economic risk factors

Annual expenditure seemed to have effect of the prevalence of PTN & Stage-I HTN . Owner of houses, possession wealth and house rent will bills were adjusted for labeling the socioeconomic strata. This study showed more prevalence of stage-I hypertension among respondents with annual income 4-6 lakh (45.3%) and more than 6lakhs (39.3%). The study are comprised about 32.7% respondents with secondary educational level. The reason behind it is educated people are more concerned and aware about their health and its relation to food habit, physical activity, tobacco etc which are concerned to be risk factors of Hypertension. Number of higher education institutes are rapidly increasing in this area referring higher educated people in the locality.⁷⁸ Another important determinant of prehypertension and hypertension in a population is occupation . Different occupation have impact on mental and physical health of people. Business was top ranked occupation (57%), then service (40%) then housewife (26%). Among the respondents logically comparable to formal data of the area by the government census revealing service 32.91%, wage labour 2.95%, industry 1.95%, commerce 22.11%, construction 3.67%, transport 16.29%, renting out 2.85% and others 17.27%⁷⁹. Business persons posses more tension, anxiety and busy schedules challenging adverse environment in many a time.

Dietary Habit

PHTN& Stage-I HTN is treated as a warning sign as illness is likely if changes aren't made lifestyle habits and dietary habits. The study shows that PHTN& Stage-I HTN is more common among those who are more prone to fast food and soft drinks. This is commonly seen among the young people, thus younger group is suffering from prehypertension which is currently a big threat to the rise of other non communicable diseases like coronary heart diseases , stroke , heart failure, kidney failure etc. Study haven't shown that taking medicine for prehypertension will reduce the risk of HTN but changed dietary habits can prevent it. The dietary approaches to stop HTN can help lower the blood pressure. It doesn't call for special food but provides a mixture of food rich in vitamins and minerals.

In our study we found 36.6% people taking fast foods where only 22% takes vegetable rich foods. This percentage should be reversed by making people aware of their balanced diet habit. This is consistent and comparable to the study outcome of Apple (1997)^{26,27,28} who could reduce blood pressure by 11.4/5.5 mmHg on 133 respondents and 5.5/3.0mmHg on 459 respondents in 11weeks by DASH plus intervention comparing to controlled diet. Canadian study by Hill studied on 309 hypertensive respondents over a period of 24montgs and could reduce BP by 7.2/14.3 mmHg by non pharmacological approaches only.

Salt intake

Relationship between use of extra table salt and blood pressure was tested with multi nominal regression analysis showing statistically significant association. The chi-square statistic obtained was the difference in -2log-likelihoods between the final model and reduced modest.

The reduced model was formed by omitting the effect from the final model . The null hypothesis was that all parameters of the effect were zero. In our study we found 58.7% people used extra table salt and 41.3% didn't use. After an intervention of 6months data analysis revealed that the change of salt intake significantly influenced the change of both systolic and diastolic blood pressure and again when tested in reduced model by multiple regression analysis salt reduction was found to be the best predictor ($t = 14.08$, $p < 0.001$) for reducing both systolic and diastolic blood pressure compared to other behavioural determinants. Salt reduction contributes more for systolic blood pressure reduction than comparable diastolic blood pressure reduction. In brief salt intake is found significantly associated with causation of blood pressure and also reduction of salt intake significantly contributes to reversal of blood pressure. A similar study , the trials of mid HTN study (TOMHS) was a 4 year trial on 902 stage-I HTN, (62%male, 80% non black, mean age of 55years). The study tested the effects of multi factorial intervention like weight loss, reduction of salt intake and reduction of alcohol intake. Average within group BP changes were 10.6mmHg reduction systolic blood pressure and 8.1mmHg reduction in diastolic blood pressure. This study results are very close to this present study outcome⁸⁰.

Smoking

Data collection for smoking was a very tedious job. Almost all of the respondents were careful enough before confessing the habit of smoking because of the recent promulgation of anti-smoking act in national parliament. However prevalence of 22.7% smoking is similar with another study among residents of adjacent neighbouring zone in Mohammadpur, studied in 2002 among people of 25-34 years age group they found 2.1% smokers in the adjacent area. Analysis revealed relation of smoking withsystolic

blood pressure. Post intervention study reveals that there is not any significant change in the number of smokers as it is a 6month interval study³⁹.

Physical activity

Only 33.3% respondents performed 60min mild activity and 54.2% respondents performed moderate activity. This is a typical scenario for a middle class sedentary society⁸¹ similar baseline study in 2002 among 988 respondents of 25-44 years age group showed that only about 2.9% respondents performed heavy physical activity on average week, the mean physical activity time in that study was 84 minutes on an average week⁸². Increment of physical activity influenced systolic blood pressure more than diastolic blood pressure ($t= 4.048$, $p<0.001$) for the change of (METs) Increment of physical activity was found to be an effective and efficient prediction for both systolic and diastolic blood pressure.

BMI

Statistical association of BMI with both systolic and diastolic blood pressure was significant. About 42.8% of the total 150 respondents were found overweight and 20.9% were obese. Zaman (2003) studied on 669 people in a rural area near Dhaka city and found mean BMI 19.4 for male and 19.7 for female⁸³ Present report also resembles the report of Ahmed (1996) where 19.0 was the mean BMI in urban slum⁸⁴

Regression analysis depicted significant direct liner correlation of body weight increment independently with systolic and diastolic blood pressure. Change of mean body weight is reduced from 26.45 ± 4.43 to 25.88 ± 4.29 in 6month intervention

($t = 1.979$, $p < 0.05$) . Change of body weight significantly induced the change of both systolic blood pressure from 130 ± 7.09 to 130.65 ± 8.84 ($p < 0.05$) and Diastolic pressure from 83.51 ± 7.39 to 79.31 ± 5.45 ($p < 0.001$) Drop out rate during intervention was acceptable (8.5%) in respect to any community trial for 6months duration in a developing country perspective. Duff (2003) started a similar intervention of specialized hospitals with 80patients. After 6months 42 cases attended monthly follow up clinic and 38 patients attended only one follow up at the end of 6month meaning a 40.5% dropouts³². In our baseline study the mean systolic and diastolic blood pressure we have found were 130 ± 7.09 and 83.51 ± 7.39 respectively. After 6 months interval systolic and diastolic blood pressure was significantly reduced to 118.65 ± 8.84 and 79.31 ± 5.45 respectively. So the mean change of systolic blood pressure is 9.35 ± 1.75 ($p < 0.05$) and diastolic blood pressure is 4.2 ± 1.94 ($p < 0.001$)

Chapter-6

Conclusion & Recommendation

Conclusion

Prevalence of hypertension has been increasing silently but significantly. In this study, the prevalence of pre-hypertension and hypertension was found to be alarming in the perspective of a developing country where most of the health resources are directed largely to the control and management of communicable diseases. By this experimental research it is tried to find out the association between the occurrence of pre-hypertension & hypertension with sedentary life style increased intake of fat-rich fast-food and unhealthy behavioral pattern. After 6 months follow-up, important & significant determinants for reversal of blood pressure were found to be reduction of extra salt intake, increment of physical activity and reduction of body weight through healthy balanced dietary habit. Through counseling, these factors are tried to be controlled by pre-hypertensive and stage-I hypertension people and the result was quite positive. Most of them become normotensive after an effective control of those factors in 6 months.

This study was conducted in a middle class community of Dhaka City and indicated trend of high blood pressure directed towards middle class population rather the richer portion of the society. Increased body weight, excess extra sodium chloride consumption and lack of physical activity were found out as statistically proven modifiable risk factors for rising of blood pressure. After decreasing body weight, reducing salt intake and increasing physical activity blood pressure could effectively be lowered down. Definite relation of increased weight has been found in this study. Smoking habit quitting has supportive effect on controlling hypertension. So counseling, following a hypertension program gives hypertensive patient a chance to carry out life changes and have their medication adjusted to achieve goals for blood pressure control. Additional future studies in this area with clear intervention and several follow-up are necessary.

Recommendation

1. Modification of Life Style and adopting healthy behavior or dietary practice should be as primordial or primary prevention against easy occurrence of high blood pressure.
2. Promotion Should be started for taking healthy balanced diet with reduction of saturated fats at diet, rather encouraging diet containing mono saturated fatty acids for calorie, reduced animal fat intake and no extra salt intake.
3. Increment of daily working habit should be campaigned. Ten minutes of move around after every main meal in addition to the regular Physical activity can be advocated. Work Place and leisure time physical activity should be encouraged for sedentary working people.
4. Consumption of tobacco in any form must be discouraged.
5. Health education can be given to people regarding general health awareness and high –risk group vulnerability focusing on childhood obesity at school on family health level.
6. Finding of this study recommends further research with more time, more resources and larger number of data set.

Chapter-8

Reference

Reference :

1. Lawes CM, Vander Hoorn S, Law MR, Elliottp, MacMahon S, Rodger A. Blood pressure and the global burden of disease 2000. Part II; estimates of attributable burden. *J Hypertens*. 2006; 24 (3): 423-30.
2. Huang Y, Su L, Cai X, Mai W, Wang S, Hu Y, et al. Association of all-cause and cardiovascular mortality with pre-hypertension: a meta-analysis. *Am Heart J*. 2014; 167 (2): 160-8. e161.
3. Huang Y, Cai X, Li Y, Su L, Mai W, Wang S, et al. Pre-hypertension and the risk of stroke: a meta-analysis. *Neurology*. 2014; 82 (13): 1153-61.
4. Lewington S, Clarke R, Qizibash N, Peto R, Collins R. Age-specific relevance of usual blood pressure to vascular mortality: a meta-analysis of individual data for one million adults in 61 prospective studies. *Lancet*. 2002; 360 (9349): 1903-13.
5. Mac Mahon S, Peto R, Culler J, Collin R, Neaton J, et al. Blood pressure, Stroke and coronary heart disease. Part-1, Prolonged differences in regression dilution bias. *Lancet*. 1990; 335 (8692): 765-74.
6. Chobanian AV, Bakis GL, Black HR, Cushman WC, Green LA, Izzo Jr JL, et al. Seventh report of the Joint National Committee on prevention, detection, evaluation, and treatment of high blood pressure. *Hypertension*. 2003; 42 (6): 1206-52.
7. Qureshi Al, Suri MF, Kimani JF, Divani AA, Mohammad Y. Is pre-hypertension a risk factor cardiovascular disease? *Stroke*. 2005; 36 (9): 1859-63
8. Shen L, Ma H, Xiang MX, Wang JA. Meta-analysis of cohort studies of baseline pre-hypertension and risk of coronary heart disease. *Am J Cardiol*. 2013; 111 (2): 266-71.
9. Wu S, Huang Z, Yang X, Lis, Zhao H, Ruan C, et al. Cardiovascular events in a pre-hypertensive chinese population: four-year follow up study. *Int Cardiol*. 2013; 167 (5): 2196-9.

10. WHO Regional Office for South-East Asia. Non-communicable diseases. Geneva, 2009. <http://www.searo.who.int/en/Section1174/Section1459.htm> ; accessed on 26 March, 2013.
11. Gaffar A, Reddy KS, Singhi M.. Burden of non-communicable diseases in SouthAsia. BMJ2004; 328:807-810 [3 April] , doi: 10.1136/bmj.328.7443.807
12. Vasan RS, Benjamin EJ, Sullivan LM, D'Agostino RB. The burden of increasing worldwide cardiovascular disease, In: Fuster V, Alexander RW, O'Rourke R.A, editors. Hurst's The Heart.. 11thed. New Yourk: McGraw-Hill; 2004:15
13. WHO, Integrated management of cardiovascular risk. Geneva: WHO, 9-12 July 2002: 36-37 [http://www.who.int/cardiovascular_diseases/media/accessed on 02-06-2013](http://www.who.int/cardiovascular_diseases/media/accessed_on_02-06-2013).
14. AKM Alamgir, MR Azad. Pre-hypertension—an Emerging Epidemic in developing countries. J Dhaka Nati.Med.Coll.Hosp.March.2009;14(1):3-5.
15. Malik A, Congenital and acquired heart diseases. Bangladesh Med Res Council Bull 1976;11:14
16. Haque KMHSS. Prevention and control of cardiovascular diseases- Bangladesh perspective. Proceedings of Japan-Bangladesh joint conference on cardiovascular Diseases, Dhaka, 2002; 17:23-24
17. Hussain A, Cardiovascular diseases in the rural community of Bangladesh .Paper presented at Japan-Bangladesh Joint Conference on Cardiovascular Diseases, 31 Jan-01 Feb 1984, Hotel Sonargaon, Dhaka.
18. Ali SMK, Chowdhury MMH, Halim A, Quazi S, Islam N. Rahman M. Mohiduzzaman M. Malek MA. Pattern of cardiovascular disease among Dhaka University teachers. Bang J Nutr Dec 1987; 1(1):26-33.
19. Ullah W. Hypertension in mixed community. Bangladesh Med Res Counc Bull, Dec 1976; 2(2); 95-99.
20. Islam N. Janan FAJ, Chowdhury A, Ahmed Z, Mathura KC, Hypertension in secretariat population of Bangladesh. Bangladesh Med Res Counc Bull, June 1979; 5(1): 19-24 .

21. Chowdhury AKMN, Alam MN, Ali SMK, Dasherhendi Project studies: Demography, morbidity and mortality in rural community of Bangladesh. Bangladesh Med Res Council Bull 1981; 7:22-39.
22. Islam N, Khan M, Latif ZA. Hypertension in the rural population of Bangladesh-a preliminary survey. Bangladesh Med Res Council Bull, June 1983; 9(1): 11- 14.
23. Begum JA, Shahidullah M, Saiduzzamn AF, Zaman S. Comparative study of hypertension in three different places of Bangladesh, JOPSOM, Dec 1984, 3(2): 17-22.
24. Sayeed MA, Banu A, HaqJA, Khanam PA, Mahtab H, Khan AKA. Prevalence of hypertension in Bangladesh: Effect of Socioeconomic risk factor on difference between rural and urban community. Bangladesh Med Res Council Bull.. 2002 April;28(1) :7-18.
25. HaqueKMHSS, Ali SMK, Alamgir AKM. Prevalence and reversal of hypertension in an urban community in Bangladesh. In: Adhikary AB, editor, Bangladesh Heart Research Association. Proceedings of National Cardiac Conference and 9th Annual General Meeting 2008 April 25; Radisson Water Garden Hotel, Dhaka: 20-21.
26. Appel LJ, Champagne CM, Harsha DW, Cooper LS, Obarzanek E, Elmer PJ, et al. Writing group of the PREMIER Collaborative Research Group. Effects of comprehensive lifestyle modification on blood pressure control : main results of the PREMIER Clinical trial. JAMA, 2003 April 23-30; 289 (16): 2083-93.
27. SvetkeyLP, Erlinger TP, Vollmer WM, Feldstein A, Cooper LS, Appel LJ, Ard JD, Elmer PJ, HarshaD, Stevens VJ. Effect of lifestyle modifications on blood pressure by race, sex, hypertension status, and age, J Hum Hypertens, 2004 Sept 23. doi:10.1038/sj.jhh.1001770 viewed on 06 Oct, 2006.
28. Bobak M, HertzmanC, Skodova Z, Marmot M.. Socio-economic status and cardiovascular risk factors in Czech Republic. Int J epid 1999;28;46-52
29. Tezcan S, Altintas H, Sonmez R., et al. Cardiovascular risk factor levels in a lower middle class community in Ankara Turkey. Trop Med Int Health 2003 Jul; 8(7):660-7 [PubMed].
30. Sheikholeslam R, Mohammad A, Mohammad K, Vaseghi S. Non communicable disease risk factors in Iran, Asia pac J Clin Nutr 2004;13 (Suppl):S100.

31. Harris GD, White RD . Lifestyle modifications for the prevention and treatment of cardiovascular diseases: an evidence- based approach. Mo Med. 2004 May- June; 101(3): 222-6.
32. Chowdhury NA, Hayee MA, Alam N. Study of complication in hypertensive patients having irregular treatment. Bangladesh Med Res Counc Bull, 1993; 19(1)86-93.
33. Rahman AKMF, Haque KHSS, Hossain N, Chowdhury AKH, Uddin MJ, Ali M. Acute myocardial infarction in hypertensive patients: a comparison of clinical outcome in hypertensive and normotensive patients. Chest and heart journal , 2000;14(2):69-76.
34. Das PK, Mohsin K. Isolated systolic hypertension and cardiovascular risk; an update . J comilla Med Coll Teach, 2003; 5(1):38-40.
35. World Health Organization, International Society of Hypertension Writing Group, 2003 World Health Organization [WHO]/International Society of Hypertension [ISH] statement on management of hypertension, Journal of Hypertension 2003, 21:1983-1992.
36. Ramsay LE, Williams B, Johnston GD, et al. BHS Guidelines. Guidelines for management of hypertension; report of the third working party of the British Hypertension Society, Journal of Human Hypertension (1999) 13, 569-592.
37. Williams B, Polter NR, Brown MJ, Davis M, McInnes GT, Potter JF, Sever PS, Thom SMcG, British Hypertension Society Guidelines. Guidelines for the management of hypertension: report of the forth working party of the British Hypertension Society, 2004- BHS IV. Journal of Human Hypertension,. 2004; 18:139-185.
38. US Department of Health and Human Services. The seventh report of the Joint National Committee on Prevention, Detection, Evaluation and Treatment of High Blood Pressure (JNC-7). NIH Publication No. 03-5233; May 2003:2-3.
39. Kastarinen MJ , Puska PM, Korhonen MH, Mustonen JN, Salomaa VV, Sundvall JE, Tuomilehto JO, Uusitupa MI, Nissinen AM; LIHEF Study Group. Non-pharmacological treatment of hypertension in primary health care: a 2-year open randomized controlled trial lifestyle intervention against hypertension in eastern Finland. J Hypertens 2002 Dec;20 (12): 2505-12[PubMed] [Abstract]

40. Sacks FM, Svetkey LP, Vollmer WM, et al. The DASH-Sodium Collaborative research Group. Effects on blood pressure of reduced dietary sodium and the dietary approaches to stop hypertension (DASH) diet. *N Engl J Med* 2001; 344(1):3-10.
41. National Institute for clinical excellence [NICE]. Clinical Guideline 18- Hypertension: management of hypertension adults in primary care. London: NHS, August 2004:12.
42. Duff EM, Wilks R. Six-month hypertension intervention study. One year follow-up. *West Indian Med J*, 2003 Sep;52(3):219-22.
43. Shaheen S. Lifestyle modification as a mean to treat stage-I hypertension [Dissertation] Dhaka: Dhaka University, June 2004.
44. Akhteruzzaman S. Molecular Genetics of Human Hypertension: New Treatment Approach. *BJMS*, March 2003;9(1):51-57.
45. Beilin L. Epidemiology of hypertension. *Medicine International* 1993;21(9):351-354.
46. McCusker ME, Yoon PW, Gwinn M, Malarcher AM, Neff I, Khoury MJ. Family history of heart disease and cardiovascular disease risk-reducing behaviors. *Genet Med*. 2004 May-Jun; 6(3):153-8.
47. Chakraborty B. Risk factors for coronary artery disease for Bangladeshis: Do they differ from western population. *J Bangladesh Coll. Phys Surg*. 2000;18:44- 46.
48. Saha SK. Diabetes and coronary atherosclerosis: The tale of a Twin Disease. *BJMS* 2000;6(2):38-41.
49. Masou K, Mikami H, Ogiwara T, Tuck ML. Weight gain-induced blood pressure elevation. *Hypertension*, May 2000;35:1135-1140.
50. Julius S. Valentini M, Platini P. Overweight and hypertension A 2-Way Street? *Hypertension* 2000;35:807-813.
51. Khatun H. Managing psychological problem of patients with essential hypertension [thesis], Dhaka: Dhaka university [Dept. of Clinical psychology] , March 2009:12-16.

52. Lijing LY, Kiang L, Mathews KA, Daviglius MI, Ferguson TF, Kiefe CI. Psychosocial factors and risk of hypertension: The coronary artery risk development in young adults [CARDIA], JAMA, 2003;290:2138-2148.
53. Vrijkotte TGM, van Dolomite LJP, de Geus Eco JC. Effects of work stress on ambulatory blood pressure, heart rate and heart rate variability. Hypertension. 2000;35:880-886.
54. WHO the world Health Report 2002. Reducing risks, promoting healthy life. World Health Organization; Geneva, Switzerland, 2002.
55. Hypertension study group. Prevalence, awareness, treatment and control of hypertension among the elderly in Bangladesh and India: a multicenter study. Bulletin of the World Health Organization, 2001;79(6): 492-93.
56. Basnyat B, Rajapaksa LC. Cardiovascular and infectious diseases in South Asia: the double whammy. Innovation, political commitment and new partnerships are needed. [Editorial] BMJ 2004;328:781.
57. Baecke JA, Burema J, Frijters JE. A Short questionnaire for the measurement of habitual physical activity in epidemiological studies. Am J clinic nutria 1982;36:-942.
58. Even KR, Rosamond WD, Cai J, et al. physical Activity and Ischemic Stroke Risk. Stroke 1999;30:1333-1229.
59. Guidelines for Data Processing and Analysis of the International Physical Activity Questionnaire (IPAQ). Version 2.0. Revised April 2004. www.ipaq.ki.se.
60. WHO BMI criteria for Asian. <https://www.halls.md/bmi/asianwho.htm> viewed on 12/04/2011 Hypertension
61. WHO. STEPS Field manual guideline for field staffs. WHO/NMH/CCS/03.05. GENEVA:WHO 2004:30-31. .
62. Aboderin I, Kalache A, Ben-Shlomo Y, Lynch JW, Yajnik CS, Kun D, Yach D. Life course perspectives on coronary heart disease, stroke and diabetes: key issues and implications for policy and research. Geneva, WHO. 2002..

63. Wolf-Maier K, Cooper RS, Banegas JR, Giampaoli S, Hense HW, Joffres M, et al. Hypertension Prevalence and Blood Pressure Level in 6 European Countries, Canada, and the United State. JAMA, May 14, 2003; 289(18):2363-2369.
64. Craig R, Mindell J, editors for National Centre for Social Research. The Health Survey for England 2006. <http://www.ic.nhs.uk/> viewed 12/08/2011.
65. Alamgir AKM, Akhter SFU. Hypertension Prevalence and Related Factors in an Urban Affluent Community in Bangladesh. Bang J Med Sci, March 2005; 11(1):22-25.
66. Thankappan KR, Sivasankaran S, Khader SA, Padmanabhan PG, Vasan RS. Community Based Detection and Monitoring of Hypertension in Kumarakom Panchayat, Kottayam. Project report. Kerala Research Program for Local Level Development, Centre for Development Studies, ULLOOR, Trivandrum.
67. Ajay VS, Gupta R, Panniyammakkal J, Chaturvedi V, Prabhakaran D, Reddy KS. National Cardiovascular Disease Database. IC HEALTH. Sticker No:SE/04/233208. Supported by Ministry of Health & Family Welfare, Government of India and World Health Organization. <http://www.whoindia.org> accessed on 18-02-2011.
68. Whitworth J. 2003 World Health Organization (WHO)/ International Society of Hypertension (ISH) statement on management of hypertension. J Hypertens. 2003; Nov; 21(11):1983-92.
69. Khanam MA, Lindeboom W, Razzaque A, Niessen L, Milton AH, et al. Prevalence and determinant of pre-hypertension and hypertension among the adults in rural Bangladesh: finding from a community based study. BMC Public Health(2015); 15:203.
70. Hal, Huang X, Liy, Hong K, LIP, et al. Prevalence & risk factors of prehypertension & Hypertension in southern china. PLOS ONE 12.2017.
71. Yadav S, Boddula R, Genitta G, et al. Prevalence & risk factors of prehypertension and hypertension in an affluent North India population. India J. Med. Res. 2008.

72. Dhugana-RR Pandey AR, Bista-B Joshi-S, Prevalence & Associated factors of hypertension. A community based cross sectional study in Municipalities of Kathmanda, Nepal.
73. Keenan-N, Kimberly A, Rosendor F. Prevalence of Hypertension & Controlled hypertension . United states 2005-2008.
74. Joshi MD. Ayah R, NjauEk, Wonjiru R, Kayima JK et al. Prevalence of hypertension and associated cardiovascular risk factors in a urban slam in Nairobi, Kenya, a population based survey, BMC Public Health, 2014.
75. Heitzinger K, Montano SG, Hawes Se, Alarcon JO, Zunt JR, A community based cluster randomized survey of non-communicable diseases and risk factors in peri-urban Shantytown in Lima, Peru. BMC Int. Health HUM, Rights 2014.
76. Kearney PM, Whelton M, Raynolds K, Whelton PK. He J. Worldwide prevalence of hypertension a systematic review. J. Hypertens 2004.
77. Stamler R, Stamler J, Riedlinger WF, Algera G, Roberts RH, Family [parental] history and prevalence of hypertension. Results of a nationwide screening program. JAMA, 1979; 241(1): 43-46.
78. Population Census Wing, BBS. Archived from the original on 2005-03-27 Retrieved on November 10,2006.
79. Ahmed SS. In: Bangladpedia. National Encyclopedia of Bangladesh 1sted Dhaka: Asiatic Society of Bangladesh, February 2009.
80. TOMHS. The Treatment of Mild Hypertension Research Group. The treatment of mild hypertension study: A randomized, Placebe controlled trail of nutritional-hygienic regimen along with various drug monotherapies. Arch Intern Med 1991;151:1413-1423.
81. Lakka TA, Venalainen JM, Rauramaa R, Salonen R, Tuomilehto J, Salonen JT. Relation of leisure time physical activity and cardio respiratory fitness to the risk of acute myocardial infarction in men. New Eng J Med, 1994; 330(22):1549- 1554.

82. Rahman M, Meerjady SF, Akhter SFU, Hosain S, Mascie-Taylor CNG. Behavioural risk factors of non-communicable diseases in Bangladesh (STEPS survey)<http://www.who.int/infobaseref102410> accessed on 12-08-2007.
83. Zaman MM, Yoshiike N. Prevalence of overweight defined by Body Mass Index in a rural adult population of Bangladesh. Journal of Health, Population and Nutrition. 2003;21(2):162-163.
84. Ahmed SM, Adams A, Chowdhury AM, Bhuiya A. Chronic energy deficiency in women from rural Bangladesh: some socioeconomic determinants. J Biosoc Sci. 1998;30:349-58.

Questionnaire

Behavioral and life style factor analysis for pre-hypertensive and hypertensive population in urban Dhaka.

ID No

--	--	--	--

Date of year

Interview

Day

Month

--	--	--	--	--	--	--	--

1.Name:

.....

.....

2.Fathers

name:.....

.....

3.Age in completed years

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4. Sex: 1- Male 2-Female 3-Others

5. Address with telephone and

email.....

6. Religion

1-Islam 2- Hindu 3-Christian 4-Buddhist

7. Marital Status

1-Married 2-Unmarried 3-Widow

8. Level of

Education.....

9. Average family income per

Year.....

10. You Live In

1- Own House 2-Rental House 3- Others

11. Monthly Rent of House Including Bills (In Taka)

1- >10000 2- 3000-9999 3- Less Than 3000

12. No of Your Family Members Living In the Same House

13. Your Main Profession

- 1-Service 2- daily labour 3- business
- 4- Housewife 5-student 6-self service
- 7- Unemployed 8-others

14. If hypertensive

- 1- No 2- Yes 3-Others

15. Any family history of hypertension

- 1- Yes 2- No 3- Don't know

Tobacco use.

16. Do you smoke cigarette now?

- 1- Yes 2- No

17. Did you ever smoke regularly in past?

- 1- Yes 2- No

18. When did you stop smoking cigarette regularly?.....

months?.....years back

19. What did you smoke?

1. Cigarette 2- bidi 3- cigarette + bidi

4- Hubble Bubble 5- others

20. On average how many cigarettes you smoke in a day?

21. For how many years you smoke?.....months?.....years?

22. How old were you when you began to smoke cigarettes regularly?

23. Do you use/take chewing tobaccos?

1- Yes 2-No

Physical activity

In order to correlate relation of physical activity with hypertension, I would like to know the status of your physical labour. I am going to ask you about the time you spent being physically active.

24a. Now think about all the vigorous activities, which take hard physical effort that you might do during the usual week. Vigorous activities may give breath much harder than normal and may include heavy lifting, digging, aerobics, swimming, fast cycling, pulling rickshaws, washing clothes, sweeping floor, carrying water or pumping tube wells etc. think about only those physical activities that you do at least 10 minutes at a time.

1. Yes 2- No

If respondent answer is no, refuse or doesn't know go to question 25

24 b. How much time per day you usually spent doing vigorous activities?

25a. now think about activities which take moderate physical effort that you feel somewhat harder than normal and may include carrying light lodes by cycling at regular pace, cleaning house, or ironing etc.

Do not include walking

Again think about those activities that you do for at least 10 minutes at a time

1. Yes 2-No

If answer in no go to question 26

25b. How much time in total would you spent in one of those days doing moderate physical activities?

26a. now think about the time you spent walking during the usual week. This includes walking at work places and at home, walking to travel from one place to another place and any other walking that you might do solly for sports, recreation exercise or leisure.

On how many days in a usual week do you walk at least for 10 minutes at a time?

26b. How much time in total would you usually spent by walking on one of those days?

26c. How much time in total you usually spent sitting on a weekend day?

Food intake

27. Which type of diet you prefer most?

1- Carbohydrate

2- Protein

3- Vegetables

4- Fat

5- Others

28. What is the usual time for your diet?

1- No System

2- When Hungry

3- Fixed Time

4- No Response

29. Which type of oil do you use most often in cooking?

1- Soyabean Oil

2- Mustard Oil

3- Sesame Oil

4- Palm Oil

5- Sunflower Oil

6- Corn Oil

30. Do you take extra salt at table for your meal?

1- Yes

2- No

3- No Response

31. How often you eat food from each of following categories?

Food Type	Never (less than once/ month)	Monthly (Times)	Weekly (Times)	Daily (Time)
Beef				
Mutton				
Chicken				
Fish				
Egg				
Rice				
Bread				
Sweet meat/cake				
Other CHO foods				
Milk/ milk products				
Dhal				
Fruits				
vegetables				

Health

32. What is your feeling about your personal health status?

1. Excellent 2- Very Good 3- Good
- 4- Bad 5- Very Bad 6- No Response

33. God save you, have any MBBS doctor told you that you are suffering for many of the following diseases?

- 1- Yes 2- No 3-Not known.

- a. Acute myocardial infraction
- b. Hypertension
- c. Stroke
- d. Diabetes
- e. Bronchial asthma
- f. Cancer

Measurement

Description	Measurement
Height in cm	
Weight in kg	
Pulse	
Systolic blood pressure (mmHg)	
Diastolic blood pressure (mmHg)	
Smoking quantity	
Physical activity minutes	

Normal blood pressure

Pre-Hypertension

Hypertension stage- 1

Hypertension stage- 2

Signature of interviewer:

.....

Signature of supervisor:

WORK SCHEDULE

Months	Subject Choosing	Literature collection & review	Data Collection	Interventional Period	Data processing & analysis	Report writing	Submission
August- 2013							
September - 2013							
October- 2013- April-2015							
May-2015							
June- October 2015							