'HYPERTENSION IN ADULTS 30 YEARS AND ABOVE, URBAN AIZAWL, MIZORAM, 2003'.

A CROSS SECTIONAL STUDY

By

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(MAE-FETP Scholar 2002-2003)

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JANUARY 2004

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Dissertation project submitted in partial fulfillment of the requirements for the degree of Master of Applied Epidemiology (M.A.E)

of

Sree Chitra Tirunal Institute for Medical Sciences and Technology,

Thiruvananthapuram, Kerala -695 011.

This work has been done as part of the two year Field Epidemiology Training Programme (FETP) conducted at

National Institute of Epidemiology

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Tamil Nadu

January 2004

CERTIFICATION

This is to certify that this dissertation, entitled **'Prevalence of hypertension in adults 30 years and above, urban Aizwal, Mizoram, 2003: A cross-sectional study'**, submitted by Dr. Biakthansangi, in partial fulfillment of the requirements for the degree of Master of Applied Epidemiology, is the original work done by her and has not been submitted earlier, in part or whole, for any other (Publication or degree) purpose.

Date: 29.1.04

DIRECTOR

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ACKNOWLEDGEMENTS

Prof. M. D. Gupte, Director, National Institute of Epidemiology, Chennai readily accepted my application to undergo this course. He has been highly supportive of various endeavors and projects conducted under the training programme. I am grateful to him for his overall interest, advise and support.

All through the process of conducting this study, from developing the protocol to statistical analysis of the data and drafting the report, it was done under the guidance and close supervision of Prof. K. Ramachandran, formerly Professor and Head of Biostatistics, All India Institute of Medical Sciences, New Delhi and Advisor to DGICMR for Field Epidemiology Training Programme, National Institute of Epidemiology, Chennai. He was kind enough to personally go through most of his suggestions and advise in spite of his busy schedule. I gratefully acknowledge his help, valuable advice and guidance during the entire period of the training programme.

The Secretary and the Director, Health and Family Welfare Department, Government of Mizoram deputed me to undergo this course and I am indeed grateful to them.

Dr. Vidya Ramachandran, coordinator at NIE and my local preceptor, for her help, advice and guidance during the entire period of the training programme.

Several scientists and staff of NIE, Chennai including Dr. B.N. Murthy, Deputy Director, Dr. P. Ramakrishnan, Assistant Director, Dr. P. Manickam, Research Officer, Mr. Satish, Librarian and Mrs. Uma, Secretary, have all helped me in various ways during the course. I gratefully acknowledge their help.

Mr. Tholeha and Mrs. Lalremruati, field investigators in the project, without their help, the project would not have been completed.

The community from Mission Veng and Kulikawn, who had consented to participate in the study, and I am grateful for their cooperation and support.

Date: **Biakthansangi**

ACRONYMS

BMI	**Body Mass Index**
BP	**Blood Pressure**
DBP	**Diastolic Blood Pressure**
H	**Hypertensives**
HBP	**High Blood Pressure**
IEC	**Information, Education, Communication**
JNC	**Joint National Committee**
NCD	**Non-Communicable Disease**
NGO	**Non Governmental Organisation**
NH	**New hypertensives**
Non-H	**Normotensives**
KAP	**Knowledge, Attitudes, Practices**
KCH	**Known, controlled hypertensives**
KH	**Known hypertensives**
KP	**Knowledge, Practices**
KUH	**Known, uncontrolled hypertensives**
SBP	**Systolic Blood Pressure**
T	**Total**
WHR	**Waist Hip Ratio**

Abstract:

Background:

Hypertension is emerging as a major health problem in India. In Mizoram too, hypertension is perhaps on the rise, But reliable data on prevalence or on knowledge and practices, which are crucial for design of sound prevention and control programmes, are lacking.

Objectives: To estimate the overall prevalence of hypertension and classify them into known and controlled, known and uncontrolled and unknown by age and sex. It also aims to assess their knowledge and practices regarding hypertension.

Methods: A cross- sectional survey was conducted from two purposively selected wards in Aizawl, Mizoram. Households were selected by systematic sampling, and 1814 adults, 30 years of age and above were interviewed. Data were collected on socio-economic variables, anthropometric measurements, history of hypertension and treatment through semi-structured questionnaires. Hypertension criteria was as per The Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (JNC 7^{th}) recommendations. Knowledge and Practices questionnaire was administered to known/ newly detected hypertensives and age and sex matched normotensives.

Results: The overall prevalence of hypertension was 34.5% (95%CI 32.2-36.7). Hypertension was associated with increasing age, sex, Body Mass Index (BMI), Waist Hip Ratio (WHR) and occupation. There were 306 (49%) newly detected hypertensives. Overall, controlled proportion was 19.7%. There were 31.4% on drug treatment, 26.9% on non-pharmacological treatment, 13.8% were on irregular treatment and 27.9% were not on any treatment. There were significant differences between knowledge and practices among known/new hypertensives and normotensives.

Conclusions: Prevalence of hypertension and proportion of newly detected hypertension is high. Added with the low compliance and control level, it stresses the need for planning and implementation of actions on prevention, detection and treatment, as part of a comprehensive programme for hypertension control in the community.

1. INTRODUCTION:

One of the most frequently encountered groups of genetic disorders are those referred to as multifactorial disorders. These disorders require genetic and environmental factors for their development and are generally polygenic. i.e. several different genetic loci each contribute partially to the disease development. The disorder occurs in genetically susceptible individuals, in the presence of the precipitating environmental factors. Apart from the prevalence of these disorders differing in different populations further variations result from age and sex differences, nutritional habits, lifestyles and extent of physical activity. Among the adult-onset group of multifactorial disorders are hypertension, diabetes mellitus and obesity. These disorders occur in almost all populations although at differing prevalence rates resulting in significant morbidity and mortality and hence extensive epidemiological studies have been devoted to determine their prevalence. [1].

Hypertension is a very prevalent condition affecting the adult population globally [2]. It is considered one of the leading non- communicable diseases facing mankind and is the most powerful contributor to cardio vascular morbidity as well as mortality [3], which accounts for 20-50% of all deaths world -wide [4-7]. Because of it's asymptomatic nature it may manifest only after causing serious, irreversible pathology and complications [8].

A number of population based studies conducted in developing countries have shown that its prevalence ranges from 9% to 30% among adults age 40-55 years [9]. In the US (United States of America), a prevalence of 24% was found in 18 years and older age. Studies conducted in Saudi Arabia documents the overall prevalence at 11.1%, where as in

middle aged populations in Mexico City and in San Antonio, Texas, prevalence of hypertension among Mexicans was found to be 17.1% for men and 17.4% for women [8].

Other epidemiological studies have found the prevalence of hypertension to be 34.5% and 27.1% for men and women respectively in Cuba, 11% in China, 18% in Iran, 27.83% and 26.89% for men and women respectively in Oman and about 15% in India, Indonesia and Thailand [3,10,11]. Studies conducted in rural south India documents the prevalence of hypertension at 22.5% for the highest socio economic group and 8.8% for the lowest socio economic group [12] and among the Tea garden workers in Assam the prevalence was found to be 60.8% in subjects above 30 years of age [13].

Surveys conducted in USA between 1976 and 1980 documents that the percentage of hypertensive people unaware of their condition was 73% [14]. Other studies document that persons unaware of their condition were 55.2% in Iran [3], 76.5% in Saudi Arabia [8] and 55% in India and Bangladesh [15].

Such high prevalence is expected to have strong economic implications for the cost of health care, especially to drugs and consultation. Studies conducted in Sweden [16], England [17], and the USA [18] showed that 30-35% of the cost of management of hypertension goes to consultation alone, while 20-59% goes to drugs [19]. With knowledge gained of the cost of treating its complications, it seems inappropriate not to pursue rigorously the best management of hypertension [19]. But developing countries cannot afford the costs of treating CVD (Cerebro vascular disease) such as hypertension etc. in large portions of their populations [20]. Therefore, a cost effective use of health services to control these emerging chronic diseases is particularly needed in developing countries, because

resources are limited and generally must be shared with the concurrent burden of persistent communicable diseases [21].

In this context, hypertension presents a major area of intervention because it is common, readily detectable, and usually amenable to control through both non-pharmacological lifestyle factors and pharmacological treatment [9,21]. Life style interventions also have the potential to reduce the need for or the amount of medications in hypertensives and prevent high BP from developing in non-hypertensives [21].

The heart and hypertension are intimately linked. Hypertension predisposes to coronary heart disease, myocardial hypertrophy and cardiac dysfunction. Hypertension usually presents as an incidental finding in other clinical situations and as a result is often sub-optimally managed or even ignored. [19]. It seems clear from what is known today that appropriate control of hypertension is a feasible way to reduce deaths from stroke and also, to a degree, deaths from other cardiovascular disease [13]. To achieve this, however, hypertensions must first be diagnosed, then treated adequately and finally followed over the patient's lifetime to ensure that control remains optimal.

Although it is obviously better to prevent than to treat a disease, interest has focused on primary prevention of high blood pressure only in recent years. Hypertension is of importance, mainly as risk factor for heart and brain diseases and to date, efforts have been made to reduce high blood pressure levels than to prevent their occurrence. Therapy for high blood pressure, whether with drugs or in other ways is a primary preventive measure for cardiovascular or coronary heart disease [22-24]. Detection and correct treatment of hypertension at the community level has thus emerged as a major challenge in cardiovascular prevention [25]. Though the rates of awareness and treatment among

hypertensives are usually taken as indicators of the level of hypertension control in a population, detection and proper knowledge of KAP factors is particularly needed in the area of chronic conditions such as hypertension, as prevention and control necessitate a lifelong adoption of healthy lifestyles [21,25].

Rationale for the study

One of the first priorities in epidemiological research in a developing country is to define the magnitude of the problem [26]. It is important, though, to acknowledge that the estimate of the prevalence of hypertension is only the first step towards tackling the condition [15]. Assessment of knowledge, attitudes and practices (KAP) is a crucial element of hypertension control, but little information is available from developing countries where hypertension has lately been recognized as a major health problem [21].

The major problem in achieving better control of hypertension in a community is based on the fact that hypertension is a silent asymptomatic disease. Ignorance of the general population as to the nature of elevated blood pressure, its morbid effects and the methods of maintaining its control is widespread and contributes to the large percentage of undetected and untreated hypertensive subjects in a community [27].

Modern lifestyles have made it difficult to make healthy choices and against a background of monumental changes in production, marketing and retailing, the advocacy of changes in individual has generally failed [29].

Resistance to adopting healthy lifestyles may indicate a situation in which environmental cues do exist but fall short because of the relatively low outcome expectations. Another

factor could be that most persons have acquired sufficient knowledge but only a few show real motivation to change, and very few have reached the stages of skills and action whereby individuals actively engage in a new behaviour. The various explanations to resistance in actually adopting healthy lifestyles could be as follows. Firstly, lay persons may underestimate the serious consequences of hypertension because of its silent evolution, chronic nature, and delayed impact on health outcomes. Secondly, lifestyle patterns prevailing in a society at a certain time are shaped by common attitudes, beliefs, behaviors and social conditions and tend to be stable over time. Thirdly, individual indulgence in immediately 'pleasurable' behaviors (eg. Smoking, avoiding physical exercise, enjoying fatty meal etc.) are powerful deterrent for adopting healthy behaviors. Finally, individuals may perceive that they lack the skills to adopt healthy lifestyles or that they cannot afford them [21].

As hypertension is emerging as a major health problem, it is essential to gather both epidemiological and KAP data as crucial steps in the design of sound prevention and control programs. Information in this regard is limited in Mizoram where hypertension is seen to be on the rise, therefore the rationale for the study.

Furthermore, the recommendations of the Steering Committee, Ninth Five Year Plan had envisaged the provision of integrated non-communicable diseases prevention and control services through the existing infrastructure, though efforts on this front has been very slow. However, the recommendations of the Tenth Five Year Plan has been that efforts should be made to improve preventive, promotive, curative and rehabilitative services of non communicable diseases throughout the country, at all levels of care so as to reduce their overall morbidity and mortality [29].

Objectives:

1. To estimate the overall prevalence of hypertension in an urban area
2. To classify the overall prevalence into known and controlled, known and uncontrolled and unknown by age and sex.
3. To assess the knowledge and practices regarding hypertension in the study population.

Pathogenesis of hypertension [30]

Hypertension is a measurable end-product of a complex series of factors including those which control blood vessel caliber and responsiveness, those which control fluid volume within and outside the vascular bed, and those which control cardiac out put. None of these factors is independent: they interact with each other and respond to changes in blood pressure. The multiple interactions of neural, hormonal, autocrine/paracrine, rheological, geometric and intracellular factors determining blood pressure obscure the role of any single effector system in hypertension. The role of factors influencing cardiac output and peripheral vascular resistance play a role in the pathogenesis of hypertension.

Neurohumoral control of blood pressure

The central nervous system plays a critical role in controlling circulation: it integrates most reflexes that regulate blood pressure, coordinates signals generated during behaviours with appropriate circulatory pattern, senses metabolic and hormone signals of importance in regulating blood pressure to elicit a specific circulatory response, and generates the tonic background vasoconstriction necessary to maintain a normal blood pressure. Common abnormalities in one or more signal transduction pathways may contribute to the functional and structural abnormalities in hypertension.

Baroreflexes:

Baroreflexes have important interaction with the sinoatrial baroreceptor in the control of hypertension. Activation of these reflexes inhibit sympathetic and augment parasympathetic outflow to the heart and vasculature, affecting cardiac output and peripheral vascular resistance. It is tempting to attribute baroreflex abnormalities in the pathogenesis of hypertension; however, hypertension itself may be responsible for baroreceptor resetting and blunted baroreceptor control of hypertension. The role of baroreflexes therefore, may be in the facilitation of the persistence of hypertension.

Sympathetic nervous system

Sympathetic stimulation influences cardiac output by its effect on Myocardial contractility and relaxation, circulating volume, venous return and heart rate. Increased systemic flow from hyperkinetic circulation results in structural vascular changes that lead to increased basal vascular resistance and vascular responsiveness to vascular stimuli, and eventually to the development of sustained hypertension.

Autonomic nervous dysfunction

Cardiac autonomic dysfunction is associated with prevalent hypertension and reduced vagal function, and the imbalance of sympathetic- vagal function are associated with the risk of developing hypertension. Catecholamines play an important function in cardiovascular function via a direct action on the heart, blood vessels and the central nervous system. However, most patients with established essential hypertension have normal levels of catecholamines.

Cardiac output

The pressure required to move blood through the circulatory bed is provided by the pumping action of the heart (cardiac output) and the tone of the arteries (peripheral resistance). An increased cardiac output has been found in some young borderline hypertensives who may display hyperkinetic circulation. The increase in cardiac output could arise due to increase fluid volume or from an increase in contractility from neural stimulation of the heart

Extracellular fluid volume

Fluid retention leads to an increase in cardiac output and a rise in blood pressure. The high blood pressure leads to excretion of the accumulated volume, so that a new equilibrium between intake and output is achieved at the expense of a higher blood pressure. Intravascular volume spans a broad range, from extremely low as in the elderly, to as high in obese persons. Intravascular fluid volume is often increased in the course of hypertension and one cause of the increased prevalence of hypertension.

Systemic and regional blood flow

The neurogenic theory predicts that excessive sympathetic nervous system activated vasoconstriction will cause centralization of blood flow, increased cardiac preload, and a tendency for inappropriately high cardiac output at any given level of arterial resistance.

Microvascular factors and hormonal mediators

Microvasculation is the site of much of the vascular resistance and exchange function. The vascular wall plays an active role in vascular homeostasis through a complex interplay of endocrine, neurocrine and auto paracrine mechanisms. The endothelial cells senses humoral and hemodynamic changes and responds by secreting a variety of metabolically active substances that act locally causing either vasodilation or vasoconsriction. Disturbance of the delicate balance between vasodilators and vasoconsrictors may play a role in the development of hypertension.

Arterial and microvascular factors

An increase in tone or structural remodeling of arterioles narrows the caliber and results in an increase in calculated systemic vascular resistance. Mechanical wall stiffness, wall thickness, elastin and collagen content may vary along the arterial tree and genetic and environmental factors contribute to alter such structural properties. Furthermore, abnormalities, both intrinsic and extrinsic to the vascular smooth muscle can contribute to elevated peripheral resistance in hypertension. A positive correlation exists between hypertension and peripheral arterial disease.

Kidney in hypertension

Renal vascular resistance is constantly adjusted by the myogenic activation in the pre-glomerular arterioles and tubuloglomerular feedback to maintain a steady blood flow, despite changes in the mean arterial pressure. An abnormality in renal blood flow could participate in the pathogenesis of essential hypertension, either initiating or sustaining the

arterial pressure. Whether the kidneys play a central role in hypertension is unclear but an increased renal nerve traffic may contribute to the initiation or maintenance of essential hypertension. But hypertension causes and is caused by renal parenchymal disease due to volume overload, increased sympathetic nervous and renin-angiotensin system activity.

Renin-angiotensin system

The renin angiotensin system is a major hormonal axis involved in both pressure and sodium homeostatis. Angiotensin is a potent vasoconstrictor, a potent stimulus for aldosterone secretion and can result in the elevation of mean arterial pressure and sodium and water retenton. Angiotensin II interacts synergistically with sympathetic nervous system augmenting each other's activity. Plasma renin levels are high in young hypertensives and tend to decrease with age.

Genetic control of hypertension

Hypertension is a common trait of multifactorial determination. It is possible for characteristics such as hypertension to show heritability and still be subject to important changes as a result of environmental variation. Environmental effects are most clearly shown between populations rather than individuals. Unless a major environmental effect has been overlooked, it is likely that blood pressure differences within populations are determined largely by genes. Familial aggregate of hypertension indicates a strong genetic linkage. The aggregation of hypertension and familial lipid abnormalities are estimated to occur in 12-16% of all hypertensive persons and in 1-2% of the general population. Genes that increase a person's obesity tends to increase that person's blood pressure and increase the clustering of hypertension in that family.

Roles of electrolytes

Sodium has an essential role in hypertension. Acquired and genetic dysregulation of cellular sodium pathways may be important in the pathogenesis of hypertension. Older and diabetic hypertensives are often salt sensitive. Salt sensitivity is highest in persons with low-renin status, increased sympathetic nervous system activity or renal insufficiency. Sodium sensitivity may be the result of a defect in renal sodium excretion, higher level of sympathetic nervous system activity or due to reduced arterial distensibility. The effects of sodium are heterogeneous and not all hypertensives respond with elevated blood pressure to increased dietary sodium intake. But sodium sensitivity becomes greater with age, perhaps more in women than in men.

On the other hand, the relationship between blood pressure and the ratio of sodium/potassium is stronger than the relationship between blood pressure and either sodium or potassium on its own. In essential hypertension, the plasma potassium concentration is inversely related to blood pressure and this has suggested that potassium may be a factor in determining the blood pressure. Potassium channels regulate the membrane potential and reactivity of arterial smooth muscle and are unregulated in hypertensives.

Calcium plays a critical role in cellular communication, regulation and function. Defects in processes that permit calcium influx, mobilization from intracellular stores, and cellular stores and efflux may affect the cellular regulatory processes and functions and contribute to a variety of pathological states, including hypertension.

Demographics

Aspects of culture such as diet and other behaviour, population genetics, climetographic zones and influence of endemic factors in early years of life, can contribute to variations in the pattern of hypertension. Increased urbanization and associated economic and dietary changes contribute to the increased prevalence of hypertension. Hypertension occurs less frequently in children than in adults. Blood pressure tends to rise with age, however, this is not an invariable phenomenon and studies have shown that blood pressure can remain low throughout life.

Blood pressure is socially and culturally determined. Environmental stressors, difference in personality and susceptibility to stress are associated with blood pressure. The mechanism for this could be due to the lesser sensitivity of the baroreceptors in hypertensives patients and is likely the principal determinant of their increase in blood pressure variability. A decreased secretion of the anti-stress or dopamine and beta-endorphin probably also contribute to the progression of hypertension.

Regular physical activity/fitness are all associated with lower blood pressure levels. The nicotine in cigarette smoke acutely raises blood pressure, even in addicted smokers. No tolerance develops, so the blood pressure remains high as long as the person continues to smoke. Smokeless tobacco or cigars, if inhaled, also raises blood pressure.

Although considerable tolerance rapidly develops, some pressor effects of caffeine may be observed with repeated consumption. Alcohol consumption irrespective of the type of beverage, causes higher blood pressure, so that alcohol intake may be the most common cause of reversible hypertension.

Obesity is a recognized risk factor for the development of hypertension. Obese persons have a higher cardiac output and intravascular blood volume, but an inappropriately normal total peripheral resistance. An adverse body fat distribution, independent of obesity, is associated with hypertension.

White coat hypertension

The finding of persistently raised blood pressure in the doctor's clinic but normal at other times is referred to as white coat hypertension. It is generally thought to be attributable to acute stress in the presence of a doctor. The prevalence of white coat hypertension is perhaps higher than is generally though and studies have reported that 21% of patients with borderline hypertension had both systolic and diastolic pressures which were below this level during ambulatory blood pressure. For patients with more advanced hypertension, the prevalence was less at 5%. White coat hypertension has been found to be more common in women than men, although some studies have reported equal diagnostic incidents in men and women. White coat hypertension can occur at any age.

The mechanisms explaining white coat hypertension are that it is the exaggerated or orienting response and therefore a generalized hyper-activity to novel or stressful stimuli. Another postulation is that it is a precursor of sustained hypertension. While this cannot be excluded, the fact that it tends to be more, rather than less common in older patients would argue against this. The third postulated mechanism is the learned or conditioned response, which is thought to originate as part of the defense reflex, which later becomes perpetuated through classical conditioning. On the other hand, opinions vary as to the significance of white coat hypertension. The majority of investigators believe that it represents a benign

entity, whereas others have suggested that the risk in this condition is similar to that of patients with sustained hypertension. In the same line, opinions of treatment of white coat hypertension vary.

Complications of hypertension [31]

High arterial pressure causes

1. Changes in endothelial cells
2. Remodeling and growth of smooth muscle cells
3. Alterations in the flow and velocity of blood in large arteries due to structural and functional changes.

The stress in the endothelial cells causes damage to the endothelium, intimal hypertrophy and focal of occurrence of atherosclerosis. Proliferation and migration of smooth muscle cells has been noted in hypertension. Endothelial cell dysfunction also stimulates the proliferation of smooth muscle. Besides the structural changes mentioned, hypertension causes alteration in the flow and velocity of blood especially in large arteries. The compliance of these arteries is reduced, increasing after load. The common vascular lesions that are found in hypertension are hyperplastic and hyaline arteriosclerosis, which narrow the lumen of the arteries and are responsible for most of the target organ damage. Aneurysms in the small cerebral penetrating arterioles which may rupture causing cerebral haemorrhages is seen typically in hyertension. Damage to the media of the arteries such as the circle of Willis causing subarachnoid haemorrhage. Cystic medial necrosis, which is responsible for aortic dissection also occurs more frequently in hypertension.

Hypertensive heart disease

Diastolic dysfunction, which is the earliest effect of hypertension on the heart causes reduced left ventricular compliance. This causes slow diastolic filling and decreased diastolic relaxation ultimately leading to heart failure.

Left Ventricular hypertrophy (LVH)-

It is one of the most common complications of high blood pressure and is a powerful predictor of serious cardiovascular sequelae. It increases the frequency of ventricular arrhythmias and myocardial ischaemia because of the greater resistance to microvascular perfusion.

Congestive cardiac failure (CCF)-

This is three times more common in hypertensives than in normotensives. Data suggests that antihypertensive treatment does not completely prevent CCF but postpones its development by several decades. The mechanisms are dilated cardiomyopathy and reduced ejection fraction, diastolic dysfunction, ischaemic cardiomyopathy and increased after load.

Coronary artery disease (CAD)-

Hypertension is the single largest risk factor for CAD. Factors accelerating CAD in hypertension are the acceleration of atherosclerosis in coronary arteries, high resistance of coronary microvasculature, systolic/diastolic dysfunction, which increases LVH resulting in impaired coronary blood flow and myocardial hypertrophy. Thus hypertensive patients may suffer from silent ischaemia, asymptomatic myocardial infarction (MI) and sudden death.

Diseases of the arteries

Hypertension is a risk factor for diseases of the large arteries as well as peripheral arteries.

Cerebrovascular disease (CVD)

Hypertension is a major cause of stroke and is predisposed by aggravating atherosclerosis in the aortic arch, carotid arteries and cerebral arteries; causing arteriosclerosis and lipohyalinosis in the end arteries of the cerebrum.

The risk of stroke is greater in hypertensives with other risk factors like diabetes, smoking, CAD, LVH, cardiac arrhythmias, hyperviscosity syndromes and a high haematocrit.

Prevalence of hypertension- review [11,28,32,33]

Hypertension is a common disease and is considered as one of the leading noncommunicable diseases facing mankind. It is recognized as an important public health problem all over the world. It is often symptomless, but can lead to lethal complications, if left untreated.

It is well established that cardiovascular risk of high blood pressure is strong, continuous, graded, consistent, independent, predictive and aetiologically significant for those with and without coronary heart disease. Hypertension is a major risk factor for the development of cardiovascular disease (CVD). Its impact for stroke and end-stage renal failure is greatest. It is also one of the contributing factors for the development if coronary

heart disease (CHD). Hypetensives, when compared to normotensives, develop twice as much coronary heart disease, four times as much congestive heart failure and seven times as much stroke. While there is no critical value for blood pressure, the risk of CVD rises progressively with the level of BP. Cardiovascular risks in hypertensives are also markedly affected by other coexisting risk factors such diabetes, high cholesterol, smoking, obesity, physical inactivity etc.

Community surveys in industrialized countries have shown a prevalence of 15%-38% in people aged 30 years and above. The National Health and Nutrition Examination Surveys (NHANES) in the United States have reported a prevalence of 20% of the entire US population. The prevalence ranges from 4% in the age group 18-24 years to 60% in the age group 65-74 years.

While surveys carried out in most of the industrially developed countries have shown an almost similar prevalence, those in the lesser- developed countries have shown a lower prevalence. In spite of this, surveys of indigenous populations in a number of African countries indicated that hypertension is on the rise. In Seychelles, hypertension affects 20% of the total population (with a rate of 38.5% in men and 27.7% in women between age-group 25-64 years); in Mauritius- 14%; in South Africa- 16%; in Cuba- 34.5% and 27.1% in men and women respectively.

In India, there are no well co-ordinated national surveys of the prevalence of hypertension available. Several regional, small surveys with varying protocols have reported a prevalence, which varies widely from 3.8 to 15.63% in men and 2 to 15.38% in women in the urban areas. More recent surveys in urban areas have reported higher prevalence- Gupta et al (1995) found a prevalence of 30% in men and 34% in women, in the age group 20

years and above, using the criteria of ≥140/90; Anand et al (2000) reported a prevalence of 26.8% in men and 27.65% in women in the age group 28-65 years, using the criteria ≥140/90. Diagnosis of hypertension was based on the average of three readings on the 2nd occasion after initial screening. A survey conducted among the tea workers of Assam by Hazarika et al on the prevalence of hypertension and its risk factors reports an overall, high prevalence of 60.8%.

Various studies to assess the prevalence of hypertension, risk factors, controlled status as well as KAP studies have been conducted in different settings and with different study designs. A detailed review of studies on various aspects of hypertension are presented below:

Author	Year	Title	Place
S.L Chadha et al [34]	1990	Prevalence, awareness & treatment status of hypertension in urban population	N. Delhi, India
Burt et al [6]	1995	Trends in the prevalence, awareness, treatment and control of hypertension	USA
Sarref-Zadegen N et al [3]	1999	Prevalence of hypertension and associated risk factors	Isfahan, Iran
Hypertension study group [15]	2001	Prevalence, awareness, treatment and control of hypertension among the elderly: A Multi center study	Bangladesh & India
LS. Al-Sowielem et al [35]	1997	Compliance and knowledge of hypertensive patients attending PHC centers	Al-Khobar, Saudi Arabia
Line Aubert et al [21]	1998	Knowledge, attitudes, and practices on hypertension in a country in epidemiological transition	Seychelles
DS P res et al [36]	2003	Arterial hypertension patients: attitudes, beliefs, perceptions, thoughts and practices	Ribeir o Preto Brazil
T Fahey et al [37]	1994	General practitioner's knowledge of and attitudes to the managements of hypertension in elderly patients	Oxford
C Cuspidi et al [38]	2002	Awareness of hypertension guidelines in general practice: a pilot study	Lombardy, Italy
David J. Hyman et all [39]	2002	Poor hypertension control: Let's stop blaming the patients	USA

Prevalence, awareness & treatment status of hypertension in urban population of Delhi. ***Indian J Med Res.*** **1990;92:233-240** [34].

S.L Chadha, S. RadhaKrishna, K. Ramachandran, U. Kaul and N. Gopinath

A community based survey for the prevalence of hypertension was carried out on a random urban sample of 13,723 adults in the age group 25-64 yr from Delhi. Hypertension was defined as systolic pressure greater than 160 mmHg and/or diastolic pressure greater than 90mmHg or a history of current anti hypertensive medication (JNC III report). The sampling design was based on probability proportional to size (PPS) with selection of 20 charges. From within each selected charges, threes blocks were randomly chosen.

The overall prevalence of hypertension was 127.5/1000 of which men had a prevalence rate of 116.6/1000 and women had a prevalence of 136.8/1000. The prevalence rate was higher in females except in age group 25-34 years. The prevalence rate increased with age in both sexes.

Those who were aware of their hypertension status or known cases were 49.5%, of which the awareness was slightly higher in women (51.8%) than in men (46.4%). The 'awareness' of hypertension showed an increasing trend with age in both sexes. Severity of hypertension showed an association with age, in both sexes and moderate and severe grades of hypertension increasing with age in both sexes. The awareness of hypertension increased with severity. Out of the known case, 20.1% had not received any treatment or had discontinued after initial medication. The percentage of men and women who fell in this category were 19.1% and 20.9% respectively. Approximately 30% of hypertensives were on medication. The proportion of hypertensives on medication in both sexes showed an increase with age. In women, the proportion of patients not taking medication decreased

with age, though such trend was not apparent in men. A small percentage of all hypertensives (8.9%) had control of their blood pressure with little difference in sexes or age group.

Overall, the study emphasizes the enormity of the problem of hypertension in an urban population in India as well as poor control of blood pressure achieved in the community.

Prevalence, awareness, treatment, and control of hypertension in the adult US population. *Hypertension*. 1995;25(3):305-13 [(6)].

(Data from the Health Examination Surveys, 1960 to 1991)

Vicki L. Burt, Jeffery A. Cutler, Millicent Higgins, Michael J. Horan, Darwin Labarthe, Paul Whelton, Clarice Brown, Edward J. Rocella

The National Health and Nutrition Examination Survey (NHANES) was conducted for information on the health and nutritional status of the civilian non institutionalized population of the United States. The III NHANES study (as all previous study) used stratified multistage probability sample designs. The sample population were adults above 18-74 years. BP measurements were taken with subjects in the seated position. Four sizes of cuffs were available. Three BP measurements were obtained on two occasions, the first set of three BPs were measured in the home by a lay interviewer and the second by a physician. Quality control measures were instituted with formal trainings and quarterly site visits, during which the accuracy of BP measurements obtained by field observers were confirmed by an experienced independent observer. The definition of hypertension was based on VI JNC report. Awareness was report of prior diagnosis of hypertension, treatment was defined

as history of current antihypertensive drug therapy at the time of the interview. Control was defined as hypertension with systolic BP <140 mmHg and diastolic BP <90 mmHg.

The age adjusted prevalence of hypertension was 22.8% in men and 18.0% in women. The prevalence of hypertension increased with age. The mean systolic and diastolic BP was 119 and 73 respectively (123/76 in men and 116/70 in women). The level of awareness of hypertension was 73% (66% in men and 81% in women). The proportion of hypertensives on treatment was 55% (46% in men and 65% in women). People with controlled hypertension were 29% (22% in men and 38% in women). Treated people with controlled hypertension were 55% (50% in men and 58% in women).

Hypertension awareness, treatment and control have improved as compared to previous surveys but notes that many people with hypertension are unaware of their condition, and many more are untreated or inadequately treated.

Prevalence of hypertension and associated risk factors in Isfahan, Islamic Republic of Iran. ***EMHJ.*** **1999;5(5):992-1001** [(3)]**.**

Sarref-Zadegen N, Boshtem M, Mostefevi S and Refiei M.

A cross sectional study with a sample size of 8624, included participants from 19 years and above, who were randomly chosen from selected clusters in the mentioned city. Data was collected using questionnaires, containing variables about smoking habits, previous history of hypertension, diabetes, complaints of cardiovascular disease and current use of medication for hypertension and diabetes. Height and weight were measured and blood pressure was measured at home, three times from the right upper arm with a 14-cm cuff, after the participants had rested for 10 minutes. The mean value obtained from three

readings was used in the analysis. A systolic reading of 160 mmHg and/or diastolic reading of 95 mmHg or the use of anti hypertensive medication were used to define hypertension.

The crude prevalence for definite hypertension was 28.6%, 38.9% and 34.8% for men, women and the entire population respectively. The prevalence of hypertension increased with age in both sexes and women had a lower prevalence only in the third decade.

The number of hypertensive participants who were aware of their disease and were taking medication increased with age in both sexes. Generally, women had a higher rate of awareness and were more commonly treated than hypertensive men. However, among those treated, men had better control rate than women in the sixth and eighth decades. The overall awareness, treatment and control rates of definite hypertension were 55.2%, 50.9% and 12.3% respectively. Overall, the proportion of women who were aware of their hypertension and were being treated was higher than men. It is noted that the absolute association of risk factors and hypertension varies as a consequence of variable cut-off levels used to define such risk factors, the nature of the study and the ethnic composition of the population under study may affect the prevalence rates. However, it is noted that the prevalence of hypertension is high.

A study on the prevalence, awareness, treatment and control of hypertension among elderly in Bangladesh and India: a multicentre study. *Bull World Health Organ.* 2001;79(6):490-500 [15].

The objective of the study was to evaluate the prevalence, awareness, treatment and control of hypertension among elderly individuals in India and Bangladesh. The study

design was a cross sectional community based survey of non- institutionalized elderly individuals (>= 60 years) in five regions of the Indian sub-continent: three in India and two in Bangladesh. Selection of the study sites was based on convenience. The sample size was 1203. A random multi stage cluster sampling strategy for ensuring that the study samples at the chosen sites were representative of the communities in the geographical region studied was done. The filed investigators performed a door to door survey of the participant households and administered questionnaires in the local vernaculars.

JNC VI report was used as criteria to determine the status of hypertension in the study. Awareness of hypertension was based on the participant's report of a prior diagnosis of hypertension made by a health professional.

The overall prevalence of hypertension was 65%. The prevalence was similar for both sexes and did not differ in the different age groups. The mean systolic or diastolic blood pressure according to sex and place of residence did not vary by sex, but were higher among urban residents. Overall prevalence was higher in urban than in rural sites.

A multivariate logistic regression model to examine the cross sectional correlates found that higher BMI, self-reported diabetes and a higher educational level were associated with increased odds of being hypertensive. Only 45% of known hypertensive subjects were aware of their elevated status out of which 97% were on allopathic medications. However, only 10% of hypertensives had their blood pressure controlled and more over, 7% of all hypertensives had blood pressure indicative of severe hypertension. Women were more aware of their hypertensive status and more likely than men to be treated. Rural samples were less likely to be aware of their status than their rural counterparts. However, rates of control of hypertension did not differ between the two sexes, pooled urban or rural sites.

This study has shown a direct evidence of an increasing burden of hypertension among elderly population. The overall awareness, treatment and adequacy of control of hypertension was low. It concludes the emphasis of the need to implement effective and low cost management regimens based on absolute levels of cardiovascular risk appropriate for the economic context.

Compliance and knowledge of hypertensive patients attending PHC centers in Al-Khobar, Saudi Arabia. *J Hypertens*. 1997;15:561-5 [35].

L.S Al-Sowielem and A.G Elzurbier

A cross sectional study in four randomly selected primary health care center from a total 10 centers serving the population of the said city. Patients were interviewed by trained interviewers, using structured questionnaires. Data that were collected comprised of age sex, marital status, educational level, positive family history of hypertension, smoking status, presence of other chronic disease, duration of hypertension, mode of diagnosis of hypertension, number of drugs taken for hypertension, regularity of taking drugs, presence of difficulties in complying with treatment, regularity of follow up and whether the patient was seen by the same doctor at each follow up visit. Patients were also asked their opinion on the possibility of a total cure for hypertension and whether treatment should be stopped if blood pressure were controlled. In addition, the patient's opinions on age and gender susceptibility, causes and complications of hypertension and if it was possible to prevent the disease were sought.

Weight, height and blood pressure were recorded during the visit and BMI calculated. Compliance was measured as the therapeutic outcome of DBP <90 mmHg as well as self reporting of compliance.

When compliance was assessed according to the therapeutic outcome (DBP method), 34.2% were found to be compliant. On the other hand, the self- reporting method revealed that 74.7% were compliant. With the therapeutic outcome method, compliance was significantly higher among patients over 55 yeas of age than those who were younger. There was no significant difference in compliance rates between males and females or between different nationals. Patients who were regular on follow-up (82.1%) had a significantly higher compliance rate than those who were irregular (37.8% and 17.6% respectively; =<0.02). A positive family history of hypertension was found in 49.5% of the patients.

Less than half (41.6%) of the patients thought that hypertension could have a permanent cure and 43.7% thought that medications could be stopped once control was achieved. Almost two-thirds of the patients (66.3%) thought that the main etiological factor of hypertension was emotional stress, while only 1.6% acknowledged the role of heredity in causing the disease. About one third of the patients (31.6%) did not know the complications of hypertension, while 42.1% knew that it might lead to neurological complications and 1.6% were aware that the disease might lead to renal complications.

The results of this study reveals the importance of regular follow up in achieving better compliance, emphasizing the need for health education to enforce this habit. It further stresses the importance of primary physicians in educating patients about hypertension, due to various misconceptions about the disease and low compliance. There is an indication of a need for health education on hypertensive patients.

Knowledge, Attitudes, and Practices on Hypertension in a Country in Epidemiological Transition. ***Hypertension.*** **1998; 1136-1145** [21].

Line Aubert, Pascal Bovet, Jean-Pierre Gervasoni, Anne Rwebogora, Bernard Waeber, Fred Paccaud

Assessment of knowledge, attitudes and practices (KAP) is a crucial element of hypertension control, though little information is available from developing countries. A cross sectional study of the general adult population, aged 25 to 64 years on the island of Mahe, Seychelles was conducted. A total of 1067 were surveyed with a response rate of 87%. BP was measured with a mercury sphygmomanometer in three readings obtained at intervals of ≥2minutes, after the subject had rested for at least 30minutes. The subject was in a sitting position at the time of the BP measurements. Large cuff for persons with middle arm circumference ≥43 cm were used. The average of the last two readings was used for analysis. A face to face structured interview in the local language was administered to all participants. Awareness of hypertension was defined as prior information by a health professional that he had hypertension.

The age adjusted prevalence of hypertension (BP≥160/95 mmHg or taking medication) was 35.8% in men and 25.0% in women. Age and sex adjusted rates of hypertension were higher in men, older persons, obese, blacks and persons with high serum cholesterol. With regard to socioeconomic variables, the age, sex, and ethnic group-adjusted rates of hypertension were higher without paid work and in those owning a car. Hypertension rate was marginally higher in persons without versus with secondary education. No consistent trend was found across job categories. The proportion of aware was

50.3%, aware and treated were 34.0%, proportion of aware, treated and controlled were 10.3% and the proportion of controlled among treated were 30.3%.

Knowledge, attitudes and practices of the study participants on hypertension were assessed. A high proportion of participants, both aware (AH), and unaware of being of hypertensive (UH) showed good basic knowledge. In contrasts, specific knowledge was significantly better in AH than in UH subjects. Among UH, knowledge was generally similar in persons unaware of being hypertensive and who are hypertensive (UHH) and persons unaware of being hypertensive and who are non hypertensive (UHN). Recognition of the detrimental effects of smoking, drinking, obesity, little physical activity were more than 70% for both AH and UH. Regarding attitudes, similar high proportions between (73% and 95%) expressed the wish to reduce the corresponding detrimental habit, though attempt to change was reported by smaller proportions of participants: 74% of smokers, 60% of heavy drinkers, 56% of overweight persons and 16% of persons with low physical activity. The KAP findings on concomitant risk factors did not differ substantially between AH and UH participants with few exceptions: more AH than UH heavy drinkers (96.3% versus 71.3%; p=0.20) thought that their alcohol consumption was harmful to their health, more AH than UH with low physical activity (79.9% versus 65.6%) considered themselves as getting too little exercise. In contrasts, fewer AH than UH smokers expressed the wish to reduce smoking (84.9% versus 95.2%; p=.027); and fewer AH than UH overweight persons knew that overweight causes hypertension (88% versus 97%; p=.001) or thought that lifestyle cab influence future health (12.2% versus 21.4%; p=0.29).

Overall, most persons, whether nonhypertensive, unaware hypertensive or aware hypertensive had good basic knowledge related to hypertension determinants and

consequences. However favourable outcome expectation, positive attitudes, and appropriate practices for hypertension and relevant health lifestyles were found in smaller proportions of participants. Furthermore, hypertensive persons with other cardiovascular risk factors affecting the overall heart risk knew well the detrimental effects of these factors but reported making little actual change to control them (particularly regarding overweight and sedentary habits) These data point to the need to maximize the efficiency of hypertension prevention and control programs so that delay in achieving effective hypertension control is minimized in countries experiencing recent emergence of hypertension as a major public health problem.

Arterial hypertension patients: attitudes, beliefs, perceptions, thoughts and practices. ***Rev Saude Publica.*** **2003;37(5):635-42** [36].

DS P res, JM Magna and LA Viana

An exploratory study was carried out in 32 hypertensive patients seen at 2 health care units in the municipal district of Ribeir o Preto, Brazil with the objective of knowing arterial hypertensive patients through their attitudes, beliefs, perceptions, thoughts and practices related to the disease. Subjects were interviewed in a single session and data were analyzed using Content Analysis method through categories not defined a priori.

About half the patients (49%) were not able to define hypertension. They believed the main symptoms were headaches and neck pain (18%) and the possible consequences of the disease were stroke and heart attack (39%). Emotional factors were mentioned as the ones that mostly impair hypertension control. To accomplish that, 40% said that there should be changes in lifestyle, such as walking and exercising. Regarding patients' practices, drug

treatment and management by a health provider were most often referred. Psychological aspects and health beliefs seem to affect directly with patients' knowledge on hypertensive disease and their health practices. Given that all patients had already received some kind of information about arterial hypertension before the beginning of the study, it would be important to propose new forms of educating these patients.

General practitioners' knowledge of and attitudes to the management of hypertension in elderly patients. ***Br J Gen Pract.*** **1994;44(387):446-9** [37].

T Fahey and C Silagy

It is not known whether the results from randomized controlled trials influence general practitioners' knowledge of and attitudes to clinical practice. So the study was conducted with the aim of assessing general practitioners' knowledge of and attitudes to the management of hypertension in patients aged 65 years and over, after the publication of three randomized controlled trials. A cross sectional survey of principals in general practice was undertaken using self-administrated questionnaire. The study was confined to 35 randomly selected general practices whose patient catchment area lay within the boundary of Northamptonshire Family Health Services Authority. A total of 92 general practitioners from 27 practices responded. The main outcome measures were: the reported use of a protocol to manage elderly patients with hypertension; method and frequency of blood pressure measurement; influence of patients' age on diagnosing and initiating treatment of hypertension; and use of non-pharmacological and pharmacological therapies.

Eighty four percent of the general practitioners' reported starting treatment only after measuring blood pressure on three separate occasions; 99% measured blood pressure with

the patient seated. Half of the respondents reported treating patients with isolated systolic hypertension once systolic blood pressure exceeded 179 mmHg. All the general practitioners reported recommending non-pharmacological treatment prior to drug therapy; 83% would use a diuretic as their drug of first choice. This has illustrated that there is still considerable variation in the knowledge and attitudes of general practitioners towards hypertension.

Awareness of hypertension guidelines in general practice: a pilot study in Lombardy. *Ital Heart J.* 2002;3(1): 60-3 [38].

C Cuspidi, I Michev, B Severgnini, V Fusi, C Valerio, S Meani, A Vaccarella, G Palubo, ML Muiesan, F Magrini, A Zanchetti and Lombardy Regional Section of the Italian Society of Hypertension.

The aim of the study was to evaluate, in a local survey in the northern area of Lombardy, the general practioners' knowledge of the WHO/ISH hypertension guidelines. The method that was used in the study was a 10-item mail questionnaire based on the WHO/ISH hypertension guidelines, that was sent to a sample of 280 primary care physicians. The number of answers in agreement with the guidelines was used as a measure of guidelines' knowledge, that was considered if a correct answer to 6 out of 10 questions, in addition to an adequate definition of hypertension was provided. The analysis was based on 83 returned questionnaires, that means a 29% response rate.

Guidelines knowledge was adequate in 23.5% of the total study population and the mean score of correct answers was 5.5 points. A significant negative correlation ($r=0.27$, $p<0.05$) was observed between the mean score of knowledge and the physicians age. An adequate knowledge of hypertension guidelines by primary physicians is a fundamental step

for the improvement of the diagnosis and treatment of hypertension in the general population. However, this study shows that in a sample of primary care physicians in the northern region of Italy, knowledge of hypertension guidelines is inadequate; the reasons and the extent of this poor knowledge requires further studies.

Poor hypertension control: Let's stop blaming the patients. ***Cleveland clin J of Med.*** **2002;69(10):793-99** [39].

David J. Hyman and Valory N. Pavlik

Hypertension is not well controlled in the United States. In spite of extensive education campaigns for physicians and patients, only 27% of Americans with hypertension have their blood pressure controlled to the recommended target of less than 140 mmHg systolic and less than 90 mmHg of diastolic. The reason for poor control have not been clearly delineated, but attention has focused primarily on patient factors such as poor compliance with treatment and lack of access to care. Patient noncompliance is frequently proposed as a major cause of the low control rate and is usually attributed to adverse effects of antihypertensive drugs, financial barriers to treatment, and lack of motivation on the part of the patient to treat a symptomless disease for an indefinite period.

Because hypertension is usually chronic, most hypertensive patients have established hypertension. And because the blood pressure levels of most patients are mildly elevated, the transition of most patients from being a nonuser to a long term user of antihypertensive medication may have some discontinuity at the start. The fact that many patients stop taking their medications (if indeed they do) is sometimes attributed to unpleasant side effects of the drugs. It is possible, however, that the contribution of drug side effects to patient

noncompliance with antihypertensive therapy is misinterpreted as different studies demonstrates that side effects were few and had lower continuation rates than those receiving placebo. Furthermore, the variability in side-effect profiles among the active drug groups was relatively small.

Moreover, studies suggest that physicians are unlikely to diagnose and treat hypertension when systolic pressure is between 140 and 160 mm Hg and diastolic pressure is less than 90 mmHg. Many health care organizations now endorse blood pressure targets even lower than 140/90 mmHg for specific groups of patients, such as those with renal insufficiency. It is clear that practicing physicians have yet to adopt this paradigm. So it is time to stop blaming the patient or even blaming the drugs for the current state of hypertension control and to reflect on how aggressively we as physicians pursue treatment goals.

Summary of Literature review

The overall literature review highlights the high prevalence of hypertension and it's positive correlation with increasing age. The association of risk factors and hypertension varies as a consequence of variable cut off levels and different ethnic composition of the study population. There is an overall low awareness level (known cases) and poor control in populations. Compliance to treatment is sub-optimal. The need of regular follow up in achieving better treatment compliance is also noted. An emphasis of the need to implement effective and low cost management regimens appropriate for the economic context is made. Need for new forms of education for hypertensive patients are stated.

Another important aspect in the control of hypertension in populations is the need of uniform treatment guidelines. Different studies in different settings have noted inconsistencies in the treatment of hypertension among primary care physicians. The reasons and extent of poor knowledge/reluctant attitude to treat hypertensive patients needs further study. Overall, the level of poor control of hypertension in populations is not only a consequent of the patients but is also a consequent of physicians knowledge/attitudes/practices.

3. METHODS:

Mizoram lies at the southern tip of North- East India. It has a population of 8,91058 (census 2001) with a Male to Female ratio of 934, and 49.5 % of the population lives in urban areas. Aizawl is the capital of Mizoram with a Male to Female ratio of 954. Its population is a mosaic of the population of Mizoram.

Mizoram has seen a rise in Non Communicable Diseases (NCD) in the past decade, but no planned epidemiological study has been undertaken.

Study design and setting:

A cross sectional household survey was conducted in 2 urban purposively selected areas, namely Mission veng and Kulikawn. The two selected areas have a population of 5869 (1156 household) and 3533 (858 household) respectively. They are situated adjacent to each other. Their lifestyles are perceived to be more or less homogeneous. They are also regarded to be representative of the urban population of Mizoram.

Sample size:

Sample size calculation was based on the formula of simple random sample and assumption that the prevalence of hypertension in an urban area would be 12%. This was based on a pilot study that assessed the prevalence of diabetes and hypertension in one ward. So with alpha error set at 5% and with an absolute error at 2% the sample size was calculated to be 1014.

$$\text{Sample size} = \frac{1.96^2 \times \text{prevalence \% (100-prevalence \%)}}{\text{absolute error \%}^2}$$

$$= \frac{1.96^2 \times 12 \times 88}{2^2} = 1014$$

But the sample size was doubled to 2028 to allow for intra class correlation, since all adults in a household who were 30 years and above were examined. Assuming an average of 3 adults above 30 years of age per household, 2028/3=676 households would be needed. Allowing for a possible 10% non- response, a sample of 750 households were selected.

Sampling design:

The 750 households were allocated to the 2 areas proportional to the respective total number of households in the areas. Thus $\frac{1156 \times 750}{2014}$=430 households were selected from Mission veng and $\frac{858 \times 750}{2014}$=320 households were selected from Kulikawn area.

From each of the two areas, the required samples of 430 and 320 households respectively were selected using a circular systematic sampling procedure. In this procedure, the first household is selected randomly from all the households in that area and then a systematic sample is chosen with a sampling interval of 2.

Data collection:

A face to face semi- structured interview with pre-designed questionnaires, in the local language was administered to all participants. The Principal Investigator was aided by 2 registered Health Workers, who were trained prior to the study for standardized procedures. Data was collected on socio-demographic characteristics such as age, sex, education, occupation and religion.

Anthropometric measurements such as height, weight, waist and hip were taken. Height was measured with the subject in an erect position, without foot wear and with the head positioned so that the top of the external auditory meatus was level with the inferior margin of the bony orbit. Measurement was taken by a steel tape and measured to the nearest centimeter. Weight was measured to the nearest kilogram. With the subjects standing motionless on a bathroom weighing scale and weight equally distributed on each leg with minimum clothing as culturally appropriate. The 'zero' was checked each day and calibration done, with reference to an object of known weight.

Waist and hip measurements were done in the standing position using steel tape and the waist: hip ratio calculated. Waist was measured at the smallest horizontal girth between the costal margins and the iliac crest. Hip was measured as the greatest circumference at the level of the greater trochanters. Measurements were taken to the nearest centimeter. Two measurements were taken and the mean readings taken.

All blood pressure (BP) measurements were taken in the morning between 8.30 am and 11.30 am. Participants were made to be in the seated position and measurements taken from the left arm of each participant, using a mercury column sphygmomanometer

(Diamond co.). Study participants were advised to refrain from smoking, taking tobacco in any form or from drinking any caffeinated beverage during the hour preceding the interview. The blood pressure measurements were done using the cuff at the level of the heart. The cuff pressure was inflated 30mm Hg above the level at which the radial pulse disappeared, then deflated slowly at the rate of about 2mm per second and the readings recorded to the nearest 2mm Hg. The first (appearance) and the fifth (disappearance) Korotkoff sounds were recorded as indicative of the systolic (SBP) and the diastolic (DBP) respectively.

Two separate measurements of the BP were done at interval on 5 to 7 minutes and the average of the two readings were taken to describe the blood pressure of the participant.

Statistical analysis

Statistical analysis was done using Epi info 6.04d. All coded data were double checked for consistency, completeness and credibility. A χ^2 test was used to compare the prevalence among different age groups, sex, education, WHR, BMI, occupation, known cases, newly detected cases and KP variables. Results were assessed at a significance level of $p=0.05$

Ethical considerations

The study subjects were included only after full explanation of the objectives of the study and the study procedures, and their consent was obtained. The use of personal information has been limited to the purpose for which it was collected. Full confidentiality is observed. Subjects who were found to have hypertension were referred to Civil Hospital, Aizawl for further necessary actions. No coersive or inducement tactics were used.

Definitions of hypertension:

Hypertension definition was based on The Seventh Report of the Joint National Committee on the Prevention, Detection, Evaluation and Treatment of High Blood Pressure (JNC 7 Report) [40] and are as follows:

Bp classification	Systolic BP, mmHg		Diastolic BP, mmHg
Normal	<120	and	<80
Prehypertension	120-139	or	80-89
Stage I hypertension	140-159	or	90-99
Stage II hypertension	>=160	or	>=100

Known hypertensives (KH) were defined based on the participant's self report of a prior diagnosis of hypertension by a health care professional, supported by other information such as treatment history, prescription cards or duration of the disease. Compliance was based on self report of current use of prescription medication for lowering elevated blood pressure or current adherence to prescribed treatment in terms of lifestyle changes/non-pharmacological treatment or both.

Persons who were unaware of being hypertensive, but found to have hypertension at the time of the study were classified new hypertensives (NH). An uncontrolled hypertension (KUH) was known hypertensives with an SBP >=140 mmHg or DBP >=90 mmHg at the time of the blood pressure measurement. Controlled rates were calculated for known hypertensives who were compliant of treatment advised, since awareness and treatment are prerequisites for the control of hypertension.

A Knowledge and Practices (KP) questionnaire was administered in the local language to all known cases of hypertension, newly diagnosed cases of hypertension (using the criteria SBP>=140 and DBP >=90, due to limitation of time) as well as sex and age matched controls of participants who were normotensive at the time of the study.

The study was undertaken during the months of September to November 2003. A total of 1814 participated in the study, corresponding to a response rate of 89.5% (88% men vrs 90.2% women). There were 8 pregnant women and 6 physically challenged persons (4 male and 2 female) who were excluded; 7 men refused to participate on the grounds that they were healthy/do not need to know their BP/it was not 'manly' to check their BP. And 7 Households were found to be locked and the inhabitants unavailable on a subsequent visit.

4. RESULTS:

Among the 750 households sampled, 2153 persons were aged 30 years and above. 1814 (84.3%) people were examined. The study sample consisted of 833 (45.9%) men and 981 (54.1%) women. The study population composed of 36.7% in the age group 30-39 years and has the highest number of participants. Older age group from 60 years and above were composed of 21.9%. Table I gives some of the general characteristics of the study population.

Table I. Age and sex distribution of the study population, urban Mizoram, 2003:

Age group (years)	Male	%	Female	%	Total	%
30-39	296	44.4	370	55.6	666	36.7
40-49	251	53.1	222	46.9	473	26.1
50-59	117	42.2	160	57.8	277	15.3
60-69	92	41.4	130	58.6	222	12.2
≥ 70	77	43.8	99	56.3	176	9.7
Total	**833**	**45.9**	**981**	**54.1**	**1814**	

Table II depicts the mean systolic and diastolic BP in known hypertensives, new hypertensives and normotensives among men and women. The mean systolic BP was highest among KH, followed by NH and Non-H. This trend is seen in both sexes, though no statistical significance is seen. The mean diastolic BP in both sexes is comparatively higher in KH than NH or Non-H. Women had a lower mean diastolic BP as compared to men, and is statistically significant.

Table II- Mean systolic and diastolic BP of the study population, urban Mizoram 2003:

Variables*	K H (n=319)			NH (n=306)			Non-H (n=1189)		
	SBP	DBP	P	SBP	DBP	P	SBP	DBP	P
Men	142.7	95.4	0.03	133.7	92.4	0.01	114.7	77.2	<0.01
	(16.10)†	(10.7)†		(13.9)†	(5.9)†		(5.9)†	(6.9)†	
Women	135.7	92.6		132	90.7		111.3	75.1	
	(16.3)†	(12.1)†		(10.8)†	(5.2)†		(9.9)†	(7.1)†	

*SBP- Systolic Blood Pressure; DBP- Diastolic Blood Pressure; KH- Known hypertensives; NH- New hyprtensives; Non-H- Normotensives
†Figures in parentheses indicate ±standard deviations

Table III. Demographic and Anthropometric characteristics of the study population, urban Mizoram, 2003:

Variables*	KH (n=319)			NH (n=306)			Non-H (n=1189)		
	M	F	P	M	F	P	M	F	P
Age	51.7	55.5	0.01	48.7	51.3	NS	44.8	45.4	NS
	(14.8)†	(14.2)†		(13.4)†	(14.9)†		(13.0)†	(13.2)†	
BMI	25.1	25.4	NS	24.7	24.4	NS	22.8	22.9	NS
	(3.7)†	(4.2)†		(3.6)†	(4.1)†		(3.2)†	(3.6)†	

* SBP- Systolic Blood Pressure; DBP- Diastolic Blood Pressure; KH- Known hypertensives; NH- New hyprtensives; Non-H- Normotensives
†Figures in parentheses indicate ±standard deviations

Table III shows the mean age and BMI among known hypertensives (KH), new hypertensives (NH) and normotensives (Non-H). The overall mean age in men was 47.02 (13.7) and 47.7 (14.1) in women (data not shown).

The mean age among KH were comparatively higher than NH or Non-H, in both sexes. The mean age of women participants are more than men and is statistically significant in KH. The mean age is highest among NH in men.

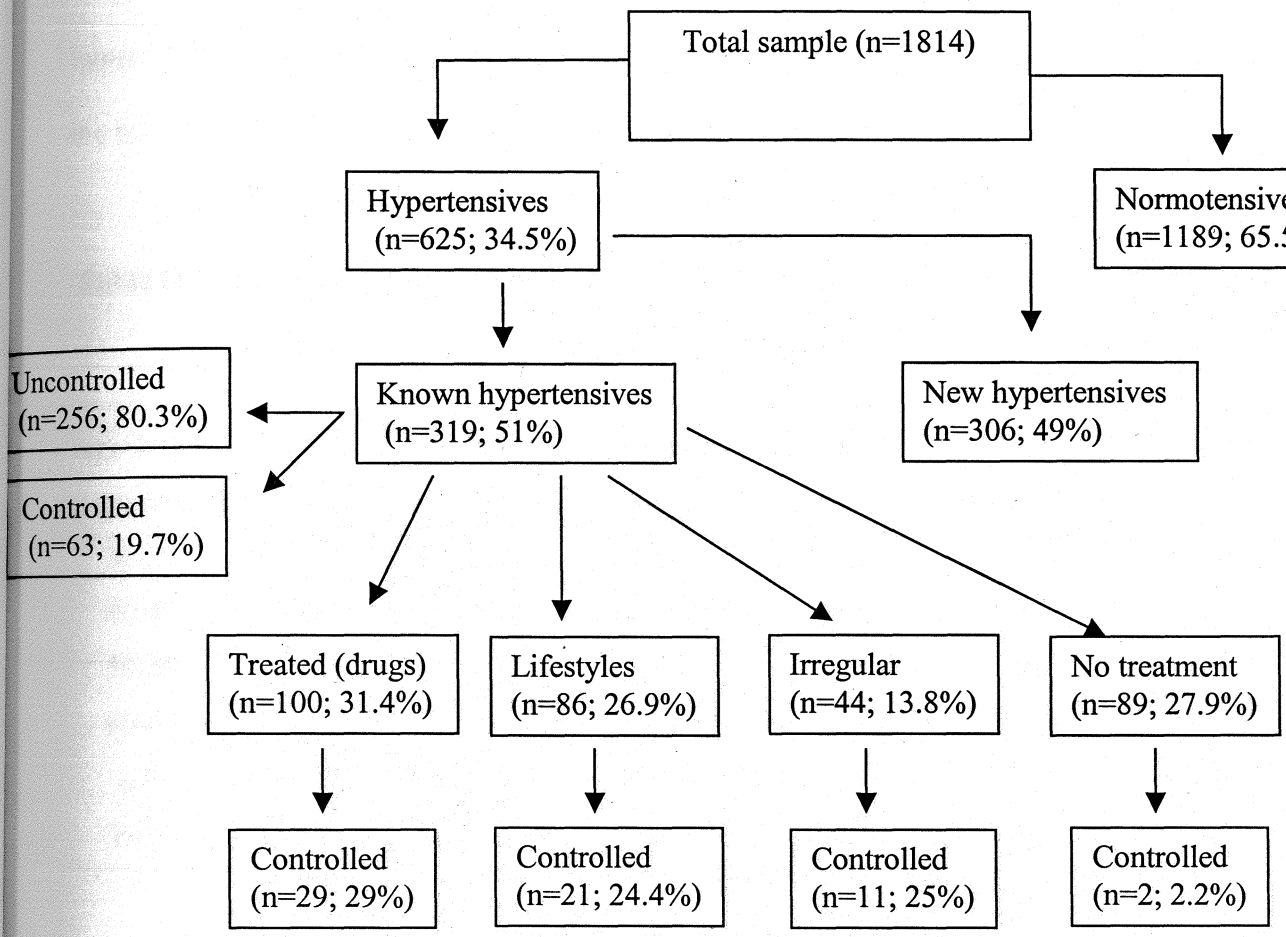
The mean waist measurement (cm) among KH (84.1) were higher than NH (80.9) or Non-H (76.1) in women, whereas the mean waist measurement is highest among NH (85.9) in men. The mean WHR in men was 0.93, 0.91 and 0.89 among KH, NH and Non-H respectively, and in women it was 0.86, 0.85 and 0.82 respectively among KH, NH and Non-H. The mean WHR was comparatively higher among KH than NH or Non-H in both sexes. The mean WHR in all categories among women are above the normal value, whereas the mean WHR among Non-H is within normal value in men (data not shown).

Mean weight in KH category is highest, followed by NH and Non-H category in both sexes (data not shown). The mean BMI in KH category is above normal. There is no statistical significance between sexes.

Summary of hypertension status

The blood pressure status of the study population is given if Figure I. Overall, there were 625 hypertensives, of which 306 (49%) were newly detected. The total controlled status of known hypertensives was at 19.7%. 'Treated' were those who reported to regular treatment with pharmacological drugs prescribed. 'Lifestyles' were those who were on non-pharmacological treatment/lifestyle changes such as diet control, tobacco/alcohol control, exercises and weight reduction. 'Irregular' were those who were irregularly complying with pharmacological or non-pharmacological treatment. 'No treatment' were not on any pharmacological/non-pharmacological treatment or were not advised any treatment (n=19).

Figure I: Flow diagram of blood pressure status of the study sample.



Prevalence of hypertension

The overall prevalence of hypertension (Table IV) in adults 30 years and above (JNC 7th recommendations) was 34.5% (42.4% in men and 27.7% in women) and the 95%CI was 32.3-36.7 (39.1-45.8 in men and 25.0-30.6 in women).

The prevalence was higher in men than women (OR-1.92, $p<0.001$). Prevalence of hypertension was higher in older age groups. The overall prevalence increased with age and the trend is statistically significant (χ^2 for trend=84.47, $p<0.001$).

Table IV. Prevalence of hypertension (≥30 years) [systolic >140 or diastolic >90] by age and sex in urban Mizoram, 2003:

Age group (years)	Male (n=833)	%	Female (n=981)	%	Total (n=1814)	%
30-39	93	31.4	54	14.6	147	22.1
40-49	111	44.2	59	26.6	170	35.9
50-59	53	45.3	61	38.1	114	41.2
60-69	51	55.4	49	37.7	100	45.0
≥70	45	58.4	49	49.5	94	53.4
Total	**353**	**42.4**	**272**	**27.7**	**625**	**34.5**

If, however hypertension is defined as systolic BP of ≥140 and a diastolic BP ≥90, the prevalence of hypertension in the study decreases from 34.5% (JNC 7 report) to 21.5% as seen in Table V below.

Table V. Prevalence of hypertension (≥30 years) [systolic BP ≥140 and diastolic BP ≥90], urban Mizoram, 2003

Age group (years)	Male (n=833)	%	Female (n=981)	%	Total (n=1814)	%
30-39	49	16.6	28	7.6	77	11.6
40-49	61	24.3	46	20.7	107	22.6
50-59	29	24.8	34	21.3	63	22.7
60-69	33	35.9	38	29.2	71	32.0
≥70	32	41.6	40	40.4	72	40.9
Total	**204**	**24.5**	**186**	**19.0**	**390**	**21.5**

Known Hypertensives

Participants with known history of Hypertension were 319 (17.6%) [Table VI]. There were more women (50.5%) who had history of hypertension. The prevalence of known hypertension shows an increasing trend with age and the χ^2 for trend in men =22.33;p<0.001; women = 57.78; p<0.001.

Table VI. Age and sex distribution of known hypertensives (≥30 years), urban Mizoram, 2003:

Age group (years)	Male	%	Female	%	Total	%
30-39	37	12.5	21	5.7	58	8.7
40-49	48	19.1	41	18.5	89	18.8
50-59	23	19.7	33	20.6	56	20.2
60-69	22	23.9	33	25.4	55	24.7
≥70	28	36.4	33	33.3	61	34.6
Total	**158**	**18.9**	**161**	**16.4**	**319**	**17.6**

‡Hypertension criteria based on JNC 7th recommendations

Controlled status of known Hypertensives

The controlled status of participants with known history of hypertension (Table VII) shows an inconsistent association with age and is also statistically not significant (χ^2=5.64, p=0.67). However, women showed a higher percentage of controlled hypertension as compared to men, though statistically not significant. Overall 19.7% of the study population with known history of hypertension had their hypertension controlled (Table VII).

On the other hand, 105 (66.5%) men and 96 (59.6%) women reported that they perceived their hypertension status to be under control (data not shown). The reasons for their perceived status of controlled hypertension was the response 'I feel well, I have no complaints/ symptoms'. This response was elicited from 94 (29.6%) of known hypertensives. 'I don't know or don't bother about it' was responded by 73 (22.9%) of known hypertensives.

There were 158 (45.5%) of known hypertensives with a positive family history of hypertension. The presence of a positive family history of hypertension did not affect the overall controlled status of hypertension and is not statistically significant (χ^2=3.02, p=0.22).

Table VII. Known hypertensives (≥30 years) with BP under control, urban Mizoram, 2003:

Age group (years)	Known, Controlled					
	Male	%	Female	%	Total	%
30-39	3	8.1	8	38.1	11	19.0
40-49	8	16.7	8	19.5	16	17.9
50-59	3	13.0	9	27.3	12	21.4
60-69	4	18.2	5	15.2	9	16.4
≥70	4	14.3	11	33.3	15	24.6
Total	**22**	**13.9**	**41**	**24.4**	**63**	**19.7**

‡Hypertension control status based on JNC 7th recommendations

Uncontrolled status of known hypertensives

Known hypertensives, whose BP were uncontrolled are presented by stage of hypertension in Table VIII. This uncontrolled status was more in men (86.1%) than in women (74.5%) (χ^2=7.22, p=0.02). But the uncontrolled status was not significant across different age groups (χ^2=1.6, p=0.81). In men, a slightly higher percentage were in Stage II (53.7% versus 46.3%). In women this difference was not seen.

Table VIII. Known hypertensives (≥30 years) with uncontrolled BP by stage, urban Mizoram, 2003:

Age group (years)	Known, Uncontrolled											
	Stage I						Stage II					
	Male	%	Female	%	Total	%	Male	%	Female	%	Total	%
30-39	18	52.9	7	53.9	25	53.2	16	47.1§	6	46.2§	22	46.8§
40-49	18	45.0	14	42.4	32	43.8	22	55.0	19	57.6	41	56.2
50-59	10	50.0	15	62.5	25	56.8	10	50.0§	9	37.5§	19	43.2§
60-69	9	50.0§	15	53.6§	24	52.2	9	50.0§	13	46.4§	22	47.8§
≥70	8	33.3§	10	45.5§	18	40.9	16	66.7	12	54.5	28	63.6
Total	**63**	**46.3**	**61**	**50.8**	**124**	**48.8**	**73**	**53.7**	**59**	**49.2**	**132**	**51.6**

‡Hypertension stages based on JNC 7th recommendations; § % based on less than 25 observations

Non- compliance with treatment

Table IX presents known hypertensives who reported to non-compliance with treatment advised, by age and sex. There were 70 (23.3%) participants with known history of hypertension who reported that they were not compliant with any of the treatment advised, and among which only one woman was found to have her hypertension under control. More men (30.9% versus 15.9%) admitted to non- compliance with treatment

prescribed. There was only one woman who reported to non-compliance with treatment but blood pressure was controlled

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Table IX. Non compliance with treatment among known hypertensives (≥30 years) by age and sex, urban Mizoram, 2003.

Age group (years)	Known hypertensives, non compliant					
	M	%	F	%	T	%
30-39	16	44.4	6	31.6 §	22	40.0
40-49	17	37.8	5	13.5	22	26.8
50-59	3	14.3 §	7	21.2	10	18.5
60-69	5	25.0 §	3	9.1	8	15.1
≥70	5	18.5	3	10.3	8	14.3
Total	**6**	**30.9**	**24**	**15.9**	**70**	**23.3**

§ % based on less than 25 observations

Compliance with treatment and controlled status

From their self- reports, there were 19 (6%) of known hypertensives who were not prescribed any pharmacological or non-pharmacological treatment. Compliance with treatment was based on self -report of adherence to advise in terms of pharmacological treatment/drugs, non-pharmacological treatment/lifestyle changes or both. Table X presents reported compliance with treatment and controlled status of hypertension. Among participants who reported to be compliant with treatment advised, 100 (33.3%) were complying with pharmacological treatment, 86 (28.7%) were complying with advise on lifestyle changes/non-pharmacological treatment and 44 (14.7%) were irregularly complying with lifestyle changes/non-pharmacological or pharmacological treatment. From their reported compliance with treatment, persons with controlled hypertension were 61 (26.5%), of which 22 (36.1%) were men and 39 (63.9%) were women.

Women reported to be more compliant with medication than men (37.7% versus. 28.9%). Participants who were on pharmacological treatment/drugs and with controlled hypertension were 29 (29%), of which 13 (44.8%) were men and 16 (55.2%) were women. However, the overall controlled status, as a consequent of pharmacological treatment was more in men than women (59% versus 40%).

Table X. Compliance with treatment and controlled status of hypertension (≥30 years) by age and sex, urban Mizoram, 2003:

Age group (years)	Controlled						Uncontrolled					
	M	%	F	%	T	%	M	%	F	%	T	%
30-39	3	15.0 §	7	53.9 §	10	30.3	17	85.0 §	6	46.1 §	23	69.7
40-49	8	28.6	8	25.0	16	26.7	20	71.4	24	75.0	44	73.3
50-59	3	16.7 §	9	34.6	12	27.3	15	83.3 §	17	56.4	32	72.7
60-69	4	26.6 §	5	16.7	9	20.0	11	73.3 §	25	83.3	36	80.0
≥70	4	18.2 §	10	38.5	14	29.2	18	81.8 §	16	61.5	34	70.8
Total	**22**	**21.4**	**39**	**30.7**	**61**	**26.5**	**81**	**78.6**	**88**	**69.3**	**169**	**73.5**

§ % based on less than 25 observations

Treatment details

It was reported that 84 (28%) of known hypertensives were advised only drug treatment, 59 (19.3%) reported that they were not advised treatment with drugs but only lifestyle changes or non-pharmacological treatment and the remaining 157 (52.4%) were advised a combination of drugs and non-pharmacological treatment.

The frequency of follow up visits that was advised to participants with known hypertension were either monthly, occasionally, daily or no given specific timeframe. However, the trend in the frequency of follow up visits that was practiced and the outcome on the controlled status of hypertension was not statistically significant across sexes

(χ^2=11.1; p=0.09) [data not shown]. It was also seen to be non significant across different age groups ((χ^2 =3.64; p=0.72).

The period of duration of last follow up visit regarding their hypertension status varied considerably. There were 137 (43 %) of known hypertensives who had their last follow up visit within the past one month, 119 (37.1%) had their last follow up visit within the past 6 months, about 21 (6.6%) had their last follow up visit between 6 and 12 months. There were 42 (13.2%) who could not remember the duration of their last follow up visit.

Prevalence of newly diagnosed hypertension

The prevalence of newly detected hypertension (Table XI) in the study was 21.5% (95%CI 19.7-23.4) and the prevalence was higher in men (24.5%, 95%CI=25.6-32.4) than women (19.0%, 95%CI=11.3-16.0) [χ^2=24.4, p<0.01]. Overall, 49% of all hypertensives in the study were unaware that they had hypertension and this unaware status is more in men 195 (55.2%) than in women 111 (40.8%). There was an increasing trend with age and is statistically significant (χ^2 for trend=21.89, p<0.001).

Table XI. Prevalence of newly diagnosed hypertension (≥30 years) by age and sex, urban Mizoram, 2003:

Age group (years)	Male (n=675)	%	Female (n=820)	%	Total (n=1495)	%
30-39	56	21.6	33	9.5	89	14.6
40-49	63	31.0	18	9.9	81	21.1
50-59	30	31.9	28	22.0	58	26.2
60-69	29	41.4	16	16.5	45	26.9
≥70	17	34.7	16	24.2	33	28.9
Total	**195**	**29.0**	**111**	**13.5**	**306**	**20.5**

Anthropometric variables related to hypertension

Hypertension and Body Mass Index (BMI)

BMI was defined as Weight (kg)/Height^2 (m). Overall, 33.9% (M-36.6%, F-31.7%) of the study population were found to be overweight. The prevalence of hypertension increases as BMI increases in both sexes. BMI was significantly associated with hypertension in both sexes. The χ^2 for trend =115.3, p<0.001. This association is also apparent in both sexes. However, 10 (2.8%) men and 13 (4.8%) women who were in the underweight category were found to have hypertension.

Table XII. Prevalence of all cases of hypertension (≥30 years) by BMI and sex, urban Mizoram, 2003:

BMI	Male (n=833)	%	Female (n=981)	%	Total (n=1814)	%
Underweight (<18.5)	10	20.8 §	13	16.0 §	23	17.8 §
Normal (≥18.5-24.9)	165	34.4	127	21.6	292	27.3
Overweight (≥25-<30)	150	56.2	100	38.8	250	47.6
Obese (≥30.0)	28	73.7	32	60.4	60	65.9
Total	**353**	**42.4**	**272**	**27.7**	**625**	**34.5**

‡Hypertension stages based on JNC 7th recommendations; § % based on less than 25 observations

The prevalence of newly detected hypertension was more pronounced among obese category, in both sexes (Table XIII). There were 5 (2.6%) men and 7 (6.3%) women of underweight category and were found to be newly hypertensive. The prevalence of newly detected hypertension was associated with BMI (χ^2 for trend =51.25, p<0.001). This trend of association is seen in both sexes.

Table XIII. Prevalence of newly diagnosed hypertension (≥30 years) by BMI and sex, urban Mizoram, 2003:

BMI	Male (n=675)	%	Female (n=820)	%	Total (n=1495)	%
Underweight (<18.5)	5	11.6 §	7	9.3 §	12	10.2 §
Normal (≥18.5-24.9)	95	23.2	59	11.3	154	16.5
Overweight (≥25-<30)	80	40.6	37	19	117	29.8
Obese (≥30.0)	15	60.0 §	8	27.6 §	23	42.6 §
Total	**195**	**29.0**	**111**	**13. 5**	**306**	**20.5**

‡Hypertension stages based on JNC 7th recommendations; § % based on less than 25 observations

Hypertension and Waist Hip Ratio (WHR)

Waist hip ratio (WHR) was used to define central obesity. WHR of >=0.90 was used as a cut off to represent central obesity in men and WHR >=0.80 for women. Overall, 479 (57.4%) of men and 711 (72.5%) of women in the study were having central obesity, as given in Table XIV. WHR was associated with hypertension in both sexes (χ^2=44.3, p<0.001 in men and χ^2=23.5, p<0.001 in women). This association was also significant, even after adjustment for age in both sexes

Table XIV. Prevalence of all cases of Hypertension (≥30 years) by WHR and sex, urban Mizoram, 2003:

WHR	Male (n=833)			Female (n=981)			Total (n=1814)		
	T	H||	%	T	H||	%	T	H||	%
Centrally obese	478	250	52.3	711	228	32.1	1189	478	40.2
Normal	355	103	29.0	270	44	16.3	625	147	23.5
Total	**833**	**353**	**42.4**	**981**	**272**	**27.7**	**1814**	**625**	**34.5**

‡Hypertension stages based on JNC 7th recommendations; ||H=Hypertensives

Table XV shows the prevalence of newly detected hypertension by WHR. Overall, 24% of centrally obese participants were having hypertension. Central obesity was seen to be associated with newly detected hypertension in both sexes (χ^2=8.5, p<0.01 in men and χ^2=8.7, p<0.01 in women). This relationship was significant even after adjustment for age in both sexes.

Table XV. Prevalence of newly diagnosed hypertension (≥30 years) by WHR and sex, urban Mizoram, 2003:

WHR	Male (n=675)			Female (n=820)			Total (n=1814)		
	T	H‡‖	%	T	H‡‖	%	T	H‡‖	%
Centrally obese	358	130	36.3	577	94	16.3	935	224	23.9
Normal	317	65	20.5	243	17	6.9	560	82	14.6
Total	**675**	**195**	**29.0**	**820**	**111**	**13.5**	**1495**	**306**	**20.5**

‡Hypertension stages based on JNC 7th recommendations; ‖ H=Hypertensives

Socio-economic variables related to hypertension

Hypertension and education

Education status was classified into 7 groups. Literates were those who had no formal

education or had not gone to school but was literate. Level of education was based on the highest educational level that a person had passed. Proportions of people with hypertension were distributed across all educational level, though among categories of graduate and above, 41.4% were found to have hypertension (Table XVI). There were 2 men who reported to illiteracy, whereas 17 women reported that they were illiterate and both sexes belonged to the age group 50 years and above. Educational status was not found to have an association with hypertension (χ^2=9.98, p=0.07) in the study, in both sexes.

Table XVI. Prevalence of Hypertension (≥30 years) by education status and sex, urban Mizoram, 2003:

Education status	Male (n=833)	%	Female (n=981)	%	Total (n=1814)	%
Illiterate	1	50.0 §	6	35.3 §	7	36.8 §
Literate	5	45.5 §	15	34.9 §	20	37.0 §
Primary level	30	34.9	72	32.9	102	33.4
Middle level	44	38.9	49	32.9	93	35.5
High school level	166	40.3	107	23.9	273	31.7
Graduate & above	107	51.2	23	21.9	130	41.4
Total	**353**	**42.2**	**272**	**27.9**	**625**	**34.5**

‡Hypertension stages based on JNC 7th recommendations; § % based on less than 25 observations

Overall, graduates and above were found to have the highest percentage of newly detected hypertension in the study. The proportion of newly detected hypertension in men were more or less equally distributed among all educational strata, except it's absence in illiterate category (Table XVII). The proportion of newly detected hypertension among women was the highest in those who were in literate category, followed by persons who have attained Primary level of education and Middle level of education. Education status was not found to have an association with newly detected hypertension (χ^2=10.5, p=0.06).

Table XVII. Prevalence of newly diagnosed hypertension (≥30 years) by education status and sex, urban Mizoram, 2003:

Education status	Male (n=675)	%	Female (n=820)	%	Total (n=1495)	%
Illiterate	0		1	8.3 §	1	7.7 §
Literate	3	33.3 §	9	24.3 §	12	26.1 §
Primary level	22	28.2	29	16.5	51	20.1
Middle level	24	25.8	18	15.3	42	19.9
High school level	85	25.7	46	11.9	131	18.2
Graduate & above	61	37.4	8	8.9	69	27.3
Total	**195**	**29.0**	**111**	**13.5**	**306**	**20.5**

‡Hypertension stages based on JNC 7th recommendations; § % based on less than 25 observations

Hypertension and occupation

Occupational group was divided into 7 groups. The highest proportion of hypertension was found in Pensioner category (Table XVIII). This is to be expected since hypertension is strongly correlated with age. Professionals, among men show the second highest prevalence, followed by business class and skilled workers. In women also, in the professional and business class, the prevalence was higher. The Overall prevalence of hypertension ranges between 25% and 67%, across varying occupational categories (χ^2=64.1, p<0.001).

Table XVIII. Prevalence of all cases of Hypertension (≥30 years) by occupation status and sex, urban Mizoram, 2003:

Occupation status	Male (n=833)	%	Female (n=981)	%	Total (n=1814)	%
Pensioner	70	67.3	15	50.0	85	63.4
Professional	75	49.0	21	25.0	96	40.5
Business/self employed	48	36.6	42	28.6	90	32.4
Skilled workers	99	39.6	30	18.4	129	31.2
Semi/unskilled workers	47	33.3	27	18.0	65	30.1
House wife	0		140	30.8	140	30.8
Unemployed	14	25.9 §	6	22.2 §	20	24.7 §
Total	**353**	**42.2**	**272**	**27.7**	**625**	**34.5**

‡Hypertension stages based on JNC 7th recommendations; § % based on less than 25 observations

Occupational category of Pensioner, in both sexes was found to have the highest proportion of newly detected hypertension (Table XIX) and this trend is seen in both sexes. In men, professional category has the second highest prevalence, followed by skilled workers and business class. Whereas among women, housewife category have higher proportion of newly diagnosed hypertension, followed by business class and professional category. Occupational category was also associated with newly detected hypertension (χ^2=20.1,p<0.001).

Table XIX. Prevalence of newly diagnosed hypertension (≥30 years) by occupation status and sex, urban Mizoram 2003:

Occupation status	Male (n=675)	%	Female (n=820)	%	Total (n=1495)	%
Pensioner	34	50.0	1	6.3	35	41.7
Professional	42	35.0	9	12.5	51	26.6
Business/self employed	28	25.2	18	14.6	46	19.7
Skilled workers	59	28.1	16	10.7	75	20.9
Semi/unskilled workers	25	21.0	6	9.5	31	14.4
House wife	0		57	15.4	57	15.4
Unemployed	7	14.9 §	4	16.0 §	11	15.5 §
Total	**195**	**29.0**	**111**	**13.5**	**306**	**20.5**

‡Hypertension stages based on JNC 7th recommendations; § % based on less than 25 observations

Knowledge on Hypertension

Table XX shows the prevalence of knowledge variables among known controlled hypertensives (KCH), known uncontrolled hypertensives (KCH), new hypertensives (NH)[BP140/90 mmHg] and normotensives (Non-H). Non-H as compared to KCH, KUH or NH tended to think that they consider their own health good. All had heard of the term 'high blood pressure'. But correct definition of hypertension in terms of its effect on the heart and the apparent symptomless nature of the disease was known by less than 10% of the study participants across all categories and was known by normotensives at (4.6%), KUH at (4.7%), KCH at (6.3%) and NH at (7%).

Description of hypertension in terms of symptoms was well known across all categories. The main symptoms that were believed were headache and dizziness, which were respectively responded at 9.5% and 36.6% (KUH), 11.8% and 30.5% (KCH), 5.3%

and 47.4% (NH) and 39.7% and 38% by Non-H. NH category gave the highest score at 77.5%, when asked 'if they think that high blood pressure can lead to other diseases'. When compared with other categories, KUH at 56.6% gave the highest knowledge for correctly stating the diseases that can occur as a consequence of hypertension. NH gave a high score at 83.1% for stating that hypertension is preventable, while KUH gave the highest correct knowledge regarding preventive lifestyle measures.

Knowledge on effects of tobacco, alcohol, physical activity and stress

Correct response for the effect of cigarette or smokeless tobacco on hypertension was not very well recognized in all categories and is least recognized among Non-H. Whereas, the harmful effects of alcohol on hypertension was more acknowledge. The harmful effect of salt or the positive effect of physical activity on hypertension was more recognized across all categories, though the knowledge was least among Non-H, though statistically not significant. The adverse effects of stress on high blood pressure was well recognized by KUH (91.7%), KCH at 86.7%, NH at 90.9% and least by Non-H at 66%.

Table XX. Prevalence of Knowledge on Hypertension (≥30 years) in percentages, urban Mizoram, 2003:

Knowledge items	KUH (n=256)	KCH (n=63)	NH (n=71)	Non-H (n=390)	P**	P††
Considers own health good	57.7	60.3	62.0	72.3	<0.01	<0.01
Describes HBP by symptoms	91.7	93.7	80.3	82.3	NS	NS
HBP can lead to other diseases	75.5	60.3	77.5	76.6	<0.01	<0.01
Say diseases correctly as a result of HBP	56.6	47.6	52.1	51.4	NS	NS
HBP is preventable	74.7	71.4	83.1	68.2	NS	0.02
HBP is preventable by lifestyles	70.4	65.1	69.0	54.8	<0.01	<0.01
Food effects HBP	98.4	95.2	92.9	88.1	<0.01	<0.01
Cigarette adversely effects HBP	68.8	68.3	69.0	57.5	0.01	<0.01
Smokeless tobacco effects adversely	64.5	69.8	64.8	52.2	<0.01	<0.01
Alcohol adversely effects HBP	87.8	84.1	87.3	79.9	NS	0.05
High salt intake adversely affects HBP	81.8	79.4	81.7	73.8	NS	NS
Physical activity is good for HBP	90.5	93.7	81.7	81.4	NS	NS
Stress adversely affects HBP	91.7	86.7	90.9	66.0	<0.01	<0.01

¶HBP-High blood pressure; KUH-Known, uncontrolled hypertensives; KCH-Known, controlled hypertensives; NH-Newly detected hypertensives; Non-H-Normotensives; P**-significant difference between KUH,KCH/NH,N; P††-significant difference between KUH,KCH,NH/N; ‡‡ figures in parentheses indicate number of respondents

Knowledge on specific food items

A correct answer for food affecting hypertension was highly elicited from all categories of respondents, though the least correct response was from Non-H and is statistically significant. The harmful effect of salted pickles on high blood pressure was recognized by 53% of KUH and least recognized by Non-H at 39.6%. Fish is generally perceived to be less harmful or even beneficial for high blood pressure by the general public. The study also shows a similar trend with 83.3% of KCH responding that fish has no effect on high blood pressure, followed at 73.9% and 68.2% by KUH and NH respectively, though the most correct response of fish having harmful effect was elicited at 63.3% by Non-H. Pork is generally perceived to be very harmful for high blood pressure by the general public. All categories that were assessed gave an increasing effect of pork on high blood pressure at 92% and above. Other food items such as beef, chicken, mutton and their adverse effect on high blood pressure were more or less similarly recognized among all categories with correct answers varying from 63% to 78%.

Knowledge by specific groups

The prevalence of knowledge on hypertension by specific groups such as persons consuming tobacco, alcohol, persons exercising or experiencing stress in their daily lives were assessed. Among consumers of tobacco, the effect of tobacco in raising high blood pressure was well recognized with a large number of correct response from KCH, followed by NH, KUH and the least by Non-H. The ill effects of alcohol on hypertension was recognized by all respondents in KCH and NH category, whereas Non-H gave a 88.6% correct response.

The beneficial effect of exercise in decreasing high blood pressure was well recognized by all categories with 80% and above correct response, though the least percentage of correct

response was elicited from NH group, followed by Non-H group and the highest correct response was from KCH category. The negative effects of stress on high blood pressure was least known by Non-H category, followed by NH group and the highest correct response was elicited from KCH category.

Table XXI. Prevalence of Knowledge on Hypertension (≥30 years) in percentages by specific groups, urban Mizoram, 2003:

Knowledge items by specific groups	KUH	KCH	NH	Non-H	P**	P††
Tobacco increases BP	88.2 (174)	96.9 (63)	96 (59)	75.8 (236)	0.02	<0.01
Alcohol increases BP	92.1 (63)	100 (13)	100 (26)	88.6 (84)	NS	NS
Exercises decreases HBP	84.9 (90)	86.4 (22)	81 (22)	82 (72)	0.01	<0.01
Stress increases BP	84.3 (132)	92.3 (30)	80 (22)	47.3 (138)	<0.01	<0.01

HBP-High blood pressure; KUH-Known, uncontrolled hypertensives; KCH-Known, controlled hypertensives; NH-Newly detected hypertensives; Non-H-Normotensives; P**-significant difference between KUH,KCH/NH,N; P††-significant difference between KUH,KCH,NH/N; ‡‡figures in parentheses indicate number of respondents

Prevalence of practices on hypertension

Prevalence of practices in percentages is given in Table XXII. An ever consumer of tobacco or alcohol was defined as a person who was consuming in the past but was not currently consuming it. A current user was defined as a person who currently uses it. Greater proportions of tobacco and alcohol use was seen in NH category. Sedentary lifestyles were

reported more or less homogeneously across all categories assessed, and are not statistically significant. Exercises, besides normal daily activities, were practiced by 35.6% of the respondents in KUH category (highest). Whereas, the experience of stress in their daily lives was reported by 52.2% of KUH category, 47.6% by KCH category and more or less equal number of proportions by NH and Non-H category.

All participants in the study were non-vegetarian except one known hypertensive (female) who was a vegetarian, though she consumed egg and milk. The practices of consumption of food items (data not shown) among categories did not differ substantially, except some food items as discussed: fish was consumed more than 2 times per week by KUH at 33.6% and by KCH at 39.7%, whereas NH was at 19.8% and Non-H at 2.2%. This is also seen to be significant ($p < 0.01$). This is because fish is generally perceived to be less harmful or even beneficial for high blood pressure. On the other hand, pork is perceived to be highly harmful for high blood pressure and is reflected by their less consumption of pork meat, in particular, among KH. Pork consumption of more than 2 time per week on average was responded at 52.6% by KUH, 39.6% by KCH, 74% by NH and 72.3% by normotensives. This is also statistically significant ($p<0.01$). Frequency of consumption of other food items such as eggs, chicken, beef, mutton, coffee, milk and tea are more or less similar and not statistically significant.

Table XXII. Prevalence of Practices on Hypertension (≥30 years) in percentages, urban Mizoram, 2003:

Practices items by specific groups	KUH (n=256)	KCH (n=63)	NH (n=71)	Non-H (n=390)	P**	P††
Ever consumer of tobacco	68.8	73.0	83.1	60.1	NS	<0.01
Current consumer tobacco	62.4	71.4	80.2	51.9	NS	0.02
Ever consumer of alcohol	24.9	20.6	36.6	21.4	NS	NS
Current consumer of alcohol	16.2	7.9	26.8	10.7	NS	<0.01
Lives sedentary lifestyles	47.4	57.1	43.7	52.9	NS	NS
Exercises besides normal activities	35.6	35.0	30.0	18.3	NS	NS
Experiences stress in daily life	52.2	47.6	31.0	35.1	<0.01	<0.01

HBP-High blood pressure; KUH-Known, uncontrolled hypertensives; KCH-Known, controlled hypertensives; NH-Newly detected hypertensives; Non-H-Normotensives; P**-significant difference between KUH,KCH/NH,N; P††-significant difference between KUH,KCH,NH/N; ‡‡figures in parentheses indicate number of respondents

Prevalence of practices by specific groups

Daily consumption of tobacco was reported by a high proportion of users in all categories. The duration of tobacco use was assessed by age of regular tobacco use. Age of regular use of tobacco before 20 years of age was responded by 58.7% of participants from KCH category followed at 57.6% by NH category. Queries, in regard to their attempt at trying to stop using tobacco was responded at 84.4% by KCH category and the least positive response was from NH category at 49%. Success in regard to their attempt to stop consuming tobacco was reported at a low rate in all categories. However, the highest success rate was in Non-H category (19.9%), followed by KUH category (12.6%), and the least success percentage was from KCH category at only 3.1% and is statistically significant.

Consumption of alcohol on a daily basis was reported at 44.4% by KUH group and is the highest. Their attempt to stop consuming alcohol was responded highly by KCH at 75% and the lowest by NH at 38.5%. Their success in their attempt to stop consumption of

alcohol were reported at the highest percentage from KCH (61.5%) category, followed by Non-H category at 50%. The least success percentage was from NH (26.9%) category, followed by KUH (34.9%) category. Stress that were encountered in their daily lives was more mild in nature and the response was more or less similar across all categories and is not significant statistically. Any attempt to limit stress, that were encountered in their daily lives was responded positively with the highest positive response from NH category at 90.9%.

Table XXIII. Prevalence of Practices on Hypertension (≥30 years) in percentages by specific groups, urban Mizoram, 2003:

Practices items by specific groups	KUH	KCH	NH	Non-H	P**	P††
Consumes tobacco daily	94.4 (174)	97.8 (46)	98.3 (59)	97.5 (236)	NS	NS
Age of using tobacco ≤19 years	46.6 (174)	58.7 (46)	57.6 (59)	46.6 (236)	NS	NS
Ever tried to stop using tobacco	62.2 (174)	84.4 (46)	49.0 (59)	49.7 (236)	0.01	0.01
Success to stop use of tobacco	12.6 (174)	3.1 (46)	4.1 (59)	19.9 (236)	<0.01	<0.01
Consumes alcohol daily	44.4 (63)	20.6 (13)	36.6 (26)	21.4 (84)	0.02	0.02
Ever tried to stop using alcohol	61.9 (63)	75.0 (13)	38.5 (26)	56.4 (84)	NS	NS
Success to stop use of alcohol	34.9 (63)	61.5 (13)	26.9 (26)	50.0 (84)	<0.01	<0.01
Stress encountered is mild	83.3 (132)	86.6 (30)	72.7 (22)	82.6 (138)	NS	NS
Tries limiting stress	84.5 (132)	86.7 (30)	90.9 (22)	89.1 (138)	NS	NS

HBP-High blood pressure; KUH-Known, uncontrolled hypertensives; KCH-Known, controlled hypertensives; NH-Newly detected hypertensives; Non-H-Normotensives; P**-significant difference between KUH,KCH/NH,N; P††-significant difference between KUH,KCH,NH/N ‡‡figures in parentheses indicate number of respondents

5. DISCUSSIONS

Prevalence of hypertension

Hypertension is the commonest cardiovascular disorder and is a major challenge to societies in socioeconomic and epidemiological transition. Epidemiological studies have consistently identified an important and independent link between high blood pressure and various disorders such as CVD, stroke, congestive heart failure and impaired renal function [1,2,41,42].

There can be no doubt that major changes in the health profile is being witnessed in Aizawl, as the high prevalence data from the study has shown. The overall prevalence of hypertension is high. Men had a higher prevalence as compared to women. Prevalence was associated with increasing age. Non- respondents were mostly young adults (mean age in years M-45.2, F-44.8), the mean age is comparatively lower than the study population, in whom hypertension would be expected to be low. This might have led to slight overestimation of the overall prevalence. However, it has to be accepted that the overall prevalence of hypertension is high.

Comparision with other studies

Based on prevalence data from other studies, even from industrialized countries, these values are higher. But the prevalence of hypertension is highly dependent on the definition used and the age distribution of the population studied. Comparison of prevalence data with other studies will have to consider several factors that might contribute to

observed differences. Prominent among these are the age differences between studied subjects and the variability in the definition of hypertension (and cut off level of blood pressure for diagnosis) [3,10]. Lack of standardization in methodology between different studies also creates difficulties for making proper comparisons.

Cross-sectional surveys and prospective cohort studies have consistently demonstrated a positive relation between age and blood pressure in most populations with diverse geographical, cultural and socioeconomic characteristics [2,15,16,32,]. Similar finding is reported in this study. The increasing prevalence of hypertension with high body mass index (BMI) and high waist hip ratio (WHR) is in agreement with findings from other studies [1,3,44]. In most studies, being overweight is associated with a twofold to sixth fold increase in the risk of developing hypertension [1,3,7].

The higher prevalence of hypertension in men that was found in this study is similar with other studies [6,41]. However, in the United States, a higher prevalence has been reported in black women compared to black men, lending credence to the hypothesis that sex differentials in hypertension rates may be influenced by ethnic differences [43].

Newly Detected Hypertension (NH)

There were 306 newly detected participants with hypertension. Nearly half (49%) of the overall hypertensives were newly detected. This highlights the importance and potentially high yield from screening for hypertension. The mean age of newly detected hypertensives were younger than known cases. The majority of new hypertensives (82.7%) were in stage I hypertension and might need only non aggressive treatment and follow up.

This high level of undetected hypertension may be comparable with western countries with what prevailed several decades back and referred to, in the 1970s, as "the rule of halves" (where half of hypertensives are aware of hypertension, half of aware are treated and half of those treated are controlled) [25]. This high unaware status underscores the need for targeted public health intervention in Mizoram, where there is yet no NCD control programme.

Among Non-H, 663 (55.8%) were in their pre-hypertensive stage. Patients with pre-hypertension are at increased risk for progression to hypertension and those in the 130/80 to 139/89 mm Hg BP range are at twice the risk to develop hypertension, as those with lower values [27,44]. Further more 45.5% of known hypertensives had a positive family history of hypertension and with the knowledge gained of the genetic predisposition of hypertension, it can be said that hypertension will be increasing in epidemic proportions unless measures are taken in the right direction.

Awareness and control of hypertension

Even in developed countries, with well developed programmes for hypertension control, the level of awareness, therapy and effective control of hypertension are not optimum [6]. With NHANES III survey, the reporting figures for awareness, treated and controlled were 68%, 54% and 27% respectively. In the present study, an intermediate proportion (51%) of participants with high blood pressure were aware or were known hypertensives. Hypertensives, on non-pharmacological therapy were 26.9%, and drug therapy were 31.4%.

The overall controlled rates were 19.8% for all known hypertensives. Higher proportion of women were more aware of their hypertensive state, and this finding is consistent with other studies in India and Iran, though the reasons are not clear [3,39]. Of all hypertensives, 306 (49%) were unaware that they had hypertension, 89 (27.9%) were not treated or were not compliant with treatment; 61 (26.5%) were compliant with treatment and hypertension was controlled while 169 (73.5%) were compliant with treatment but hypertension remained uncontrolled.

One prominent feature regarding hypertension is the low controlled rates of hypertension. In spite of the fact that 62% had reported treatment with drugs or lifestyle changes at the time of the survey, only 19.7% were controlled. Patient non-compliance with treatment is common in hypertension and could be a factor in these communities [15]. There was no significant difference in the controlled rates for those who were regular in follow up, though other studies have established the positive association of regular follow up with controlled status [3,35].

The major problem in achieving better control of hypertension in a community is based on the fact that hypertension is a silent asymptomatic disease. Ignorance of the general population as to the nature of elevated blood pressure, its morbid effects and the methods of maintaining its control is widespread and contributes to the large percentage of undetected and untreated hypertensive subjects in a community [27]. Therefore, education of the public is needed.

Treatment status

There were 19 cases (m-9, f-10) who reported that they were not advised any treatment with drugs or lifestyle changes. Some of them (31.6%) reported that their BP were just above normal, 21% stated that though their BP was above 140/90 mmHg, it was normal for their age. Their blood pressures were uncontrolled (except one female) at the time of the study, though no significant differences were observed between sexes. More than half of them (52.6%) were in stage II hypertension. This may perhaps demonstrate the reluctancy of physicians in treating hypertensive patients, particularly those in stage I hypertension or borderline hypertension. While there are numerous observations indicating that in patients with borderline hypertension, blood pressure may either progress to a higher level, remain in the same or revert to entirely normal levels, it may hardly seem justified to treat all patients with borderline hypertension until it is certain that a permanent hypertension is present [(45)]. However, in our study, only one person with history of hypertension, and who was not advised any treatment, was at normal BP. Therefore, even if drugs are not prescribed, particularly to new hypertensives, lifestyle modifications/ non-pharmacological treatment have to be advised, not only to borderline hypertensives but to all persons, including pre-hypertensive persons, as per the guidelines of JNC 7 report [(40)].

Of the total 300 participants of known hypertensives, 59 (19.6%) were prescribed no drugs but only lifestyle modifications/ non-pharmacological treatment. The frequency of follow up visits that were advised to known hypertensives were variable. There were 240 (80%) who reported that they were advised to have follow up visit/ review their BP with no specific time frames; while 32 (10.6%) were advised for occasional follow up visits. Only 9.4% reported to specific time frame advise for follow up visit. Some studies have reported a

positive relation between regular check up and controlled rates of hypertension [3,35], though it was not significant in the present study.

However, if advise on regular and specific time frames for follow up visits are more stressed, the possibility of a higher controlled rate at the community level is plausible, as patients will be made more aware of the value, thereby realizing it's importance. This can lead to increased perception of the seriousness of the disease thereby decreasing patients' complacent attitude of this rather silent disease. This can then be translated to increased adoption of healthier lifestyles, as the potential for prevention/control of hypertension by lifestyle modification is well known. Regular and specific time frame for follow up visit is also important for determining the adequacy of hypertension control and the presence of adverse effects with prescribed drugs. Timely and necessary changes can then be made for overall patient's benefit. However, further studies are needed for conclusive recommendations/suggestions.

Considering the low controlled rates and non- treatment of known hypertensives resulting in uncontrolled hypertension (94.7%), this may perhaps reflect a physician's negative attitude, contributing to the sub-optimal management of the disease [46]. An attitudinal questionnaire survey of general practitioners and hospital doctors in the Northern Region showed that many factors appear to contribute to doctor's reluctance to treat and control hypertension, particularly in older people. These factors include fear of adverse effects and lack of appreciation of both the risks of untreated 'mild' hypertension [48]. Successful strategy/guidelines for implementation, targeted at doctors may perhaps solve this aspect of management.

Knowledge and Practices (KP) Variables

The overall Knowledge among known hypertensives was better when compared to new hypertensives or normotensives, although in some aspects, such as the preventability of hypertension and lifestyle modification for prevention was not highly perceived by known hypertensives. This may perhaps be because of knowledge about the genetic disposition of hypertension that was brought to the notice of the Principal Investigator at the time of the study by some known hypertensives. Knowledge about the adverse effects of tobacco and alcohol was no more highly perceived by known hypertensives than new hypertensives or normotensives. But knowledge about the healthy effect of physical activity was more recognized among known hypertensives. The adverse effect of stress was also highly recognized among known hypertensives as compared, in particular to normotensives category.

Overall, practices among known hypertensives was favourably more healthy than newly detected hypertensives but not to normotensives, in terms of alcohol and tobacco consumption. However, physical activity, besides normal activities was more practiced among known hypertensives. On the other hand, attempts to adopt healthy lifestyles were more infrequent among new hypertensives and normotensives. Furthermore, success at attempts to stop consumption of tobacco or alcohol was high in KCH category as compared to KUH or NH category, in particular to the habit of alcohol consumption, possibly because of the high- perceived adverse effects of alcohol.

Importantly, the study has suggested that most persons were ill informed about the adverse effects of non-vegetarian diet on high blood pressure. The perception that non vegetarian diet, except pork, was less harmful, and as well as the low level of knowledge on

the adverse effects of smokeless tobacco (which is widely practiced) throws insight into needed areas of IEC (Information, Education and Communication) activity, besides the overall need for IEC towards integrated NCD prevention programme.

Limitations of the study

Some limitations to our approach needs to be acknowledged. Blood pressure is a highly labile quantity and it is impossible to classify, without multiple readings on different days [27,45]. Therefore use of a single visit to ascertain hypertension status can result in overestimation of it's prevalence. For example, in one study of BP measurements in surveys, the variability of BP measurement indicated that classifying individuals as hypertensive or normotensive based on observation at a single examination would result in more than one third being incorrectly classified as hypertensive and 5% being falsely classified as normotensives. The resultant estimate of hypertension prevalence would have been overestimated by 17% [6].

Another limitation is that only one standard sized cuff was used in the study. A study of obese subjects found that the difference in BP readings among adult, large, and thigh cuffs was greater with increasing arm circumference. In people with a large arm circumference, the mean difference between BP values obtained with a large cuff and a regular cuff was 5.9 mm Hg systolic and 4.4 mm Hg diastolic. Therefore the use of a regular cuff when a large cuff was warranted may result in a 37% overestimation of hypertension in the study population [6]. Therefore, there may perhaps be an overestimation of the prevalence of hypertension in this study too.

Newly detected hypertensives were not subjected to other diagnostic tests to ascertain the presence of other contributory diseases to hypertension, due to limitations of time and finance. They were thus classified NH in the present study. However, it has to be noted that the prevalence of hypertension is, nonetheless high.

Selection of NH for administration of KP questionnaire was to 71 participants who were newly detected with hypertension, instead of the 306 newly detected hypertensives, as per the criteria used in the present study. This is due to limitation of time and the selected NH (71) were based on the criteria of BP $\geq$140/90 mmHg. This may have perhaps reduced the power of the study to detect significant differences in some KP variables which was not being experienced in the present study.

KP assessment from population surveys invariably poses the problem of social desirability, whereby respondents are reluctant to admit socially poorly acceptable KP to avoid giving negative impression [47,48]. The fact that about 65.9% of respondents answered that smoking causes high BP (while smoking is generally not recognized as a strong risk factor for hypertension) may reflect such social desirability effect. The validity of self-reported use of substances such as alcohol, cigarette, tobacco or the consumption of non-vegetarian food stuffs, may be questionable as they are usually perceived as signs of affluence, in particular, consumption of non-vegetarian foods. Self reported KP remains likely to be biased towards socially expected norms, which currently tend to correspond to perceived healthy ones. However, questions were asked in a standardized manner and trainings had been imparted towards this process.

Biases

The two areas that were studied were purposively selected. Therefore, the representation of the findings to the whole population has to be cautiously done. So the limitation of the external validity of the study. There were non responders/participants in the study. Though basic demographic information such as age and sex were collected, status of hypertension and other variables that were studied were not available from non-participants in the study, thereby limiting the internal validity of the study. The results of the study needs to be cautiously interpreted since the study design was cross sectional in nature and the association between BMI, WHR, occupation, age and sex cannot be interpreted as a Causal association.

Public health implications

The findings in this study have several public health implications for the general public, as well as known hypertensives. The overall prevalence of hypertension and the proportion of newly detected hypertension are high. The proportion of uncontrolled hypertension among known hypertensives is a cause of concern.

While basic knowledge of hypertension in the general population is perhaps good, adoption of healthy practices is limited, even among known, uncontrolled hypertensives. This stresses the need for the development of an environment conducive to such healthy lifestyles. Adoption of healthy lifestyles by the general public is likely to depend on further development of relevant policies. It took no fewer than 30 to 40 years of sustained effort to substantially improve hypertension detection and control in western countries, and rates are

still far from optimal [6]. Therefore measures that is conducive and within the economic realities at local levels have to be planned.

Recommendations

Primary prevention

Availability of epidemiological data and it's acknowledgement is only the first step towards tackling the hypertension situation. Effective treatment is perhaps the next logical step [15]. But the magnitude of the problem is a major economic challenge to the health care system in Mizoram that is already weighed down with the burden of communicable diseases, in particular Malaria and Tuberculosis. It is therefore important to formulate guidelines and strategies at local levels based on local competing health care priorities and economic situations.

While community screening programmes have been advocated, it's cost effectiveness and sustainability is debatable, considering the low turn over at these programmes, added with the existing economic constraints [27,40]. However, every attempt should be made to utilize opportunities of routine periodic contact of individuals with health care providers to record the blood pressure in an adult at least once a year. This would require education and motivation of the public and providers [42]. Therefore, more people should be encouraged to have their BP checked. Furthermore, the limited impact of case detection and pharmacologic management that is evident, particularly in developing countries indicates primary prevention as mandatory [41]. Without primary prevention, the hypertension problem would never be solved and would rely solely on detection of existing high blood pressure.

Primary prevention provides an attractive opportunity to interrupt and prevent the continuing costly cycle of managing hypertension and its complications. Primary prevention should focus on modification of unhealthy lifestyles and behaviours, such as tobacco control, prevention and control of obesity, promotion of healthy diet and physical exercise. While lifestyle modifications/ non-pharmacological treatment offer the potential for prevention of hypertension, lowering blood pressure reduces other cardiovascular risk factors at little cost and with minimal risk [44].

Public education and motivation

The relation between lifestyles and cardiovascular disease is now well established, and efforts should be made to encourage change. Firstly, people should be made aware of the harm caused to their health by their behaviour. Secondly, there must be a desire to change this behaviour and thirdly, the desire must be translated to action [50]. Most of the changes required to promote active lifestyles lie outside the influences of the health sector. Underfunded public health departments often have little influence over the decision- making processes of larger revenue-generating sectors. Furthermore, the resolves of the health sectors is sometimes eroded from within. There is often more short-term political capital to be gained from the construction of hospitals and investments in high-technology (curative technology) than on alleviating the causes of ill health [28].

On the other hand, early habits have lifelong consequences. Often individuals consider modifying their lifestyles only when symptoms of disease and ill health set in. And lifestyle messages are more frequently directed at middle-aged individuals who may already be in the early stages of the disease. So what measures are to be taken? A new pamphlet will

not change the structure of society. A media message on healthy eating will not change the younger generation that is enamored with fast food. Trade, business, economic and development issues also need to be addressed, if health is to be promoted and lifestyles are to change. Without these, communication campaigns will result only in a better informed public, that is still unable to take action [28].

Therefore, building healthy environments and health promotion should be a priority and healthy public health policy be formulated. Secondly, improve the quality of communications. Not only should the health department be the spokesperson for health, other influential people such as entertainers, athletes and other trendsetters should take on a more visible role in health promotion. These communication activities should be sustained. Thirdly, partnerships with other departments, NGO's and the commercial sector particularly beauty and fitness industries, for provision of clearer directions to maximize advantages in the promotion of health.

As evident from the present study, more than 45% of tobacco users (in all categories of KP assessed) began their use in their teens, so partnerships with School Departments should be strongly encouraged so that health education messages are given to school children, in order to propagate healthy practices from early life, and since evidence from the Bogalusa study also suggests existence of significant correlations between childhood and adult blood pressure levels [22]. Fourthly, the role of Health Workers, which have been mainly focused on communicable diseases and family planning programmes could be used for provision of screening centers during their routine visits or clinics, as well as provide counseling on lifestyle changes [28].

Human resources development

Epidemiological assessment and monitoring of hypertension or NCD's should be regularly taken every 5-7 years. Appropriate data collection and analysis systems should be developed. If monitoring mechanisms are difficult to implement, periodic surveys/evaluations may be effective alternatives. Human resources development should be strengthened [11].

Uniform management guidelines

Concurrent with these actions, as evident from clinical trials and public health data, the benefits of controlling hypertension in individuals and populations is immense, but implementation in practice is less than optimal. Barriers have been identified at the patient, provider, health care organization and community levels. At every level, knowledge, attitudes, values and beliefs can impede evidence-based recommended bahaviours needed to lower blood pressure and sustain lowering over time [42]. While there may be considerable variation in the knowledge and practices of treating physicians in regard to the treatment of hypertension, successful strategies to implement guidelines are also required for primary care physicians [46].

Since the major problem for known hypertensives is inadequate control, explicit setting of target blood pressure in individual patients, and recording of target blood pressure record cards could help focus both general practitioners and patients on this aspect of management. [27].

Furthermore, the most effective therapy prescribed by the most careful clinician will control hypertension only if patients are motivated. Motivation improves when patients have positive experiences with and trust in the clinician [40]. Therefore, the development of successful implementation strategies targeted at both patients and doctors is urgently needed.

6. REFERENCES:

1. A.S Wersy, M.A.F. El-Hezmi. Diabetes Mellitus, Hypertension and Obesity-common multifactorial disorders in Saudis.*EMHJ.*1999;5(60):1236-s
2. M.Al-Shahri, A.M.A. Mendil, A.G. Elzubier and M. Henif. Epidemiological aspects and cost of managing hypertension in Saudi Arabia primary health care centers. *EMJH.* 1998;4(3):493-01
3. Sarraf- Zadegan N, Boshtem, Mostefevi S and Refiei M. Prevalence of hypertension and associated risk factors in Isfahan, Islamic Republic of Iran. *EMHJ.* 1999;5(5):992-1001.
4. Alwan AAS. Cardiovascular diseases in the Eastern Mediterranean Region. *World Health Stat Q.* 1993;46(2):97-110
5. Strasser T et al. Assessing hypertension control and management. Hypertension Management Audit Project, a WHO/WHL study, Copenhagen, *WHO* 1993 (WHO Regional Publications, European series No.47)
6. Vicki L. Burt, Jeffery A. Cutler, Milicent Higgins, Michael J. Horan, Darwin Labarthe, Paul Whelton et al. Prevalence of hypertension in adult US populations: results from the third National Health and Nutrition Examination Survey, 1988-91. *Hypertension.* 1995;25(3):305-13
7. Langer R.D. The Epidemiology of hypertension control in populations. *Clin Exp Hypertens.*1995;17(7):1127-44
8. Mostafa A et al. Prevalence of hypertension in South- western Saudi Arabia. *BMJ.* 1996;2(2):211-218.
9. Eugene Braumwald, Anthony S. Fauci, Dennis L. Kasper, Stephen L. Hauser, Dan L. Longo, J. Larry Jameson. Harrison's Principles of Internal Medicine. Mc graw- Hill professional publishers.2001.1. 15th ed. p-1414.
10. A.A.Hasab, A. Jaffer and Z. Hallaj. Blood pressure patterns among the Omani population. *EMHJ.* 1999;5(1):48-54.
11. World Health Organizations fact sheets N.106, March 1996. Non- communicable diseases. WHO, Geneva.

12. E.C Gilbert et al. Hypertension and determinants of blood pressure with special reference to socio economic status in a rural South Indian community. *J Epidemiol Community Health*.2003;48(3):258-261.

13. Hazarika N.C, Biswas D, Naarain K, Kalita HC and Mahanta J. Hypertension and its risk factors in tea garden workers of Assam. *Nat Med J of India*. 2002;15(2): 63-8.

14. Kaplan N. Clinical hypertension, 7th ed. New York. Leppicott Williams and Wilkins company, 1990: 12-13.

15. A multi centre study. Hypertension study group, Prevalence, awareness, treatment and control of hypertension among the elderly in Bangladesh and India. *Bull World Health Organ.* 2001;79(6):490-500.

16. Ahmed A.F, Mahmoud M.E. The prevalence of hypertension in Saudi Arabia. *Saudi Med J.* 1992;6:548-5.

17. Clark L.T. Improving compliance and increasing control of hypertension: needs of special hypertensive populations. *Am Heart J.*1991;121: 664-9.

18. Sharkness C.M, Snow D.A. The patient's view of hypertension and compliance. *Am J of Prev Med.* 1992;8:141-6.

19. K.E. Berkin, S.G. Ball. Essential hypertension: the heart and hypertension. *Heart 2001*; 86: 467-475

20. Pascal Bonet, Allen G Ross, Jean-Pierre Gervasoni, Mashombo Mkamba, Deo m Mtasiwa, Chriatian Lengeler et al. Distribution of blood pressure, body mass index and smoking habits in the urban population of Dar es Salaam, Tanzania and associations with socio economic status. *Int J of Epidmiol*.2002;31: 240-247.

21. Line Aubert, Pascal Bovet, Jean-Pierre Gervasoni, Anne Rwebogora, Bernard Waeber, Fred Paccaud. Knowledge, Attitudes, and Practices on hypertension in a Country in Epidemiological Transition. *Hypertension*. 1998; 1136-1145

22. Bao W, Threefoot SA, Srinivasan SR, Berenson GS. Essential hypertension predicted by tracking of elevated blood pressure from childhood to adult hood: the Bogalusa Heart study. *Am J of Hypertens*.1995;8 (7):57-65.

23. Larson MG. Assessment of cardiovascular risk factors in the elderly: the Framingham Heart study. *Stat Med.* 1995;14(16):1745-56.

24. Maciviahon S et al. Obesity and hypertension: Epidemiological and clinical issues. *Eur heart J.*1987;8: 57-70.

25. G.B. Ambrosio, T. Strasser, J.E. Dowd, J. Tuomilehto, A. Nissinen, A. Froment et al. Effects of interventions on community awareness and treatment of hypertension: results of a WHO study. *Bull World Health Organ.*1998; 66(1): 107-113

26. M. Mohsen Ibrahim. Future of research in hypertension in developing countries. *2000 Web Health.*1996;2(2):202-205

27. Joseph A.Wilber and J. Gordon Barrow. Hypertension- A Community Problem: *Am J of Med.*1997;52:653-663

28. World Health Organisation Regional Committee- 53rd. session, Sept. 2002. Japan.

29. Report of the steering committee on health. The tenth five year plan (2002-2007). Government of India Planning Commission. 2002.

30. Ahsan Ejaz, Peter M. Fitzpatrick, Andrzej Wasiluk and Prince K. Zachariah. *Hypertension, An Int Monograph.* IJCP Group of Publications. 2001.p.26-35

31. Sandhya A. Kamath, M. Paul Anand. Complications of hypertension. *Hypertension, An Int Monograph.* IJCP Group of Publications .2001.p.106-109

32. M. Paul Anand. *Hypertension, An Int Monograph.* IJCP Group of Publications. 2001.p.10-15.

33. Report of a WHO Expert Committee. Community prevention and control of cardiovascular diseases. *TRS* .1966; (732):24-29

34. S.L. Chadha, S. Radhakrishna, K. Ramachandran, U. Kaul and N. Gopinath. Prevalence, awareness and treatment status of hypertension in urban population of Delhi. *Indian J Med Res.*1990;92:233-240

35. L.S. Al-Sowielem and A.G. Elzubier. Compliance and knowledge of hypertensive patients attending PHC centers in Al-Khobar, Saudi Arabia. *J Hypertens*-1997;15:561-5

36. DS P res, JM Magna, LA Viana. Arterial hypertension patients: attitudes, beliefs, perceptions, thoughts and practices. *Rev Saude Publica.*2003;37(5):635-42

37. T Fahey, C Silagy. General practitioners' knowledge of and attitudes to the management of hypertension in elderly patients. *Br J Gen Pract.*1994;44(387):446-9.

38. C Cuspidi, I Michev, B Severgnini, V Fusi, C Valerio, S Meani et al. Awareness of hypertension guidelines in general practice: pilot study in Lombardy. *Ital Heart J.* 2002;3(1):60-3

39. David J. Hyman and Vallory N. Pavlik. Poor hypertension control: Lets stop blaming the patients. *Cleveland clin J of Med.*2002;69(10):793-99

40. Aram V. Chobanian, George L. Bakris, Henry R. Black, William C. Cushman. Lee A. Green, Joseph L. Izzo, Jr et al. The Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure. *JAMA*. May 21, 2003;289(19): 2560-72

41. AK. Srinath Reddy. Hypertension control in developing countries: generic issues. *J Hum Hypertens*. 1996;10(1):33-38

42. MN Hill, BS Sutton. Barriers to hypertension care and control. *Curr Hypertens Rep*. Oct 2000;2(5):445-50.

43. Hypertension prevalence and status of awareness, treatment and control in the United States. Final report of the sub-committee on definition and prevalence of the 1984 Joint National Committee. *Hypertension* 7 (1985) 457.

44. The Sixth Report of the Joint National Committee on Prevention, Detection, Evaluation and Treatment of High Blood Pressure. *Arch of Int Med.*1997; 157:2413-2446.

45. Edward D. Freis. The treatment of Hypertension. *Am J Med.*1972; 52: 664-71

46. Sandra Duggan, Martin P. Eccles, Nicholas Steen, Samantha Jones and Gary A. Ford. Management of older patients with hypertension in primary care: improvement on the rule of halves. *Br Geriatrics Society*. 2001; 30: 73-76

47. Nothwehr F, Elmer P, Hannan P. Prevalence of health behaviours related to hypertension in three blood pressure treatment groups: the Minnesota Heart Health Program. *Prev Med.* 1994;23:362-68

48. Welte JW, Russel M. Influence of socially desirable responding in a study of stress and substance abuse. *Alcohol Clin Exp Res*. 1993;17:758-61

49. Duggan S, Ford GA, Eccles M. Doctors' attitudes towards the detection and treatment of hypeprtension in older people. *J Hum Hypertens* 1997;11:271-6

50. RL Gibbins, M Riley, P Brimble. Effectiveness of programme for reducing cardiovascular risk for men in one general practice. *BMJ*.1993; 306:1652-60

APPENDIX – I

"Assessment Of Prevalence Of Hypertension Among > 30 Years" And "Treatment Compliance Among Known Hypertensives" (Administered To All Respondents)

I. IDENTIFICATION PARTICULARS FOR RESPONDENTS

1. ID. NO. ☐☐☐
2. Name
3. House Address
4. Age (in years) ☐☐
5. Sex: (1) Male (2) Female ☐

II. SOCIO-ECONOMIC PARTICULARS

6. Education Status ☐

Illiterate	(1)
Primary School	(2)
Middle School	(3)
Secondary School	(4)
Diploma / Certificate	(5)
Graduate	(6)
PG. / Deg	(7)

7. Occupational Status ☐

Unemployed	(1)
House wife	(2)
Self employed (Business (own/partner)	(3)
Professional (Doctor/Engineer/Teacher/CA)	(4)
Skilled (Electrician/Plumber/Tailor/Typist)	(5)
Semi skilled (Handy person)	(6)
Unskilled (Daily wage earners / labourers)	(7)

8. Religion ☐

Hindu	(1)
Muslim	(2)
Christian	(3)
Other specify	(4)

III. PHYSICAL MEASUREMENTS

	Anthropometric measurements *	No. of Readings		
		1st Reading	2nd Reading	Mean
9	Height (cms)			
10	Weight (kgs)			
11	Waist (cms)			
12	Hip (cms)			

* Specify No. of decimals used for each category

	Blood pressure (BP) measurements (in mm of Hg)	No. of Readings		
		1st Reading	2nd Reading	Mean
13	Sysfolic blood pressure (SBP)			
14	Diastolic blood pressure (DBP)			

IV. TREATMENT PARTICULARS

15. Have you ever been diagnosed as having a high blood pressure

    (1) Yes

    (2) No

    If "Yes" go to question 17

    If "No" go to Appendix II, Section V, Q-28

    (If "Yes" verify information using available)

    Medical records (1)

    OPD card readings (2)

    Others (specify) (3)

16. Please state when you were diagnosed as having high blood pressure

    _____(month) _____ (year)

17. Have you been prescribed any treatment?

    (1) Yes

    (2) No

    If "Yes" go to question 19

    If "No" go to question 22

18. Please give details of the treatment prescribed with respect to

    1. Diet
    2. Drugs
    3. Others (Specify)

19. Please state in the last 2 months how often you have missed observing the prescribed treatment

Once	(1)
Twice	(2)
Thrice	(3)
> Thrice	(4)
Other specify	(5)

20. Please state how often you have been advised to have your blood pressure checked?

Once a month	(1)
Once in 3 months	(2)
Once in 6 months	(3)
Others (specify)	(4)

Please give reasons for your answers

22. When did you last go for a health check?

_____ (month) _____ (year)

23. How much was your blood pressure during the last health check?

(Give both systolic and diastolic blood pressure reading)

_____ mm of Hg.

(verify reading with

Medical records (1)

OPD card readings (2)

Others (specify) (3)

24. Do you think that your blood pressure is under control?

(1) Yes

(2) No

Please give reasons for your answer

25. Are any of your family members suffering from high BP?

(1) Yes

(2) No

If "Yes" mention the relationship of affected family members to you

APPENDIX – II

"ASSESSMENT OF KNOWLEDGE AND PRACTICES"

To be Administered to:

(a) All respondents identified as having high blood pressure

(b) All respondents selected as matched controls

(1) ID.NO. ☐☐☐ (2) Respondent Name:

V. KNOWLEDGE

27. How would you consider your present health?

Very good	(1)	☐
Satisfactory	(2)	
Not good	(3)	
Don't know	(4)	

28. What do you think could be the factor(s) that contribute to your present health status?

_____ _____

29. Have you heard the term "High Blood Pressure"? ☐

(1) Yes

(2) No

If "Yes" go to question 30

If "No" go to Section VI, Question 33

30. Please explain what you understand by the term "high blood pressure"

31. Do you think high blood pressure will lead to any future health problems?

Yes	(1)
No	(2)
Don't know	(3)

If "Yes" please mention the health problems that high blood pressure can lead to:

_____ _____

If "No or Don't know" please go to question (32)

32. Do you think high blood pressure can be prevented?

Yes (1) ☐

No (2)

Don't know (3)

If "Yes" please mention the ways in which high blood pressure Can be prevented?

_____ _____

If "No or Don't know" please go to Section VI, question 33

VI. PRACTICES

33. Please state if you are a: ☐

1. Pure vegetarian
2. Lacto Vegetarian
3. Egg tarian
4. Non Vegetarian

34. In any given week how often do you consume the following:

Items	Never	< 1 /week	1-3 /week	> 3/ week
Pickles (salted) (1)				
Fish (2)				
Eggs (3)				
Pork (4)				
Chicken (5)				
Mutton (6)				
Beef (7)				
Milk (8)				
Coffee (9)				
Tea (10)				
Other (Specify) (11)				

35. Do you think the food you eat may affect your BP?

Yes (1)

No (2)

Don't know (3)

If "Yes" which items listed in Q-34 do you think may lead to (include name of each item) :

1. Increases in BP

2. Lowering of BP
3. No effect on BP

If "No or Don't know" go to question (36)

36. What do you think could be the effect of the following items on your blood pressure?

Items	No effect	Increases	Lower	Protects	Don't Know
Diet rich in Animal fats (1)					
Alcohol (2)					
Smoking (3)					
Physical exercise (4)					
High salt diet (5)					
"Sahdah" (6)					
"Khaini" (7)					
"Tuibur" (8)					
Pan + tobacco (9)					

37. Have you ever been a consumer of tobacco?
    1. Yes
    2. No

    If "Yes" go to question (38)

    If "No" go to question (43)

38. In what form(s) do you consume tobacco?

    (tick all answers that apply)

    1. Cigarette smoking
    2. Chewing
    3. Chewing with betel leaves and nuts

39. When did you become a tobacco consumer?

    (State your age in years)

40. What is the frequency of your tobacco consumptions?
    1. Daily
    2. Occasionally
    3. Others (Specify)

41. Do you think tobacco consumption may influence your blood pressure?
    1. Yes

2. No
3. Don't know

If "Yes' please explain how it could influence your blood pressure?

If "No or Don't know" please go to question (42)

42. Have you ever been tried to stop consuming tobacco?
    1. Yes
    2. No

If "Yes" please state how successful have you been in stopping tobacco consumption?

1. Currently non consumer
2. Previously a regular consumer – now only occasionally so
3. Unsuccessful – still a consumer as before
4. Other (specify)

43. Hove you ever been a consumer of alcohol?
    1. Yes
    2. No

If "Yes' answer questions 44

If "No" go to question 48

44. What type(s) of alcohol do you consume? (Tick all answers that apply)
    1. Whisky
    2. Brandy
    3. Beer
    4. Rum
    5. Gin
    6. Wine
    7. Locally prepared
    8. Others (specify)

45. How often do you consume alcohol?
    1. Daily
    2. Occasionally on social/festive occasions
    3. Others (specify)

46. Do you think alcohol consumption is likely to affect your blood pressure?
    1. Yes
    2. No
    3. Don't know

If "Yes" please explain how alcohol consumption could affect your blood pressure?

If "No or Don't know" go to question (47)

47. Have you ever tried to stop consuming alcohol?

    1. Yes
    2. No

    If "Yes' please state how successful have your efforts been?

    1. Currently I am a non consumer
    2. Previously a regular consumer-now only occasionally so
    3. Unsuccessful – I am still a regular consumer as before
    4. Others (specify)

    If "No" go to question (48)

48. Please describe the nature of the job you are doing?

49. Does it involve: (tick whichever one that applies)

    Mostly mental activity (1)

    Mostly physical activity (2)

    Equal measure of 1+2 (3)

    If your answer is 2 or 3 please describe the nature of physical activity involved

    If your answer is 1 Please go to question (50)

50. Do you regularly engage in any physical activity other than your job?

    1. Yes
    2. No

    If "Yes" please list the type of activities you engage in

    1. Play games (mention type of games)
    2. Brisk walking
    3. Jogging
    4. Others (specify)

    If "No" go to question (51)

51. Do you think the physical activities you engage in are likely to influence your blood pressure?

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

If "Yes" please explain how it could influence your BP?

If "No or Don't" please go to question (52)

52. Do you experience stress in your daily life?

1. Yes
2. No

If "Yes" go to question (53)

If "No" go to question (57)

53. Is the stress you experience related to (tick all these applicable)

1. Work
2. Family
3. Financial
4. Other (specify)

54. Please explain the nature of the stress mentioned in (53)

1. Work
2. Family
3. Financial
4. Other (specify)

55. Have you taken any steps to reduce/control the stress experienced?

1. Yes
2. No

If "Yes' please describe the steps taken by you

If "No" go to question (56)

56. How successful have you been in reducing / controlling stress?

1. Successfully able to cope with it
2. Only partially able to control it
3. Unsuccessful – unable to reduce / control it
4. Other (specify)

57. Do you think stress can affect your blood pressure?

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

If "Yes' please explain how it could influence your BP

If "No or "Don't know" go to question (58)

58. Do you wish to state anything else?

1. Yes
2. No

If 'yes' please elaborate

If 'No" – no further questions

Remarks of Interviewer :

Signature of Interviewer :

Date of interview :