THE PATTERN AND DETERMINANTS OF PRE-HYPERTENSION AMONG ADULTS ATTENDING GENERAL OUTPATIENT CLINIC OF SPECIALIST HOSPITAL BAUCHI

BY

SHEHU BALA ABBA
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A DISSERTATION SUBMITTED TO THE POSTGRADUATE SCHOOL, AHMADUBELLO UNIVERSITY, ZARIA IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF MASTERS IN PUBLIC HEALTH (FIELD EPIDEMIOLOGY)
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ATTESTATION

I declare that the work in this project entitled, the pattern and determinants of pre-hypertension among adults attending general outpatient clinic of specialist hospital Bauchi was performed by me in the department of Community Medicine under the supervision of Dr A.A. Aliyu and Dr A. Abubakar. The information derived from the literature has been duly acknowledged in the text and a list of references provided. No part of this project was previously presented for another degree or diploma at any university.

_____ _____

Shehu Bala Abba Date

CERTIFICATION

This dissertation entitled The pattern and determinants of pre-hypertension among adults attending General outpatient clinic of Specialist Hospital, Bauchi by Shehu Bala Abba meets the regulations governing the award of the degree of Master of Public Health (field epidemiology) Ahmadu Bello University, and is approved for its contribution to knowledge and literary presentation.

_____ _____

Dr A.A Aliyu Date
MBBS, MPH, FMCPH
Supervisor

_____ _____

Dr A.A. Abubakar Date
MBBS, FWACP, MPH-Epid
Co-supervisor

_____ _____

Dr A.A. Abubakar Date
MBBS, FWACP, MPH-Epid
Head of Department,

_____ _____

Prof. Kabiru Bala Date
BSC, MSc, MBA, Ph.D.
Dean Postgraduate School

DEDICATION

Am dedicating this project work to my dearest children and wife.

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SUMMARY

Like hypertension, adults with prehypertension are known to have higher prevalence of other cardiovascular disease (CVD) risk factors, with about 93% of prehypertensive subjects having more than one other CVD risk factors and it progress to hypertension over time. It is also associated with sub-clinical CVD. Hypertension is now recognized as one of the most important CVD contributing about 40% of these diseases in the continent of Africa. The aim of the study is to determine the prevalence of prehypertension among adults attending GOPD of Specialist hospital Bauchi.

A hospital based cross sectional study with a sample size of 410 consisting of adults aged 18 years and above was carried out. Systematic random sampling was used to obtain the required sample size. The study was based on WHO and JNC-7 classification of blood pressure.[4] Multi-sectional questionnaires was administered to collect information. Bivariate analysis of the association between the explanatory and outcome variable were carried out and assessed using Odds ratio with 95% confidence interval; variables in a binary screening found at p-value $\leq$ 0.005 are found to be statistically significant.

The prevalence of hypertension and prehypertension among the study participants was found to be 29.9% and 57.8% respectively. And the prevalence of hypertension and prehypertension among males is higher than in females (59.3% and 55.8%) and (34.6% and 23. 6%).There is statistical association with some socio demographic variables like age, sex, as well as family history of some medical conditions like hypertension, sudden death, stroke and diabetics.

The study revealed that the socio-behavioral risk factors for hypertension were common, so provision of health education & setting up of and strength a surveillance system for hypertension and its risk factors and further extended studies including biological risk factors; is necessary to reduce the burden of hypertension in the survey population.

Keywords: Adult Prehypertension, hypertension, Determinants

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ABBREVIATIONS

AOR	Adjusted Prevalence Odds Ratio
ARMA	Autoregressive Moving Average
ATP III	Adult treatment panel III
BMI	Body Mass Index
BP	Blood Pressure
CDC	Centres for Disease Control and Prevention
CHD	Coronary heart disease
CVD	Cardiovascular disease
DALYs	Disability Adjusted Life Years
DBP	Diastolic Blood Pressure
FET	Fishers Exact Test
IOTF	International Obesity Task Force
JNC	Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure, United States of America
K1-5	Korotkoff sounds 1 to 5
NCD	Non Communicable Disease
NHANES	National Health and Nutrition Examination Survey in the United States of America
NHBPEP	United States of America's National High Blood Pressure Education Programme
POR	Prevalence Odds Ratio
SBP	Systolic Blood Pressure
SRS	Simple Random Sampling
WHO	World Health Organisation

CHAPTER ONE

INTRODUCTION

1.1 Background

The relentless worldwide spread of non-communicable disease poses a major challenge, which threatens the health and economics of all countries. In 2001, cardiovascular disease (CVD) was the number one cause of death worldwide.[1] The global CVD epidemic is rapidly evolving, with the burden of disease shifting toward developing countries , as twice the deaths due to CVD now occur in developing countries as in developed countries.[2] Unlike the developed countries, the justifiable alarm about the spread of HIV/AIDS and the old foes such as TB that are still posing formidable challenges in many developing countries, the epidemics of CVD have insidiously established themselves without attracting global attention or local action.[3]

The risk for developing cardiovascular diseases (CVD) increases progressively with an individual's rate in rise of blood pressure, but the age at which BP crosses the arbitrary threshold of hypertension depends on prior BP levels (hence "pre-hypertension"). This prompted the United States of America's Joint National Committee On Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (JNC-7) to promulgate the concept of "pre-hypertension", (which is defined as a systolic and diastolic blood pressure range of 120-139/80-89 mmHg respectively*)* into guideline for the management of blood pressure in 2003.[4] The term pre-hypertension was coined in 1939 by Robin and Brucer based on their study,[5] which showed that future hypertension will originate from pre-hypertension and that the mortality rate of people with pre-hypertension roughly double that of individuals with normal blood pressure (<120/80mmHg); however they did not formulate treatment guideline for pre-hypertension. Following their postulation various terminologies have been used to describe pre-hypertension

including "transient hypertension" in 1940s,[6] borderline hypertension in 1970s,[7] high normal blood pressure in 1990s,[8] and most recently pre-hypertension in 2003.[4] Regardless of the terminology, this condition is a precursor of hypertension and is associated with excess morbidity and mortality from cardiovascular disease.[6,7]

The prevalence of pre-hypertension is high worldwide and varies with differences in socio-demographic characteristics and cardiovascular risk factors of the population studied.[7] The prevalence of pre-hypertension among U.S. adult population was 31% in 2004.[9] A cross-sectional study among adult family practice population in Canada show prevalence of pre-hypertension of 30.6% in 2008.[10] The prevalence of pre-hypertension among Ghanaian adults in the Ashanti region of Ghana, West Africa was found to be 40% in 2008.[11] A retrospective study among newly presenting diabetics in Maiduguri, Nigeria show a prevalence of 36% in 2008.[12] The prevalence rates of 58.7% (men 59.2%, women 58.2%) was observed among adult Hausa and Fulani ethnic groups in Sokoto, Nigeria in 2010.[13]

Like hypertension, adults with pre-hypertension are known to have a higher prevalence of other Cardiovascular disease risk factors, with about 93% of pre-hypertensive subjects having more than one (≥1) other CVD risk factor abnormality.[14] With respect to specific risk factors, the risk ratios for obesity, dyslipidemia, insulin resistance, metabolic syndrome, Micro-albuminuria, hyper-uraemia, diabetes and abnormalities in circulating markers of inflammation, such as C-reactive proteins, interleukin 6, and tumour necrosis factor are all greater in pre-hypertensive than normotensive subjects while they are intermediate between those with normotension and hypertension.[15-17] The above risk factors activate neuro-humoral systems (renin-angiotensin and sympathetic nervous) and contribute to age-related BP increases.

Pre-hypertension can progress into clinical hypertension over time depending on the rate of rise of BP and age and the rate of progression was found to be 19% over a period of four years.[18] Pre-hypertension is associated with sub-clinical CVD, including both micro-vascular and macro-vascular pathology. A number of large cohort studies have shown that, pre-hypertension caused a variety of cardiovascular diseases, such as coronary artery disease, heart failure and cardiovascular death.[19,20]

The JNC7 treatment guideline recommendation or pre-hypertension without compounding conditions is early intervention and prevention through lifestyle modifications. While individuals with compounding conditions diagnosed with pre-hypertension would receive lifestyle modifications with drug intervention.[4] Recommended lifestyle modifications include weight reduction, Dietary Approaches to Stop Hypertension (DASH) eating plan, sodium intake reduction to 2.4 grams per day, regular aerobic physical activity such as brisk walking at least 30minutes daily most days of the week, smoking cessation and moderate alcohol consumption.[4]

The five non-pharmacological treatments for pre-hypertension recommended by JNC-7 have been proven through clinical trials to significantly lower blood pressure, and most have been shown to prevent progression to hypertension and cardiovascular disease.[21,22]

1.2 Statement of Problem

The prevalence of pre-hypertension is a growing national and global health concern and is therefore, a concern to health care providers. Population with pre-hypertension constitute a significant proportion of patients seen in outpatient clinics, who usually come for curative and sometimes preventive health services, which if not checked and managed can progress to hypertension and its complications. The limited healthcare personnel and facilities, the busy

nature of a typical clinic in our environment coupled, with the level of poverty in our environment, more especially rural areas, and our poor attitude and response towards preventive care can all hinder early screening and intervention. With these, pre-hypertension can easily progress to hypertension and cardiovascular disease, which are major drain of individual, community and state resources. Previous studies in Nigeria have shown that urban cities in Nigeria have high prevalence of hypertension, but studies on the pattern and determinants of pre-hypertension are scarce especially in rural communities[12]. Hence, routine screening and advocacy for prevention are of urgent need in our environment.

1.3 Justification for the Study

Pre-hypertension is highly prevalent and is associated with the traditional cardiovascular risk factors linked to hypertension, such as obesity, diabetes mellitus and dyslipidaemia[4]. A large proportion of the population in our family practice need close surveillance of BP levels because of the high prevalence of pre-hypertension. Prevention of pre-hypertension should be an important goal for primary care patients and health concern for health personnel, policy makers on the entire continent. Hence, the role of public health in terms of routine screening, counselling about lifestyle modification and advocacy for prevention cannot be over-emphasized[2]. Public health physicians as frontline doctors and advocate of patients are in the best position to abate the current trend of epidemics of cardiovascular disease, whose major component hypertension can be controlled by mere routine screening and early adoption of life style modification to prevent the inevitable consequences on our individual patient, family, community and continent at large. This study is being undertaken to increase awareness of pre-hypertension in our environment, encourage the people and physicians to routinely screen for it and its determinants in high-risk populations and offer early intervention.

1.4 Objectives

1.4.1 Main objective

To describe the pattern and determinants of pre-hypertension among adult patients attending general outpatient clinic of Specialist Hospital, Bauchi State.

1.4.2 Specific objectives

1. To determine the prevalence of pre-hypertension among adults attending the General Out-patient Clinic of Specialist hospital Bauchi.
2. To determine associated cardiovascular risk factors among adults attending the General Out-patient Clinic of Specialist hospital Bauchi.
3. To assess the associated co-morbidity among adults attending the General Out-patient Clinic of Specialist hospital Bauchi.
4. To assess the determinants of pre-hypertension among adults attending the General Out-patient Clinic of Specialist hospital Bauchi.

CHAPTER TWO

LITERATURE REVIEW

2.1 Definition of Terms

2.1.1: Hypertension and prehypertension

2.1.2: Physical activity

Physical activity is defined as any bodily movement produced by skeletal muscles that require energy expenditure including activities undertaken while working, playing, carrying out household chores, travelling and engaging in recreational pursuits.[39, 55]

The term physical activity should not be confused with exercise, which is a subcategory of physical activity that is planned, structured, repetitive, and aimed to improve or maintain one or more components of physical fitness. Both, moderate and vigorous intensity physical activities bring about their health benefits.

The WHO recommended physical activities for adults are:[39]

1. Moderate intensity activities of at least 150min per week or at least 30min in more than four days per week. it can also be 75min of vigorous-intensity physical activity per week.
2. For additional health benefits, adults should increase their moderate-intensity physical activity to 300min per week, or its equivalent.
3. Muscle-strengthening activities should be done involving major muscle groups, two or more days a week.

2.1.3: Diabetics

Diabetes is a group of metabolic diseases in which the person has high blood glucose, due to inadequate insulin production or the body cells do not respond properly to insulin or both.

2.1.3.1 Types of diabetics[2]

Type 1: This is referred to as insulin dependent, juvenile diabetes or early onset diabetes. The body does not produce insulin. It constitutes about 10% of all diabetic cases.

Type 2: This constitutes about 90% of all diabetic cases. The body does not produce enough insulin for proper function or the cells in the body do not react to the insulin (insulin resistance).

Type 3: Gestational diabetics, this effects females during pregnancy some women have very high level of glucose in their blood and their bodies are not able to produce enough insulin to transport all of the glucose to the cell, resulting to progressive rise in blood glucose.

2.1.3.2 Determination of diabetics[2]

1. Fasting plasma glucose test

    - Greater than or equal to 126 g/dl is diabetic
    - Between 100mg/dl to 125.99g/dl is Prediabetes
    - Less than 100mg/dl is normal

2. Random blood sugar test

- Greater than or equal to 199.9 mg/dl (11.1. mmol/l) taken on two different occasion or on one occasion with additional symptoms e.g. polydipsia, polyuria etc. is diabetics

3. Oral glucose tolerance test (OGTT)

    - At least 200mg/dl is diabetes
    - Between 140 mg/dl to 199.9mg/dl is Prediabetes
    - Less than 140mg/dl is normal

2.1.4: Residence

Each city is designed in a way that distinct how the land will be used. The distinction is usually into residential area, industrial area and commercial area.

The residential area is further divided based on population density into high, medium and low-density settlement with corresponding social and infra structural amenities.

After establishing the Bauchi State geographical information services under the ministry of Lands, Bauchi, the agency mapped out the city using GIS remote sensing technique and categorize the settlements into low, medium and high-density settlements[75]

2.1.5: Metabolic syndrome

The term "metabolic syndrome" describes a constellation of cardiovascular risk factors related to hypertension, abdominal obesity, dyslipidemia, and insulin resistance. The definition adopted by the National Cholesterol Education Program, Adult Treatment Panel III (ATP) guidelines in 2001[64] is the presence of three or more of the five risk factors . The World Health Organization has a somewhat different definition of the metabolic syndrome, but for consistency, JNC 7 has adopted the ATP III definition. Several other associated features have been reported, including hyperinsulinemia, insulin resistance, and higher density of LDL-cholesterol particles.[65] The metabolic syndrome has also been associated with high levels of inflammatory risk markers,[66]reduced fibrinolysis (including elevated plasminogen activator inhibitor-1),[67] heightened magnitude of oxidative stress,[68,69] microalbuminuria,[70] abnormalities in autonomic regulation,[71] and activation of the renin-angiotensin-aldosterone axis.[70]

2.1.5.1 Clinical criteria defining the metabolic syndrome in Adult Treatment Panel III[74]

1. **Waist circumference**:

   >102 cm (>40 inches) for men

   >88 cm (>35 inches) for women

2. **Blood pressure**:

   >130 mmHg systolic and/or

   >85 mmHg diastolic

3. **Fasting glucose**:

   >110 mg/dL or 6.1 mmol/L

4. **Triglycerides**:

   >150 mg/dL or 1.69 mmol/L

5. **HDL-cholesterol**:

   <40 mg/dL (1.04 mmol/L) in men

   <50 mg/dL (1.29 mmol/L) in women

2.1.6: BMI

Body mass index (BMI) is a person's weight in kilogram divided by the square of height in meter. BMI does not measure body fat directly but research has shown that BMI is moderately correlated with more direct measures of body fat obtained from skin fold thickness measurement, bioelectrical impedance, densitometry, dual energy x-ray absorptiometry (DXA) and other methods.[60,61] Moreover, BMI is strongly correlated with various metabolic and disease outcome as are these more direct measures of body fatness.[62] In general BMI is inexpensive and easy to perform screening for weight category.

In adults, BMI is interpreted into underweight, normal/ health weight, overweight and obese. This is demonstrated in the table below.

BMI	Weight Status
Below 18.5	Underweight
18.5 – 24.9	Normal or health weight
25.0 – 29.9	Overweight
30.0 and above	Obese

2.2 Prevalence of Prehypertension among Adults Attending GOPD

Hypertension was thought to be a rare medical condition in Africa, but it is now recognized to be one of the most important causes of cardiovascular diseases accounting for about 40% of the disease in Africa.[22,23] Pre-hypertension is also increasing the risk of cardiovascular diseases, beginning at a Systolic/ diastolic of (120 -139/80-89 mm Hg), the risk of cardiovascular disease doubles with each increment of 20/10 mm Hg.[25]

The prevalence of pre-hypertension is high worldwide and varies with differences in socio-demographic characteristics and cardiovascular risk factors of the population studied.[7] In 2008 CVD was responsible for 10% of the annual DALY[26] lost that year. Behavioural risk factors such as inactivity, tobacco use and unhealthy diet explains nearly 80% of CVD cases.[26]

From previous studies conducted across the world in countries like United States of America, Canada, India, United Arab Emirates, Ethiopia, and Ghana and within Nigeria on

prehypertension and hypertension among adults. Most of these studies are cross sectional studies (surveys). The prevalence of prehypertension in those studies ranges from 11.5% to 59.2% depending on the country and other demographic variables. Though the sample size varies from 218 to 4809 but the age groups are the same consisting of adults of all age groups >18 years. The studies use either the JNC-7 or the NHBPEP to establish the cut-off reading for prehypertension and hypertension, which are very similar. Most of the studies use auscultation with mercury sphygmomanometer as the gold standard for measuring blood pressure[4].

Prevalence of prehypertension is almost the same as the prevalence of hypertension in most of the studies from developed countries as reported, in the USA 31% and 29 % respectively,[9] in Canada prehypertension 30% and hypertension 28% was reported. [10] While the gap between the prevalence of hypertension and prehypertension is wider in developing countries, as reported in Ethiopia prehypertension 37.2% and hypertension 18%,[12] in Ghana study done shows prehypertension 40 % and hypertension 28.3%.[11] This could be related to the nature of the population pyramid in developing countries where there is higher population of youths with lower population of elderly at the top of the pyramid and these youths are at the state of developing and progressing to full blown hypertension. And those that have developed hypertension might not be on proper medication thereby having high rate of fatality amongst the elderly.

In Nigeria similar studies reported very high prevalence of prehypertension and hypertension 58.7% and 40.8%.[13]

All studies conducted were cross sectional studies and most were community based.

2.3 Factors Associated with Hypertension and Pre-hypertension among Adults

2.3.1 Non-modifiable factors

Age and gender

Hypertensive and Prehypertensive risk factors are known to increase with age and there is a marked difference between males and females, it tends to cause CVD three times higher among males and five times more mortality than among females.[17] However, with increase in age it increases more sharply in women. The differences in sex is usually due to factors like high density lipoproteins (HDL), Basic metabolic index (BMI) and diabetes.[18]

Ethnicity

Ethnicity is the group a person belongs to because of mix of cultural factors such as language, diet, religion and ancestry.[24] There is variation in hypertension and prehypertension between different ethnic groups.[25,26,27]

Family aggregation and heritability

There are epidemiological evidences that environmental cofactors such as level of calorie excesses, high salt intake, physical inactivity alcohol consumption and anthropometric characteristics are directly correlated with cardiovascular diseases visa-a-vis hypertension and prehypertension.[28]

Although there has been contradiction, as to what extent the observed familial aggregation on both systolic and diastolic is due to genetic or environmental reason. It has been reported that almost 30% of the risk factors are accounted by genetic hereditary and about 70% are familial.[29,30]

2.3.2 Modifiable factors

Anthropometric variables

Despite the development in modern techniques anthropometric measurements such as weight, height, BMI, waist hip ratio (WHR) are important methods to study the genetic structure and prediction of risk factors of many complex diseases.[31]

World statistics have suggested that the prevalence of obesity have increased in the last few decades and this trend will likely continue.[32] Obesity is highly associated with increased risk of developing prehypertension and eventually hypertension.[33]

Many studies have been conducted to assess the best anthropometric method to assess the patients with elevated blood pressure[31] .Many studies claimed there is a very strong relationship between different anthropometric measurements and elevated blood pressure.[34]

Body mass index is widely used for classification of overweight and obesity and its a strong predictor of metabolic risks.[35,36,37] Some studies have shown association between BMI and systolic blood pressure (SBP) in both genders (r=0.3 in men , r = 0.33 in women , p = <0.0001) as well as between BMI and diastolic blood pressure (DBP) (r=0.28 in men , r = 0.32 in women , $p < 0.0001$).[38]

Socioeconomic status

This is the condition in which people were born, grow, live, work and age and are shaped by the distribution of money power and resources at global, national and local levels.[39] It has been established that prehypertension and hypertension among high-income countries of the industrialized world leading to high prevalence of CVD which account for one-third of total

death.[40] It's also been argued that this trend could be shifting with more cases among in poor subjects in countries of economic transition such as Nigeria , India , Egypt etc.[41,42]

Life style

The dramatic change in lifestyle from traditional to modern has lead to physical inactivity. With an urbanization rate of 3.75 (2011)[43] and that of 4.66 (2015)[43] this is only expected to keep increasing leading to increase inactivity, higher consumption of junk food which are widely available even among low-socioeconomic levels, leads to overweight and obesity causing an increase in the prevalence of prehypertension and hypertension among subjects.[32] Life style can be influenced by wealth but blood pressure is more related with educational level than with wealth.[44]

Cigarette smoking

It has been documented that that there is a direct relationship between cigarette smoking and prehypertension / hypertension while there is an inverse relationship between socio economic status and smoking with hypertension in relation to prevalence of CVD in a representative sample of adults in Dar Salam, Tanzania.[44]

Alcohol use

There is are evidence from both clinical and epidemiological studies that alcohol consumption , especially at higher levels is associated with elevation in blood pressure,[45,46,47] both SBP and DBP , although the elevation in SBP is of greater magnitude. It has been found that mild to moderate consumption of alcohol can be protective against coronary heart disease, with a relative risk of 0.5 although the suggestion remains controversial.[48,49,50]

Physical activity and exercise

Globally, around 23% of adults aged 18 and above were not active enough in 2010 (men 20% and women 27%). In high-income communities, the level of inactivity is (26% of men and 35% women) as compared to low-income countries (12% men and 24% women). Low or decreasing physical activity level often corresponds with high or rising gross domestic product (GDP).[52] There are convincing evidence that physical activity reduces the incidence of prehypertension / hypertension with an overall reduction in CVD and all causes of mortality among men.[51,52,53]

Regular physical activity has been linked to reduced risk of prehypertension and hypertension.[54,55] Physical inactivity account for 1.9 million deaths worldwide WHO (2005),[32] Women are said to participate less than men in physical activities.[56,57] Women are known to spend a lot of time in carrying out social activities like housekeeping, shopping and food preparation activities, which also contribute to energy expenditure.[58] The minimum recommended physical activity is 30 – 45 minutes of moderately intense activity daily.[59]

CHAPTER THREE

METHODOLOGY

3.1 Study Area

The study was carried out at the General Out Patient clinic of Bauchi General Hospital, Bauchi State, Nigeria. Bauchi State is in the North – East zone of Nigeria and was created in 1976. It is now becoming the most populous state in North eastern Nigeria with a population of 4,653,066 million people (2006census).[43] The State is bordered from the North east by Yobe State, North by Jigawa State, North west by Kano State, South west by Kaduna State, South by Plateau State, South east Taraba State and Gombe State from the East. The capital of Bauchi state is Bauchi. The State has twenty local governments authorities (LGAs) divided into three senatorial zones, it is located in the Sudan savannah and the inhabitants within the capital are mainly traders and civil servants while farmers dominate the rural areas. They are majorly of Hausa and Fulani,Gerawa, Sayawa, Jarawa, kirfawa, turawa Bolewa, Karekare, Kanuri, Fa'awa, Butawa, Warjawa, Zulawa, and Badawa tribes and of Islamic and Christian faith. Other tribes like Yoruba, Ibo, Tiv, Nupe, Ebira etc. are also resident in Bauchi. The subjects therefore represent sub-group of Nigerian adults. The State is made up of a teaching hospital, a Federal medical centre, a new state of the arts general hospital and each of the LGAs have at least one general hospital with numerous primary health care centres, a Federal University, and a State University as well as three other tertiary institutions. Bauchi is the hub of sports activities in the North east housing the major stadium with other advanced sports facilities. Bauchi General Hospital is located within Bauchi metropolis serving Bauchi and its new immigrant communities from neighbouring States of Jos, Adamawa, Yobe, Maiduguri and Gombe, and is a 200 bed-capacity

hospital. The GOPD is a busy primary care centre run by general duty doctors, who see an average of 350 undifferentiated male and female patients daily.

3.2 Study Design

The study is a descriptive cross-sectional study.

3.3 Study Population

The study population comprised of adults ≥ 18years of age attending the General Out-patient clinic of Bauchi specialist Hospital

3.3.1 Inclusion criteria

Adults aged ≥ 18 years attending general outpatient clinic of Bauchi specialist Hospital.

3.3.2 Exclusion criteria

1. Hypertensive adults.
2. Pregnant women as they may have hypertensive disorder in pregnancy.
3. Persons who did not give consent.

3.4 Sample Size Estimation

The sample size was calculated using the formula;[24]

$n = Z\alpha^2 p (1-P)/ d^2$

n = minimum sample size

Zα = standard normal deviate corresponding to the 95% confidence interval. (1.96)

p = Prevalence rate (58.7%, prevalence rate of pre-hypertension obtained from previous study in Sokoto, Nigeria).[15]

q = 1 – p

d = absolute of precision (0.05)

Thus, $n = \frac{1.96^2 \times 0.587 \times (1 - 0.587)}{(0.05)^2} = 372.529$

A minimum sample size of 373 was therefore obtained, but additional 10% was added to accommodate for non-response. Therefore, the final sample sizes of 410 subjects were recruited for the study.

3.5 Sampling Technique

Systematic random sampling method to select 410 adults attending General Out-patient clinic was done. Out of 1750 patients who came to General Out-patient clinic every week, 82 patients were recruited each week therefore the study duration lasted for a period of a 5 weeks. To get the sampling frame and sample size of 8750 and 410 respectively. The daily turnout of patients is approximately 350 daily and the samples required daily was 17. With a required sample size of 410 and a sample frame of 8750, this translates to a sampling interval of (350/17) =21. The first person was selected using simple random sampling method by balloting**.**

3.6 Instrument of Data Collection

Data was collected using a pretested administered questionnaire in English and Hausa. The questionnaire is made up of five sections**.** The questionnaires consisted of five sections: Bio data, relevant family history (of known determinant), Risk factors (of pre-hypertension/hypertension and CVD), and Physical examination and Laboratory parameters.

The questionnaire was pretested in Murtala Muhammad General Hospital Kano were twenty questionnaires were administered with the help of research assistants i.e. Community health extension workers (CHEW). The tool was found to be able to capture required information as it was in simple language and very straightforward question requiring straight answers even though

there was a slight challenge in getting information on age and income from the respondents. A range was therefore provided for these variables.

3.7 Data Collection Method

Researcher and research assistants collected data. Four research assistants who were senior community health extension workers (SCHEW) were recruited.

The training was conducted on two different occasions and it involved the following:

- The pre-hypertension was defined using JNC 7 classification.
- The concept of the study was explained to them along with the objectives.
- They were trained on the standard (WHO) method of taking blood pressure using sphygmomanometer taking it step by step with practical demonstration as shown below.

3.7.1 Blood pressure (BP) measurement[5]

1 Subjects were seated quietly for at least 5 minutes in a chair (rather than on an examination table), with feet on the floor, and arm supported at heart level.

2 The subjects were asked to refrain from strenuous exercise or consumption of alcohol or caffeine – containing beverage for at least 30 minutes prior to blood pressure measurement.

3 An appropriately sized cuff (cuff bladder encircling at least 80% of the arm) was used to ensure accuracy.

4 The cuff was inflated to 30 mm Hg above palpated systolic BP and deflated at a rate of 2 to 3 mm Hg/second.

5 The bell of the stethoscope was lightly placed over the brachial artery pulse, proximal and medial to the cubital fossa, and below the bottom edge of the cuff (i.e., about 2 cm above the cubital fossa).

6 Both Systolic BP and Diastolic BP were recorded; using the first appearance of Korotkoff sound (phase 1) to define Systolic BP. Moreover, the disappearance of Korotkoff sound (phase 5) to define Diastolic BP. The pressure was recorded to the nearest two mmHg.

7 Two or more readings separated by 5 minutes were taken and averaged. If the first two readings differ by more than 5 mm Hg, additional readings were obtained and averaged.

Respondents whom were prehypertensive were asked to come back the following day for blood sample collection. They were shown the use of appropriate bottle for blood sample collection as well as whom to collect from:

3.7.2 Blood sample collection

Two blood samples (total of 6.5mls) were collected for laboratory investigations after the routine antiseptic technique as follows:

1. 2.5mls of venous blood in a fluoride oxalate bottle for Fasting Plasma Glucose.
2. 4mls of venous blood in a lithium heparin bottle for Lipid profile analysis (Total, High Density, Low density Cholesterol and Triglycerides).
    - The research assistants were taught to collect urine sample in a sterile urine specimen bottle to be tested for Micro-albuminuria.
    - The research assistants were also shown how to take height reading using Standiometer.

3.7.3 Subsequent follow-up

Participants identified with the pre-hypertension or any of the associated cardiovascular risk factor or co-morbidity was managed accordingly using JNC 7 preventive guidelines, which are:

1. Life-style modifications were encouraged with emphasis on weight reduction (where necessary).

2. Healthy eating i.e. low salt intake , low calories etc
3. Increase in physical activity of at least 30 min daily from brisk walk , jogging , aerobics etc

3.8 Data Management

Data was analyzed using Epi-info version 3.5 statistical software. Absolute numbers and simple percentages are used to describe categorical variable, such as sex, marital status. Similarly, quantitative variables, such as age, blood pressure, are described using measures of central tendency (mean) and measures of dispersion (range, standard deviation) as appropriate. Frequencies and proportions are used to describe the characteristics of the study population. The chi-square test was used in assessing the significance of associations between categorical variables. A p-value of ≤ 0.05 was considered statistically significant.

3.9 Ethical Consideration

Ethical approval was obtained from the medical research ethics committee of Ministry of Health Bauchi State. Informed consent of the participants was also sought for and obtained and they were assured of confidentiality of data collected.

3.10 Limitations of this Study

1. Inability to rule out white coat hypertension by using 24-hour ambulatory blood pressure measurement.
2. Non-adherence to fasting instructions might affect results of lipid profile and Fasting.

CHAPTER FOUR

RESULTS

4.1 Socio Demographic Characteristics

In all, a total of 410 subjects were recruited for the study out of which 5 decline to participate giving a response rate of 98.8%. The date collected was analyzed adhering to the study protocol. The socio demographic characteristics such as age, sex, educational level, marital status, occupation where highlighted in this section.

Table 1: Age and sex distribution of respondents

Variable	Frequency (n=405)	Percent (%)
Age group (years)		
18-29	94	23.2
30-39	120	29.6
40-49	72	17.8
50-59	54	13.3
60-69	39	9.6
>70	26	6.4
Sex		
Male	231	57.0
Female	174	43.0

There were more males 231(57.0%) than females 174(43.0%) in the study. The respondents most represented were between 30 – 39 years 120 (29.6%).

Table 2: Educational level and occupation of respondents

Variable	Frequency (n=405)	Percent (%)
Educational Level		
None	40	9.9
Primary	37	9.1
Secondary	98	24.2
Tertiary	89	22.0
Quranic	141	34.8
Occupation		
Artisan	29	7.2
Civil servants	75	18.5
Housewife	69	17.0
Self employed	97	24.0
Trader	92	22.7
Unemployed	43	10.6

On educational level, 141 (34.8%) of respondents had a minimum of a Quranic school education while only 89 (22.0%) had tertiary school education. Most of the respondents were either self-employed 97 (24.0%) or traders 92 (22.7%) only75 (18.5%) were in the civil service.

Table 3: Marital status and place of residence of respondents

Variable	Frequency (n=405)	Percent (%)
Marital Status		
Divorced	16	4.0
Married	260	64.2
Single	108	26.7
Widowed	21	5.2
Place of Residence		
Low density	59	14.6
Medium density	209	51.6
High density	137	33.8

On the marital status, 260(64.2%) of the respondents were married with only 21(5.2%) widowed and 16(4.0%) divorced. On their place of residence 209(51.6%) lived in medium density settlements

Table 4: Summary of anthropometric measurements and mean blood pressure among respondents (n=405)

Variable	Female	Male
Mean of weight (Kg)	53.0 ±16.6	58.0 ± 15.1
Means of height (meters)	1.60 ± 0.6	1.71 ± 0.5
Mean Diastolic BP (mmHg)	89.4 ±16.8	82.7 ± 11.3
Mean Systolic BP (mmHg)	127.1 ±23	133.7 ± 21

The mean weight of males (58kg) is higher than that of the females (53kg). The mean diastolic BP is higher among the females while the mean systolic BP is higher among the male respondents.

Table 5: The mean values of blood biochemical parameters between different body mass index (BMI) subgroups, according to the gender and age of prehypertensive persons among the study subjects

Gender	Age group	BMI (Kg/m^2)	LDL (mg/dl)	HDL	Total Cholesterol	Triglyceride	FBS
Female	<40	<25	59.8(39.5)	65.4(23.8)	155.9(43.0)	43.2(25.8)	102(38.0)
		25-30	59.5(45.8)	99.3(27.9)	**422.5(64.7)**	35.3(14)	136(30.0)
		>30	54.2(32.2)	65.4(21)	205(32)	37.2(23)	132(40.0)
	40-49	<25	98.5(2.7)	59.8(2.7)	164.1(24.6)	38.6(5.5)	109(2.7)
		25-30	83.8(39.2)	41.6(5.8)	150.5(20.4)	26.5(12)	147(32.5)
		>30	74.4(20.5)	64.0(33.1)	171.4(9.3)	44.4(22.1)	107.1(146.7)
	>50	<25	38.6(38.2)	75(27)	129.3(46.4)	27.0(22)	**130.3(60.1)**
		25-30	42.3(19.1)	82(19)	139(0.0)	49.7(34.9)	**165(32.5)**
		>30	57.9(0.00)	69.5(0.0)	150.7(0.0)	46.3(0.0)	**157(0.0)**
Male	<40	<25	57.8(32.1)	64.7(16.4)	154.9(38.2)	49.0(23.7)	108.1(37)
		25-30	49.8(37.1)	72.7(23.6)	146.1(31.6)	50.1(41.0)	143.8(52)
		>30	42.9(23.5)	63.2(19.0)	136.9(32.9)	87.0(108)	147.2(36.4)
	40-49	<25	54.1(30.6)	59.3(15.9)	154.4(37.2)	47.5(44.5)	154.4(4)
		25-30	40.5(12.0)	135.1(0.0)	141.9(28.3)	41.5(15.2)	120.6(14)
		>30	46.3(0.0)	80.1(17.4)	208.5(0.0)	57.9(0.0)	107(0.0)
	>50	<25	60.1(32.1)	62.6(18.2)	148(41)	36.2(15.6)	**120(48)**
		25-30	59.9(46.1)	73.4(10.9)	142.8(21.8)	38.6(5.5)	**153(49)**
		>30	52.1(47.0)	66.6(22.8)	149.6(45.3)	54.0(13.4)	**230.7(15.8)**

The table indicates that the number of respondents with other co-morbidity especially elevated glucose level, is relatively high especially among those with obesity and above 50 years.

4.2 Prevalence of Hypertension and Prehypertension among Respondents

Table 6: Prevalence of hypertension and prehypertension among respondents

Variable	Frequency (n=405)	Percent (%)
Normotension	50	12.35
Prehypertension	121	29.88
Hypertension	234	57.78

It can be seen that the prevalence of hypertension is almost twice that of prehypertension and only 12% of respondents have a normal BP, 88% are either hypertensive or Prehypertensive.

Table 7: Prevalence of hypertension and prehypertension by respondent's occupation and highest educational level

Variable	Hypertension n(%)	Prehypertension n(%)	Normal n(%)	Chi square test
Educational level				
None	27(67.5)	13(32.5)	0(0)	
Quranic	99(70.2)	28(19.8)	14(10.0)	
Primary	21(56.8)	14(37.8)	2(5.4)	Not valid
Secondary	46(47.0)	31(31.6)	21(21.4)	
Tertiary	41(46.1)	35(39.3)	13(14.6)	
Occupation				
Artisan	13(44.8)	12(41.4)	4(13.8)	
Civil servants	46(61.3)	24(32.0)	5(6.7)	
Housewife	30(43.5)	19(27.5)	20(30.0)	Not valid
Self employed	65(67.0)	27(27.8)	5(5.2)	
Trader	58(63.0)	27(29.4)	7(7.6)	
Unemployed	22(51.0)	12(28.0)	9(21.0)	

The prevalence of prehypertension was highest among those with tertiary education (39.3%) as their highest level of education and those with Quranic (70.2%) education have the highest prevalence of hypertension. Civil servants (32%) constitute the highest prevalence of prehypertension and self employed (65%) have the highest prevalence of hypertension among the study population.

4.2.1 Hypertension and Prehypertension among Respondents with Some Family History Related to Hypertension

Table 8: Hypertensive and prehypertensive cases among respondents with family medical history of heart failure

Positive family histories	Frequency (n=31)	Percent (%)	95% Confidence interval
Positive history of Heart Failure			
Hypertensive	26	83.9	**66.3 - 94.6**
Prehypertensive	3	9.7	2.04 - 25.8
Normal	2	6.5	0.8 - 21.4

Most of the respondents with hypertension 26(83.9%) have a family history of heart failure. This is statistically significant.

Table 9: Hypertensive and Pre-hypertensive cases among respondents with family medical history of hypertension, history of sudden death

Positive family histories	Frequency	Percent (%)	95% Confidence interval
Positive history of Hypertension (n=200)			
Hypertension	139	69.5	62.6 - 75.8
Prehypertension	38	19.0	13.8 - 25.1
Normal	23	11.5	7.4 - 16.8
Positive history of Sudden death (n=33)			
Hypertensive	21	63.6	45.1 - 79.6
Prehypertensive	9	27.3	13.3 - 45.5
Normal Pressure	3	9.1	1.9 - 24.3

Most of the respondents with family history of hypertension 139(69.5%) were hypertensive and its statistically significant.

And most of those with past history of sudden death 21(63.6%) were also hypertensive and its also significantly significant but weak due to small sample.

Table 10: Positive family history of Diabetics and presence or absence of hypertension and prehypertension

Variable	Hypertensive n(%)	Prehypertensive n(%)	Normal n(%)	Chi Square test
Family history of Diabetics				
Positive	52(74.3)	9(12.9)	9(12.9)	0.002
Negative	182(54.3)	112(33.4)	41(12.2)	

The association of hypertension, prehypertension with family history of diabetics was statistically significant. p= 0.002

4.2.2 Hypertension and Prehypertension among Respondents with Factors Associated with Hypertension

Table 11: Hypertension and prehypertension among those who do adequate exercise, smoke cigarette and those who take alcohol

Variable	Hypertension n (%)	Prehypertension n (%)	Normal n (%)	Chi square Test
Adequate exercise				
History of exercise	89(58.6)	43(28.3)	20(13.2)	0.84
No history of exercise	145(57.3)	78(30.8)	30(11.9)	
Smoking				
Positive history of smoking	11(64.7)	5(29.4)	1(5.9)	Not valid
No history of smoking	223(57.4)	116(29.9)	49(12.6)	

The prevalence of prehypertension was higher among respondents who had no history of exercise (30.8%)**.** The prevalence of hypertension is higher among respondents that smoke cigarette (64.7%) while the prevalence of prehypertension is almost the same among both with positive and negative history of smoking, and the prevalence of normal blood pressure among non-smokers is twice of those who smoke. The chi square is not valid

Table 12: Hypertension and prehypertension among those who took alcohol

Variable	Hypertension n(%)	Prehypertension n(%)	Normal n(%)	Chi square Test
History of alcohol intake				
Positive	2(66.7)	1(33.3)	0(0)*	Not valid
Negative	232(57.7)	120(30.0)	50(12.4)	

*FET (Fischer's exact test)

The prevalence of hypertension and prehypertension is higher among respondents with positive history of alcohol intake

4.2.3 Prevalence of overweight and obesity among respondents

Table 13: Prevalence of overweight and obesity among respondents

Variable	Frequency n (%)	95% confidence interval
Obese	55(13.6)	10.5 – 17.4
Overweight	136(33.6)	29.0 – 38.4
Normal	213(52.6)	47.6 – 57.5
Underweight	1(0.2)	0.0 – 1.6

The prevalence of obesity in this study is 13.6% (n=55) and the prevalence of overweight is 33.6% (n= 136).

Table 14: Prevalence of overweight and obesity among respondents by sex

Variable	Obese	Overweight	Normal	Underweight
Sex				
Female	15(8.6)	59(33.9)	99(56.7)	1(0.6)
Male	40(17.3)	77(33.3)	114(49.4)	0(0)

The prevalence of obesity among males (17.3%) is more than twice than that of women while the prevalence of normal weight among women (56.7%) is higher than among males in the study.

4.3 Bivariate Analysis for Factors Associated with Prehypertension

4.3.1 Socio-demographic factors

Table 15: Prevalence of prehypertension and hypertension in association with gender, age and marital status

Variable	Freq. (n=405)	Prehypertension n(%)	No prehypertension n(%)	OR (95%CI)	p-value
Gender					
Female	174	41(23.6)	133(76.4)	1.72(1.1-2.6)	0.008
Male	231	80(34.6)	151(63.4)		
Age groups					
Elderly	119	15(12.6)	104(87.4)	4.1 (2.23 -7.4)	**0.001***
Youths	286	106(37.1)	180(62.9)		
Marital status					
Married	260	58(22.3)	202(77.7)	2.6(1.7 -4.2)	**0.000006***
Not married	145	63(43.5)	82(56.6)		

The prevalence of prehypertension is higher among males (34.6%) than among the female group. In addition, this difference was found to be statistically significant. The prevalence of prehypertension is more than twice (37.1%) among youths than among the elderly. The prevalence of prehypertension among the unmarried respondents is almost as twice among the married respondents.

Table 16: Presence of prehypertension in association with employment and BMI

Variable	Freq. (n=405)	Prehypertension n(%)	No prehypertension n(%)	POR	95%CI	p-value
Employment status						
Employed	293	90(30.7)	203(69.3)	0.86	0.5 -1.4	0.28
Unemployed	112	31(27.7)	81(72.3)			
BMI Status						
Normal	214	3(1.42)	211(98.6)	113.7	35-368	0.0001*
Overweight/ underweight	191	118(61.8)	73(38.26)			

*statistically significant

The prevalence of prehypertension was slightly higher among the employed (30.7%) than among the unemployed respondents.

4.3.2 Bivariate of prehypertension associated with family history of associated medical conditions

Table 17: Prehypertension and family history of hypertension and sudden death among respondents

Variable (family history)	Freq. (n=405)	Prehypertension n(%)	No prehypertension n(%)	POR	95%CI	P-value
Hypertension						
Family history of hypertension	200	38(19)	168(81)	0.3	0.2 – 0.5	0.002*
No family hypertension	205	83(40.5)	122(59.5)			
Family history of sudden death						
Family his of sudden death	56	8(14.3)	48(85.7)	2.9	1.4 –6.7	0.002*
No family history of sudden death	349	113(32.4)	236(67.6)			

*statistically significant

There is statistically significant association between family history of hypertension and prehypertension among respondents. There is statistically significant association between family history of sudden death and prehypertension among respondents.

Table 18: Prevalence of prehypertension associated with family history of heart failure and diabetics

Variable (family history)	Freq. (n=405)	Prehypertension n (%)	No prehypertension n (%)	POR	95%CI	p-value
Family his of heart failure	31	3(9.7)	28(90.3)	0.2	0.06– 0.7	0.004*
No family history of heart failure	374	118(31.6)	256(68.5)			
Family his of DM	70	9(12.9)	61(87.1)	0.3	0.1 – 0.6	0.0002*
No family history of DM	335	112(33.4)	223(66.65)			

*statistically significant

There is statistically significant association between family history of heart failure and prehypertension among respondents. There is also statistically significant association between family history of diabetics and prehypertension among respondents.

4.3.3 Bivariate of prehypertension with other known associated factors

Table 19: Prevalence of prehypertension in association with alcohol intake and adequate exercise

Variable	Freq. (n=405)	Prehypertension n (%)	No prehypertension n (%)	POR	95%CI	p-value
Alcohol intake						
Alcohol ingestion	3	1(33.3)	2(66.7)	1.2	0.02 –16	0.4*
No alcohol ingestion	40	120(29.9)	282(70.2)			
Adequate Exercise						
Do exercise	120	33(27.5)	87(72.5)	1.2	0.7 –1.9	0.25
Don't do exercise	285	88(31)	197(69)			

*FET (Fishers' exact test)

There is no statistically significant association between prehypertension and alcohol consumption. There is no statistically significant association between prehypertension and adequate exercise.

Table 20: Prehypertension and association with income and cigarette smoking

Variable	Freq. (n=405)	Prehypertension n (%)	No prehypertension n (%)	POR	95%CI	p-value
Income						
High income	101	30(29.7)	71(7.3)	1.1	0.6 – 1.6	0.49
Low income	304	91(30)	213(70)			
Cigarette smoking						
Smoke cigarette	17	5(29.4)	12(70.6)	0.9	0.3 – 3.1	0.49
Don't smoke cigarette	388	116(29.9)	272(70.1)			

There is no statistically significant association between prehypertension and income among the respondents. There was no statistical significance in association between prehypertension and cigarette smoking among the respondents.

4.4 Bivariate Analysis of Factors Associated with Hypertension among the Study Group

4.4.1 Socio-demographic factors

Table 21: Prevalence of Hypertension and association with Gender

Variable	Freq. (n=405)	Hypertensive n (%)	Non-hypertensive n (%)	POR	95%CI	p-value
Gender						
Female	174	97(55.8)	77(44.3)	0.9	0.6 – 1.3	0.24
Male	231	137(59.3)	94(40.7)			
Age group						
Elderly	119	103(86.5)	16(13.4)	7.6	4.3– 13.5	0.0001*
Youths	286	131(45.8)	155(54.2)			

*****statistically significant

There is no statistical significance between the association of gender and with prehypertension among the respondents. There is a statistically significant association between age group and prehypertension among the respondents.

Table 22: Prevalence of Hypertension and association with marital status and educational level

Variable	Freq. (n=405)	Hypertensive n(%)	Non-hypertensive n(%)	POR	95%CI	p-value
Marital Status						
Married	260	168(64.6)	92(35.4)	2.1	1.4 – 3.3	0.0001*
Unmarried	145	66(45.5)	79(54.4)			
Educational level						
Post Secondary	89	41(46.1)	48(53.9)	0.5	0.3 – 0.9	0.006
Secondary and below	316	193(61.1)	123(39.0)			

*****statistically significant

The prevalence of hypertension is higher among married people (64.6%). There is a statistically significant association between marital status and prehypertension among the respondents. There is strong a statistically significant association between educational level and prehypertension in the study population.

Table 23: Presence of hypertension and association with income

Variable	Freq. (n=405)	Hypertensive n (%)	Non-hypertensive n (%)	POR	95%CI	p-value
Income						
High income	101	55(54.5)	46(45.5)	0.8	0.5 – 1.3	0.22
Low income	304	66(45.5)	125(41.1)			

There is no statistically significant association between the level of income and hypertension among the respondents.

4.4.2 Bivariate with family history of associated medical cooonditions

Table 24: Presence of hypertension in association with family history of hypertension and stroke

Variable	Freq. (n=405)	Hypertensive n (%)	Non-hypertensive n (%)	POR	95%CI	p-value
Hypertension						
Family history of hypertension	200	139(69.5)	61(30.5)	0.3	0.3 – 0.7	0.0001*
No family history of hypertension	205	95(46.3)	110(53.7)			
Stroke						
Family history of stroke	56	20(35.7)	48(53.9)	1.3	0.7 – 2.5	0.15
No family history of stroke	349	198(56.7)	151(43.3)			

*statistically significant

There is a strong statistically significant association between family history of hypertension and hypertension among respondents. There is no statistically significant association between family history of stroke and hypertension among the respondent.

Table 25: Family history of sudden death and heart failure and presence of hypertension

Variable	Freq. (n=405)	Hypertensive n (%)	Non-hypertensive n (%)	POR	95%CI	p-value
Sudden death						
Family history of sudden death	33	21(63.6)	12(36.4)	0.8	0.4 – 1.6	0.24
No family history of heart failure	372	213(57.7)	159(42.7)			

There is no statistically significant association between the family history of sudden death and hypertension. There is a strong statistically significant association between family history of heart failure and hypertension.

Table 26: Presence of Hypertension and association with family history of diabetics

Variable	Freq. (n=405)	Hypertensive n (%)	Non-hypertensive n (%)	POR	95%CI	p-value
Family history of DM						
Family history of DM	70	52(74.3)	18(25.7)	0.4	0.2 – 0.7	0.001*
No family history of DM	335	182(54.3)	153(45.7)			

*****statistically significant

There is a strong statistically significant association between DM and hypertension among the respondents.

4.4.3 Bivariate analysis of factors associated with hypertension

Table 27: Presence of hypertension in association with adequate exercise

Variable	Freq. (n=405)	Hypertensive n(%)	Non-hypertensive n(%)	POR	95%CI	p-value
Adequate exercise						
Positive	120	74(61.7)	46(38.3)	1.3	0.8 – 1.9	0.15
Negative	285	160(56.1)	125(43.9)			

There is no statistically significant association between adequate exercise and hypertension among respondents (P= 0.15)

Table 28: Cigarette smoking and presence of hypertension

Variable	Freq. (n=405)	Hypertensive n (%)	Non-hypertensive n (%)	POR	95%CI	p-value
Cigarette smoking						
Positive	17	11(64.7)	6(35.3)	0.7	0.3 – 2.0	0.29
Negative	388	223(57.5)	165(42.5)			

There is no statistically significant association between cigarette smoking and hypertension among respondents.

Table 29: Prevalence of hypertension in association with alcohol intake

Variable	Freq. (n=405)	Hypertensive n(%)	Non-hypertensive n(%)	POR	95%CI	p-value
Alcohol intake						
Positive	3	2(66.7)	1(33.3)	0.7	7.6	0.41
Negative	402	232(57.7)	170(42.3)			

There is no statistically significant association between alcohol intake and hypertension among respondents. (P = 0.41)

CHAPTER FIVE

DISCUSSION

The study included all the adults attending GOPD. Of the total 405 involved in this study, male was (57 %) slightly higher than the females were (43%), the model age group is 30-39 year (120).

The prevalence of prehypertension of prehypertension in the study was 28.9% and hypertension was 57.8% this is very close to the findings from studies carried out in some developed countries like a survey in America shows 31%,[9] in a cross-sectional study in Canada 30.6%.[10] This may be due to change in life style among the study population (from developing country) which is metropolitan in nature and very similar to those of the other studies in America and Canada .In other studies, the prevalence of prehypertension is seen to be higher than in this study, in Ghana 40% and in a retrospective study among patients presenting with diabetics in Maiduguri 36%,[12] where the study population is already diabetic with a confirmed predisposing and high risk factors to prehypertension and hypertension.

Socio demographic risk factors; Taking a dynamic perspective on these social determinants of health and viewing them in biological and epidemiological context emphasise that intervention as early in life as possible is necessary in order to prevent hypertensive diseases. In this study the SES analysed include were age, sex, educational level, residence and occupation.

Many reports and review articles describe prehypertension and hypertension as highly distributed and people are affected at younger ages much in men than women in both developing and developed countries.[9,10,11,12,13,17,18] Of the total non-hypertensive and pre-hypertensive, the Prehypertensive male and females were 80(34.6%) and 41(23.6%) respectively. There was an

evidence of significant relationship between sex and prehypertension with preponderance in the bi-vitiate analysis. The finding is consistent with findings reported in other studies[10,11,12] but disagree with some.[18]

This study shows that the prevalence of prehypertension is higher among youths (18- 45 years) than the elderly (>45 years) as in this study they are 37.1% and 12.6% respectively. Studies agreed with the fact that prehypertension increase with age and eventually evolve to hypertension in higher age group among the elderly (>45 years).[22,23,28]

The gap between urban and rural, richer and poorer countries, low and high density settlements is narrowing rapidly. This agree with the findings in this study were the disparity in the prevalence of hypertension and pre-hypertension does not show a significant variation due to type of settlement. Thus, the public health importance of prehypertension and hypertension is apparent in all communities.[5] Though the urban to rural gradient in prehypertension and hypertension is wider in some countries than others.

Higher level of education is associated with greater awareness regarding health and diseases. Other reports and studies[35,43] that education significantly reduce the prevalence of illness. Some studies found that education is inversely associated with hypertension and prehypertension similar to study conducted on Punjabi females were literates were more hypertensive than illiterates.[38] This study also shows that hypertensive cases decrease with the level of education from (67% - 46.1%). While the bivariate analysis indicated that those who attended post secondary school 46.1% and those with secondary school education and below have a prevalence of 61.1% respectively with an OR of 0.5.

Pre-hypertension and HTN are highly driven by reported risk factors. During the initial population based survey, the distribution of these factors were (95%), current khat chew and alcohol use was the highest and lowest (38.6% and 7.1%), in rural men (67.3%) and rural women (2.0%), definitely.[48,49,50] However, in this study population alcohol use is lowest among normotensive, with Prehypertensive and hypertensive groups (33.3% and 66.7%), yet 5.3% within hypertensive individuals even though alcohol use is not popular in the community because they are predominantly Muslims just 3 (0.7%) take alcohol among the study population.

The use or misuse of addictive substances, such as cigarettes, is also not very prevalent in the study population. In the current study 11(64.7%), 5(29.4%) and 1 (5.9%) were current smoking as compared hypertensive, Prehypertensive and normotensive. In addition, current smoking ranks high as behavioral risk factors between Prehypertensive/ hypertensive. So far no significance in relationship was found between hypertension, prehypertension and cigarette use in this study.

The relationship between prehypertension, HTN and alcohol drink is unclear, but many reports and studies[49,50] suggested among drinkers; not binge drinkers there appears to be J/or U shaped relation, while heavy use was associated with HTN. In this study the sample size is too small and therefore there is no statistical association between alcohol intake and prehypertension which was shown to be 1(33.3%). Moreover, among young women who use light to moderate alcohol reduce the risk of developing hypertensive CDs and show J relationship.[50]

Participate at work, recreational or leisure's reduced the burden of hypertensive CDs, particularly among young men and above middle aged. In the current study 120(29.6%) and 285(70.4%)

were physically active and inactive, compared prehypertensive to normotensive, 33(27.5%) and 88(31%) with an OR of 1.2. However, it was found to be not statistically significant.

In this study, some of the variables of family medical history have statistically significant association with prehypertension. Those with the family histories of medical conditions have lower prevalence of prehypertension than those without family history of the medical condition such as hypertension (19% and 40.5%), sudden death (14.3% and 32.4%), heart failure (9.7% and 31.6%) and diabetics (12.9% and 33.4%) respectively. This could be because most of those with the family history of the medical conditions have already developed full-blown hypertension, as it is evident in this study. The prevalence of hypertension among the respondents with and without family history of hypertension (69.5% and 46.3%), sudden death (63.6% and 57.7%), heart failure (83.9% and 61.1%), diabetics (74.3% and 54.3%) respectively. Pre-hypetension with or without a family history of hypertension, diabetes, history of stroke, family history of sudden death or cardiovascular diseases. Patients with a family history of hypertension, diabetes or cardiovascular diseases are at a similar risk of developing pre-hypertension as patients without a family history. This agrees with findings from other studies.[1,2,12,13,18,20,24,25]

The coexistence of pre-hypertension with the above-mentioned risk factors is a phenomenon of clinical importance requiring prompt medical attention. This study emphasizes the need for medical practitioners to update their clinical practice skills in order to identify high-risk cases by closely examining for the presence of pre-hypertension along with other risk factors. Moreover, a high prevalence of pre-hypertension is a profound finding and has important implications for the prevention strategies of chronic diseases, which may facilitate the modification of current practice and help towards building a cost-effective primary healthcare service. A number of

limitations confounded this study, however. Namely, the study design being cross sectional made it difficult to assess the risk factors and the study is hospital based, recruiting only those who present to the GOPD. Due to cultural influence and education, getting the correct age of respondents always prove to be difficult we had to resolve to use age range.

CHAPTER SIX

CONCLUSION AND RECOMMENDATIONS

6.1 Conclusion

In conclusion, the prevalence of prehypertension as well as hypertension in the study population is high. These findings are crucial for evidence-based decision-making. Some of the associated risk factors to prehypertension and hypertension are found to include gender, which increases with age, marital status with prevalence higher among married people. Other risk factors from the past family medical history include, sudden death, stroke and diabetics. The associated co-morbidities are obesity and diabetics. But there was no association between and total level of physical activity, cigarette smoking with prehypertension and hypertension. In addition, to the assessed, involving other biophysical and chemical risk factors will be helped in understand significance difference with the risk.

6.2 Recommendations

The findings confirm the growing public health challenge of HTN and associated factors as a public health problem in the survey population in particular. It will help policy makers for planning of preventive and control measures of these modifiable risk factors. This study also give baseline information that will enable researchers to conduct an extended inclusion of biological and biochemical risk factors and follow-up studies. Based on the findings of the study the following proposals are forwarded (for all stake holders' including State, Federal Health Ministry):

1. Base line screening should be made mandatory on patients visiting GOPD especially those above the age of 40 years

2. The health facilities must make provision in providing health talk to patients before commencement of clinics,
3. Educating the people on the consequence and associated factors could be done in form of campaigns at work
4. Physical activity / exercises should be encouraged at places of work as its seen that hypertension is higher among those with higher education i.e. those with white collar jobs.
5. The non-high risk population has higher prevalence of prehypertension meaning that they are on the verge of becoming hypertensive and therefore require more knowledge and information on the need for healthy life style hence the need to use the media in enlightenment as well as the social media for prevention.
6. More community-based studies of this nature are required to determine the extent of this problem and the risk factors for HTN in the communities.

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APPENDICES

APPENDIX A

CONSENT FORM

I, Dr Shehu Bala Abba, am conducting a study on the pattern and determinants of pre-hypertension among adult Patients attending GOPC, Specialist Hospital as part of the requirement of my training in the faculty of community medicine ABU Zaria. You are being requested to voluntarily participate in this study because of its importance for early detection and intervention of the prehypertension.

If you agree to participate, you will be asked some questions about yourself, and your family. You will be examined and blood and urine samples shall be taken from you for investigation. There is no risk in participating in this study and the result will be made known to you. All information shall be treated with utmost confidentiality.

If any problem is detected, you will be appropriately treated or referred with your consent. Your refusal to participate will not affect your care by me or any other member of the hospital.

Do you have any questions?

I agree to participate in this study.

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

Signature/thumb Print of participant Signature/thumb Print of witness

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

Name of participant Name of witness

Date ---------- Date ----------

I confirm that I have explained to the participant the purpose and nature of this study.

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

Signature Name Date

(Attached is the Hausa language translation of the consent form)

SASHI NA A: TAKARDAR NEMAN AMINCEWA

Ni Dr Shehu Bala Abba ina gudanar da bincike akan yanayi da musabbabin kamu wa dacutar hawan jini a lokacin marasa lafiyar da ke ziyartar bangaren sha ka tafi na asibitin Kwararru na Bauchi.

Ana bukataa don raayin kanka,ka amince da shiga a dama da kai cikin wannan shiri sabo da mahimmancinsa na ganowa da magance musabbabin cutar hawan jini.

Idan ka amince da shiga a dama kai cikin wannan bincike, a kwai tambayoyi da zaayi maka game da kanka da kuma lalurar ka .

Babu wani hadari idan ka shiga cikin wannan bincike , kuma sakamakon da bincicen ya haifar zaa yi maka cikakken bayani game das hi. Dukan wani bayani zai kasance cikin sirri, ba tare da bayyana wa ba.

Idan bincike na a kan ka ya gano kana da wata matsala to, za a yi maka maganin ta ta hanyar baka magani ko kuma tura ka wajen kwararru bisa amince war ka.

Rashin amincewar ka da shinga cikin wannan shiri, ko kusa bazai shafi irin kulawar da ya kamata ka samu daga wajena ko wani maa kacin asibitin ba.

Ko kana da wata tambaya?

Na amince a dama dani cikin wannan shiri.

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

SA HANNU/DANGWALA DAN YATSA- SA HANNU/DANGWALA DAN YATSA-SHAIDA

WANDA YA AMINCE A DAM DASHI

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

SUNAN WANDA YA AMINCE DA SHIGA CIKIN WANNAN SHIRI SUNAN SHAIDA

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

RANA RANA

TABBAS NA YIWA MAI SHIGA CIKIN WANNAN NAZARI CIKAKKEN BAYANI GAME DA DALILAI DA KUMA YANAYIN WANNAN SHIRI

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

SA HANNU SUNA RAN

APPENDIX B

QUESTIONAIRE

A study on the determinants of prehypertension at the General Outpatient clinic, General Hospital Bauchi.

Date ---------- Study number ----------

This questionnaire is part of a study on prehypertension. You have been chosen to voluntarily participate in the study. Kindly answer the questions and all information shall be confidential. Thank You.

A. BIODATA

1. Name (initials) ----------

2. Age (in years):

1. 18-29. □. 2. 30-39 □. 3. 40-49 □. 4. 50-59 □. 5. 60-69 □. 6. >70 □.

3. Sex 1. Male □ 2. Female □

4. Residence ----------

5. Marital Status 1. Single □ 2. Married □ 3. Divorced □ 4. Widowed □

6. Religion 1. Islam □ 2. Christianity □ 3. Traditional □ 4. Any other □

7. Tribe 1.Hausa□ 2 Fulani □ 3. Yoruba □ 4. Igbo □ 5. (Others specify) □

8. Educational Level: 1. None □ 2. Quaranic □ 3. Primary □ 4. Secondary □ 5.Tertiary □

9. Occupation: 1. Civil Servant □ 2. Trader □ 3.Self Employed □ 4. Artisan □

5. Housewife□ Unemployed□.

10. Household Income per month:

1. <5, ooo □. 2. 5,ooo- 20,000 □. 3. >20,000-50,000 □. 4. >50,000- 100,000 □. 5. > 100,000

B. FAMILY HISTORY

11. Hypertension 1. Yes □ 2. No □ 3 Don't know □

12. Diabetes mellitus 1. Yes □ 2. No □ 3 Don't know □

13. Stroke 1. Yes □ 2. No □ 3 Don't know □

14. Sudden Cardiac Death 1. Yes □ 2. No □ 3 Don't know □

15 Heart failure 1. Yes □ 2. No □ 3 Don't know

C. ASSOCIATED CARDIOVASCULAR RISK FACTORS

16. Smoking 1. Yes □ Sticks per day ----------/Duration---------- 2. No □

17. Alcohol Consumption 1. Yes □ (Quantity per day ----------) 2. No □

18. History of Diabetes 1. Yes □ 2. No □

19. If yes, state duration 1. < 1 year □ 2. 1 to 5years □ 3. 6 to 10 years □ 4. > 10 years □

20. If yes to (19) are you on treatment? 1. Yes □ 2. No □

21. Do you do any exercise? 1. Yes □ 2. No □

22. If yes, which exercise?

1. Walking □ 2. Jogging □ 3. Racket ball □ 4. Football □ 5. Swimming □ 6. Others □

23. Frequency of exercise;

1. Daily □ 2. > 3times a week □ 3. 3 times a week □ 4. < 3 times a week □

24. Duration of exercise; 1. < 30 minutes □ 2. 30 minutes □ 3. > 30 minutes □

D. PHYSICAL EXAMINATION

25. HEIGHT (Meters)

26. WEIGHT (Kilograms)

27. BODY MASS INDEX (BMI) Kg/m^2

28. PULSE RATE (beats/minute)

29. AVERAGED BLOOD PRESSURE (mmHg)

E. LABORATORY PARAMETERS

30. FASTING PLASMA GLUCOSE (mmol/l)

31. TOTAL CHOLESTEROL (mmol/l)

32. HIGH DENSITY LIPOPROTEIN (HDL) CHOLESTEROL (mmol/l)

33. LOW DENSITY LIPOPROTEIN (LDL) CHOLESTEROL (mmol/l)

34. TRIGLYCERIDES (mmol/l)

35. PROTEINURIA 1. Positive □ 2. Negative □

APPENDIX C

SECRET

GOVERNMENT OF BAUCHI STATE

MINISTRY OF HEALTH

HEADQUARTERS BAUCHI

BELLO KIRFI ROAD, OFF MURTALA MUHAMMED WAY
P.M.B. 065, BAUCHI. E-MAIL.: bauchismoh@gmail.com

Reference.....MOH/GEN/S/1409/I..... *Date*.....9th March 2015.....

PROTOCOL APPROVAL N0: NREC/12/05/2015/03

Dr Shehu Bala Abba,
Nigeria Field Epidemiology & Lab. Training Programme,
Resident,
MoH,
Bauchi.

ETHICAL CLEARANCE FOR SUBMITTED PROTOCOL:

"The Pattern and Determinants of Pre-hypertension among Adults attending GOPD in SHB"

The Bauchi State Health Research Ethics Committee (HREC) under the State Ministry of Health has received the above named protocol from you for ethical clearance and approval in line with the guidelines set by the Committee. The protocol was reviewed and the committee noted that that the research falls under the Expedited Category which does not entails clinical trials or any invasive procedures.

2. Consequently, the Committee has granted approval for the research to be conducted. However, you should share with us your workplan clearly indicating the start date, where and when to visit the research site(s) and also **the final results of your findings.**

3. The Committee requires you to comply with all Institutional Guidelines, Rules and Regulations and with the tenets of the National Health Research Ethics Committee Code including that all adverse events are reported promptly to the Committee. **No changes are permitted in the research without prior approval by the Committee** except in circumstances outlined in the Code. The Committee reserves the right to conduct compliance visit to your research site without prior notice.

4. Thank you.

(Usman U. Muhammad)
For: Hon. Commissioner.