DISTRIBUTION AND ASSOCIATED RISK FACTORS OF DYSLIPIDEMIA AMONG HYPERTENSIVE PATIENTS IN JIMMA UNIVERSITY SPECIALIZED HOSPITAL

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Jimma, Ethiopia

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ABSTRACT

Background: Dyslipidemia and hypertension are established risk factors of prime importance in Cardio Vascular Disease. Both hypertension and dyslipidemia are the most important modifiable risk factor for coronary heart disease, stroke, congestive heart failure, end-stage renal disease (ESRD), and peripheral vascular disease.According to world Health Organization estimates, about 60% of deaths in the world are now caused by non-communicable diseases and out of these deaths more than eighty percent is from developing countries.

Objective: To determine the prevalence, distribution and associated risk factors of dyslipidemia among hypertensive patients at hypertensive follow up clinic of Jimma University Specialized Hospital, Jimma, in southwest Ethiopia, from March to August, 2014.

Method and Materials: Hospital-based cross sectional study design was conducted for this study and a total of 282 hypertensive patients were selected using simple random sampling method among hypertensive patients who have had follow up at Jimma University Specialized Hospital. The data was analyzed using SPSS version 20.0 computer software. Data was presented with tables and figures. Association between dependent and independent variables had done and statistical significance of the results was tested using Chi- square test with ninety-five percent confidence interval (CI) and with P- value of ≤ 5% (≤ 0.05) for statistically significance and multivariate logistic regression with P- value of ≤ 5% (≤ 0.05) and adjusted odds ratio (AOR) was conducted to identify factors independently was associated with the dependent outcome of the study.

Results: Two hundred and eight two hypertensive patients were participated in the study. The prevalence of dyslipidemia among hypertensive patients was 27.7%. Age, central obesity smoking, diabetes mellitus, smoking and divorce were predictors of dyslipidemia among hypertension patients while sex, occupation, residence and religion were not associated with dyslipidemia. Being married were decrease the risk of dyslipidemia by 87%as compared to divorce in hypertensive patients (OR =0.13, 95% CI: 0.04-0.37). Central obesity was increased the risk of dyslipidemia by 7 fold as compared to those who did not have central obesity (AOR=7.90, 95% CI: 2.68-23.32 WITH P-value <0.001). Divorce was increased the risk of dyslipidemia by 6 folds as compared to those who were married (AOR=6.78, 95% CI: 1.91-24.07 with p-value 0.003). Alcohol users were less likely to be dyslipidemic. (OR =4.42, 95% CI: .86-22.86 and p-value 0.0760)

Conclusion and Recommendation: Central obesity, co morbidity, smoking and divorce were common as well as strongly associated with dyslipidemia among hypertensive patients in Jimma University Specialized Hospital. On the other hand underweight was also associated with dyslipidemia among hypertensive patients. Among the lipid abnormality pattern hypercholesterolemia was the most common one. We recommend screening and management of these risk factors.

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LIST OF ACRONYMS

BP - Blood pressure

CAD - Coronary artery disease

CHD - Coronary Heart Disease

CHF - Congestive heart failure

CI - Confidence interval

CKD - Chronic kidney disease

Cm - Centimeter

CVD - Cardiovascular disease

DH - Dyslipidemic hypertension

DL - Deciliter

ESRD - End stage renal disease

FBG - Fasting blood glucose

HDL-C - High density lipoprotein-cholesterol

IHD - Ischemic heart disease

IQR - Interquartile range

Kg - Kilogram

LDL-C - Low-density lipoprotein cholesterol

LVH - Left ventricular hypertrophy

M^2 - Meter squared

Mg - **Milligram**

Min - Minute

Ml - Milliliter

NHANES- National health and nutritional examination survey

OR - Odds ratio

PAD - Peripheral arterial disease

RFT - Renal function test

RAAS - Renin-angiotensin aldosterone system

TC - Total cholesterol

WHO - World Health Organization

CHAPTER ONE: INTRODUCTION

1.1. Background

Hypertension currently is defined as a blood pressure (BP) of 140/90 mm Hg or higher or patient's on anti-hypertensive medications. Hypertension affects around 1 billion people worldwide and 70 million Americans'. It is one of the leading causes of the global burden of disease. Approximately 7.6 million deaths (13–15% of the total) and 92 million disability-adjusted life years worldwide were attributable to high BP in 2001.[1, 2] In the United States, based on results of the National Health and Nutrition Examination Survey (NHANES), approximately 30% (age-adjusted prevalence) of adults, or at least 65 million individuals, have hypertension. Hypertension prevalence is 33.5% in non-Hispanic blacks, 28.9% in non-Hispanic whites, and 20.7% in Mexican Americans. The likelihood of hypertension increases with age, and among individuals' age ≥60 years, the prevalence is 65.4%. Because of escalating obesity and population aging, the global burden of hypertension is rising and projected to affect 1.5 billion persons one third of the world's population by the year 2025.[1,2] Currently, high BP causes about 54% of stroke and 47% of ischemic heart disease (IHD) worldwide. Half of this disease burden is in people with hypertension; the other half is in people with lesser degrees of high BP (prehypertension).In African Americans, hypertension appears earlier, is generally more severe, and results in higher rates of morbidity and mortality from stroke, left ventricular hypertrophy (LVH), congestive heart failure (CHF), and end stage renal diseases (ESRD) than in white Americans.[1, 2] World Health Organization (WHO) 2009, report shows metabolic syndrome and its individual components are prevalent among an apparently healthy working population in Ethiopia. These findings indicate the need for evidence-based health promotion and disease prevention programs; and more robust efforts directed towards the screening, diagnosis and management of metabolic syndrome and its components among Ethiopian adults. According to WHO by 2020, mortality by Cardiovascular Diseases (CVD) is expected to increase by 120% for women and 137% for men. In countries such as Nigeria, Ghana and South Africa, the prevalence of chronic diseases is increasing, while the threat of communicable and poverty-related diseases (malaria, infant mortality, cholera, malnutrition) still exists, the same is true in Ethiopia. Dyslipidemia is defined as abnormality in one of lipid profile such as:- low density lipoprotein-cholesterol (LDL-C), high density lipoprotein-cholesterol (HDL-C), total cholesterol (TC) and triglyceride levels, according to NCEP- ATP III. Dyslipidemia, by itself, is one the main risk factor for non- communicable diseases. Dyslipidemia is also main component of metabolic syndrome.

1.2. Statement of the Problem

Dyslipidemia and hypertension are established risk factors of prime importance in CVD.[1 - 3] According to world health organization (WHO) estimates, about 60% of deaths in the world are now caused by non-communicable diseases and out of these deaths more than eighty percent is from low- and middle- income countries, Ethiopia is one of these countries. In 2005, an estimated 17.5 million people died of CVD representing 30% of all global deaths of which 80% were from low- and middle-income countries.[3] These findings highlight the need to explore the nature and magnitude of risk factors of CVD and other non-communicable diseases in developing countries like Ethiopia. The common risk factors of dyslipidemia include diabetes mellitus, hypertension, obesity, sedentary life, metabolic syndrome, smoking and chronic kidney disease (CKD).[2] As dyslipidemia risk factors increases, the patient quality of life decreases, increase frequencies of admissions to the Hospital, expense of money for health problem is very high even in the developed countries, and increased complication of comorbid conditions like CVD from which mortality is very high across the world.[1, 2] Various epidemiological studies have shown the prevalence of the co-existence of hypertension and dyslipidemia, in the range of 15 to 31%.[7, 8] The co-existence of the two risk factors has more than an additive adverse impact on the vascular endothelium, which results in enhanced atherosclerosis, leading to CVD.[9] Blood pressure has a continuous and consistent relationship with the risk of cardiovascular events; the higher the BP, the higher the chance of CVD. The presence of each additional risk factor multiplies the risk for hypertension and risk of CVD. There is limited data demonstrating the effect of elevated BP on lipid profile abnormality. There is no literature done on the prevalence, the distribution and associated common risk factors of dyslipidemia among hypertensive patients in Ethiopia. The objective of current research is to determine the prevalence, the distribution and associated risk factors of dyslipidemia in hypertensive patients at hypertensive follow up clinic of JUSH, in southwest Ethiopia. The reduction in dyslipidemia can lower the BP as well as reduces the risk of CVD, so that knowing the prevalence and common risk factors pattern of dyslipidemia in our set can help us in a lot ways. Out of these the main is it increase the quality of service provided for the patients as a result,we can salvage the life of patients and improve quality of life of patients. It also helps us in the management and prevention of both hypertension and dyslipidemia as well as their complications at early stage. It can alert the health provider to think twice while they are treating non-communicable diseases as they can occur in cluster and accelerate the impact of problem in term of finance, morbidity, and mortality.IT also give us the opportunity to compare the prevalence and

distributions of common risk factors of dyslipidemia among hypertensive patients in Ethiopia with other countries of the world. Finally this study can also serve as the baseline for other researchers.

CHAPTER TWO: LITERATURE REVIEW

The Framingham Heart Study data on the hypertensive population reported that more than 80% had at least one additional CVD risk factor and predominantly these risk factors were atherogenic in nature. Studies have consistently indicated that hypertension and hypercholesterolemia frequently coexist, causing what is known as dyslipidemic hypertension (DH).[3] The risk of CVD associated with concomitant hypertension and dyslipidemia is more multiplicative than the sum of the individual risk factors.[4] Hypertension, often combined with obesity and dyslipidemia, is one of the four most important predictors of CVD, as well as stroke, being present in more than 70% of all cases [5]. Epidemiological data indicates that the prevalence of hypertension varies greatly between different countries [6] and diverse ethnic populations [7].The previous prevalence estimates for the existence of DH range from 15 to 31% in the United States.[5] The elderly population in the United State had 31% existence of DH. In another study, the overall prevalence of DH, hypertension alone, and hypercholesterolemia alone was 30, 47, and 18%, respectively.[5-7] The incidence of DH was 20% in women versus 16% in men ($P < 0.05$).[18] The incidence was variable in different age groups with only 1.9% in the 20 – 39 year age group versus an increasing trend of 56% in the aged, > 80 years ($P <$,0.001). DH prevalence showed racial variation, with the least in Hispanics (9.8%) and highest in African–Americans (22%) ($P < 0.01$). The prevalence increased with addition of risk factors; highest in those with CVD plus DM or metabolic syndrome (69%).[8]. Dyslipidemia, one of the strong predictors of CVD, causes endothelial damage and loss of physiological vasomotor activity.[19-21] The damage may manifest as elevated systemic BP. Cross-sectional studies have suggested a link between abnormal lipids and hypertension.[5-8] Few prospective studies have demonstrated the relationship between plasma lipids and the future development of hypertension, finding that there is an association between plasma lipids and development of hypertension. The presence of each additional risk factor multiplies the risk for hypertension.[3-5]. Hypertension, a major component of DH, damages the endothelium through altered shear stress and oxidative stress, resulting in increased endothelial cell synthesis of collagen and fibronectin, reduced nitric oxide-dependent vascular relaxation, and increased permeability to DH.[7,8] Hypertension is also associated with an up regulation of lipid oxidation enzymes. LDL, especially oxidized LDL, is a major cause of endothelial dysfunction. Hence, DH contributes to atherosclerosis and the resultant vascular risk, through its effects on the level of the endothelium. However, there is limited data demonstrating the effect of elevated BP on lipid levels. Blood pressure lowering drugs have a certain impact on the lipid levels. These changes in lipid levels are important in hypertensives, as up to 40% of the newly diagnosed hypertensives have at least one lipid abnormality.[9]

Small trials have looked at the effect of lipid lowering on BP, finding that intensive lowering of hypercholesterolemia leads to decreases in BP.[31, 32, 33] The use of statins in combination with antihypertensive drugs may improve BP control in patients, with uncontrolled hypertension and high serum cholesterol levels.[9] The pathophysiological basis for the apparent beneficial effect of statin therapy on BP may be that statins have positive effects on endothelial or vascular smooth muscle cell functions or both. Hypercholesterolemia can also influence BP by potentiating the effects on the endothelium of the vasoconstrictors endothelin-1 and Angiotensin II.[10] Thus, a reduction in nitric oxide production, coupled with a heightened vasoconstrictor response, will tend to increase BP in patients with dyslipidemia. Insulin resistance coexists in up to 50% of the hypertensive and dyslipidemic individuals. Non-familial forms of DH are more common than the familial ones.[3, 9, 10] The renin-angiotensin aldosterone system (RAAS) promotes atherogenesis. Angiotensin II, a major villain of the RAAS pathway, promotes atherogenesis through stimulation of the angiotensin type 1 receptor (AT1), which increases lipid uptake in cells, vasoconstriction, and free radical production, to foster both hypertension and atherosclerosis.[11].Higher levels of plasma TC, non-HDL-C, and the TC/HDL-C ratio are independently associated with a subsequent increased risk of incident hypertension in apparently healthy men and that higher levels of HDL-C are associated with a decreased risk of incident hypertension. Elevated lipid levels appear to predate the onset of hypertension by years. The relationship between lipids and hypertension is preserved even after adjustment for multiple confounders and after the exclusion of men with diabetes and obesity. [11] .Micro albuminuria has been identified in hypertensive patients as a marker of glomerular dysfunction and a predictor of CAD.[12] Microalbuminuria has also been associated with lipid abnormalities, including high levels of LDL-C and triglycerides, low levels of HDL-C, and elevated levels of lipoprotein (a).[38] This area will merit further attention, because it suggests a possible role for circulating lipoproteins in the small vessel organ damage associated with hypertension.[10-12].Obesity and weight gain are strong, independent risk factors for hypertension.[10] It has been estimated that 60% of hypertensive patients are >20% overweight.[36] Among populations, hypertension prevalence is related to dietary salt intake, and the age-related increase in BP may be augmented by a high salt intake. Low dietary intakes of calcium and potassium also may contribute to the risk of hypertension. The urine sodium-to-potassium ratio is a stronger correlate of BP than is either sodium or potassium alone. Alcohol consumption, psychosocial stress, and low levels of physical activity also may contribute to hypertension.[1, 11].Dyslipidemia and hypertension are complex multifactorial and polygenic disorders that are thought to result from an interaction between an individual's genetic background and various environmental factors.[40] A number

of studies such as genetic linkage analyses and/or genome-wide association studies have been performed to elucidate the contribution of genetic factors to both conditions.[3, 5,9] These genetic observations indicate that multiple genetic factors exist that may affect both the BP and serum lipid levels. Some genes involved in lipid metabolism may be involved in the genetic component of the development of hypertension.High prevalence of hypertension and hypercholesterolemia (46.7% and 58.7% respectively) detected in the rural population is of considerable epidemiological significance.[42]. Abnormalities in serum lipid and lipoprotein levels (dyslipidemia) are recognized as major modifiable CVD risk factors and have been identified as independent risk factors for essential hypertension giving rise to the term dyslipidemic hypertension [5, 9].Dyslipidemia is more common in untreated hypertensives than normotensives, and lipid levels increase as BP increases [9]. Though no specific pattern of dyslipidemia has been consistently reported among hypertensive individuals, many studies have shown that TC, triglycerides (TG), and virtually all fractions of lipoproteins tend to be more frequently abnormal among hypertensive patients than in the general population. In general, black Africans have been reported to have lower serum total cholesterol and higher HDL-C) than whites and other blacks in industrialized countries; however, as in Westernized countries, age, sex, socioeconomic status, and diet also significantly affect lipid levels in healthy Africans [8, 9, 11].In Nigeria although the incidence of CAD and atherosclerosis is still low, it is rising as atherosclerotic lesions of the aorta, coronary, and cerebral arteries are being reported [9, 11]. Hypertension is a powerful risk factor for CVD and it remains one of the biggest health and economic issues facing the world [48] and in Nigeria the prevalence of hypertension is known to have varied from 11% to 45% [13].Hypertension is known to be associated with alterations in lipid metabolism which gives rise to abnormalities in serum lipid and lipoprotein levels. It has also been documented that presence of hyperlipidemia substantially worsens the prognosis in hypertensive patients [13, 14].

CHAPTER THREE: OBJECTIVES

3.1. General Objective

- To determine the prevalence, distribution and associated risk factors of dyslipidemia in hypertensive patients at hypertensive follow-up clinic of JUSH, in southwest Ethiopia

3.2. Specific Objectives

- To describe socio-demographic characteristics of dyslipidemic patients among hypertensive patients
- To determine prevalence of dyslipidemia among hypertensive patients
- To describe the distribution of common risk factors of dyslipidemia among hypertensive patients
- To determine the correlation between lipid profiles and Body Mass Index (BMI)

CHAPTER FOUR: METHODS AND MATERIALS

4.1. *Study Area and Period*

The study was conducted from March to August, 2014 at hypertensive follow up clinic of Jimma University Specialized Hospital (JUSH) which is the only teaching and referral Hospital, in southwest Ethiopia. Jimma University Specialized Hospital has 503 beds and providing different specialized medical services for people living in southwest of the country. The general Internal Medicine department consists of five wards with 88 beds, three out patients department (OPD), and three chronic illnesses follow up.

4.2. *Study Design*

Hospital-based cross sectional study design was conducted.

4.3. *Population*

4.3.1. ***Source Population***

Adult hypertensive patients who had follow up at hypertensive clinic of JUSH from March to August, 2014.

4.3.2. ***Study Population***

Adult hypertensive patients were selected by simple random random technique every 3rdPatients from all adult hypertensive patients that had follow up at hypertensive clinic of JUSH from March to August, 2014.

4 . 4 . Inclusion and Exclusion Criteria

Inclusion Criteria

- All adult patients whose age is greater than or equal to 18 years old, and had hypertension and follow up at hypertensive clinic of JUSH

Exclusion Criteria

- All patients whose age is less than 18 years
- Patients with pregnancy related hypertension disorders like Eclampsia, gestational hypertension and/or preeclampsia
- Hypertensive patients on lipid lowering agents previously at any time
- HIV positive patients and/or on ante-retroviral treatment
- Patients who could not fast or cannot return to the clinic for blood examination next day
- Patients who refuse to participate to the study
- Psychiatric patients

4.5. Sample Size Determination

The required sample was determined using sample size formula for estimation of a single proportion. Based on this calculated as follow:-

$$n = Z^2 .P(1 - P) / d^2 = 322 \text{ patients}$$

Where:- Z= is the standard normal value for 95% confidence interval (1.96)

P= is the probability of hypertensive patients become dyslipidemia range from 0.1 to 0.3 I took the maximum prevalence probability as 0.3

d= is desired precision (the margin of error tolerable =(0.05).

Ten percent of the calculated sample was considered for non-response and the total sample adjusted to 374 patients. Simple random simple random sampling technique was considered to select patient's that participated in the study among those who had follow up at hypertensive c

4.6. **Study Variables**

4.6.1 ***Dependent Variables*****:**

- Dyslipidemia

4.6.2 ***Independent Variables*****:**

- Age
- Sex
- Residence
- Occupation
- Duration of illness
- Cigarette smoking
- Chat chewing
- Shisha
- Alcohol intake
- weight
- Height
- Abdominal circumference
- Marital status
- Educational status
- Religion
- Average monthly income

4.7.Data Collection Instrument and Measurements

Questionnaire had four parts. The first section was concerning about socio-demographic characteristics like age, sex, ethnicity, working status and income. The second section was about habits including cigarette smoking, alcohol consumption, and coffee drinking. The third part was focused on clinical data including age at diagnosis of hypertension, (duration of hypertension after diagnosis), history of diabetes mellitus and its treatment and other risk factors of hypertension. The final part was about measurements like: weight, BMI, waist circumference, BP and laboratory like serum fasting lipid profile, and renal function test (RFT), urinalysis, fasting blood glucose (FBG) and abdominal ultrasound. Weight was measured in kilograms (kg) using the WHO weighing scale (Health-O-Meter, USA) at a precision of 0.1kg with the study patients minimally dressed. Height was measured in centimeter (cm) in erect position at a precision of 0.1cm with shoes removed. Waist circumference was measured in cm at the midpoint of the line between the lowest border of the thoracic cage and anterior superior iliac spine. Anthropometric measurements including weight and height will be measured by trained staff. Body mass index (BMI) was obtained by dividing the weight in kilograms by the square of the height in meters. Blood pressure was measured using standardized mercury sphygmomanometers with a cuff inflation and deflation rate of 2mmHg. A trained nurse have performed the procedures while the subject was in a sitting position on the chair with feet on the floor and the arm at the level of the heart and after 5 minutes rest. One BP readings was taken at each arm from each patient at 5 minutes without wearing white coat and the average reading of both was used in this study. For laboratory measurements, blood have taken at the clinic after an overnight fasting of 10–14 hours. The patients attending the clinic advised to come after an overnight fasting for the determination of serum lipid profiles. For those patients whose residence was in Jimma have come on the next day foe those who has afforded to come but, for those lived outside Jimma town blood sample have taken on the next appointment and the patient have advised to come with fasting overnight. Serum total cholesterol, HDL-C and triglyceride have determined using the hem analyzer machine (Human, USA) and appropriate reagents. Low density lipoprotein-cholesterol (LDL-C) was calculated using the Freidwald formula.

4.8. Data Collection Methods

4.8.1. Data Collectors and Supervisor

The interview, chart review and physical measurement have carried out by trained medical interns. Laboratory samples was collected by an experienced nurse working at the hypertensive clinic. Laboratory analyses was carried out by a trained laboratory technician. A first year medical resident has supervised the daily activity, consistency and completeness of the checklist and has given appropriate support during the data collection process. The Principal investigator had given training for data collectors on how to fill the prepared checklist, the importance of data quality and the relevance of the study. The Principal Investigator had checked the daily activities of data collectors and supervisor.

4.8.2. Data Collection Techniques

The data collection had through well-structured developed questionnaire after reading different literature done on hypertension and dyslipidemia. Questionnaire had four parts. The first section contained socio-demographic characteristics like age, sex, occupation, income and so on. The second section was about habits including cigarette smoking, alcohol consumption, and coffee drinking. The third part had focused on clinical data including age at diagnosis of hypertension, history of diabetes mellitus and its treatment and other risk factors of hypertension. The final part was about measurements like: weight, height, BMI, waist circumference, BP and serum lipid profile.

4.9. Data Processing, Analysis, Interpretation and Presentation

After data is collected, it was coded, entered and cleaned using computer software SPSS windows version 20 to be analyzed by using descriptive statistics like Percentages, mean, and frequency was used for elementary data analysis. Data had presented by frequency tables and figures. Association between dependent and independent variables was done and statistical significance had tested by using chi square test and odds ratio (OR) with confidence interval (CI) of 95 % and P value of < 0.05 as statistically significant. Multivariate logistic regression with p-value <=5% will be conducted to identify factor for the different outcomes of the patients.

4.10. Data Quality Management

Before data collection: The prepared checklists in English were assessed. During data collection. data was collected by the same data collectors throughout the data collection. Regular daily supervision had done for checking the consistency and completeness of the filled out checklists by the principal investigator. The completed checklists had checked for their completeness and consistency at every step of data collection. After data collection, before starting data analysis completeness was rechecked again.

4.11. Ethical Consideration

Ethical approval for the study was granted from the ethical review committee of Jimma University. The Hospital medical director has permitted us to conduct the study. The data had been collected by interviewing the patient using structured checklists. The patients had asked for their willing and interest to participate in the study. They were also informed that it was their right to discontinue the study at any time if they don't like to continue. The privacy of patient and confidentiality has secured. Before interview the patient informed about the advantage of the study and there was written informed consent.

4.12. Dissemination of Results

The result of the study will be disseminated to Jimma University College of public health and medical science, and to department of Internal Medicine. The result of the study will be disseminated to the study site and other concerned bodies. Further attempt will be made to publish it on national and international scientific journals.

4.13 Operational Definitions

Hypertension: is defined as the systolic blood pressure greater than or equal to 140 mmHg, or diastolic BP greater than or equal to 90 mmHg, or patient on anti-hypertensive medications.[2]

Dyslipidemia: in broader sense is defined as abnormality in LDL-C (≥ 130 mg/dl), HDL-C < 40 mg/dl for male &< 50 mg/dl for female, total cholesterol > 200 mg/dl, & triglyceride ≥ 150 mg/dl according to NCEP – ATP III.

Body mass index (BMI): will be categorized as underweight < 18.5 kg/m^2, normal between 18.5-24.9 kg/m^2, overweight between 25 - 29.9 kg/m^2, and obesity when ≥30 kg/m^2 [2]

Central Obesity: is defined as waist circumference > 102 cm for male and > 88 cm for female according to NCEP-ATP III

Chronic kidney disease (CKD): encompasses a spectrum of different pathophysiologic processes associated with abnormal kidney function and a progressive decline in glomerular filtration rate (GFR). [2]

Diabetes mellitus: is the patient whose fasting blood sugar is greater than and/or equal to126 mg/dl or who is on treatment of diabetes.[2]

Smoker: According to Centers for Disease Control and Prevention: current smoker is respondents who reported smoking at least 100 cigarettes in their lifetime and who still smokes atleast once in the past 30 days, whereas past smoker is respondents who reported smoking at least 100 cigarettes in their lifetime and who, stops smoking before one month.

Drunker: According to Centers for Disease Control and Prevention: current drunker is respondents who have still habit of taking alcohols in the past 30 days where as former drunker (past drunker) is respondents who quit alcohol intake before 1 month.

Exercise: According to the National Health Interview Survey 2008, Physical activity is defined as bodily movement produced by the contraction of skeletal muscle that increases energy expenditure above the basal level. Categories of physical activity include occupational, household, leisure time, and transportation Whereas, the term "exercise" is a form of physical activity that isplanned, structured, repetitive, and purposeful witha main objective of improvement or maintenance of one or more components of physical fitness for atleast 150 minutes per week.

CHAPTER FIVE: RESULTS

5.1 Socio-demographic characteristics of the study patients

The mean age ± standard deviation (SD)of the hypertensivepatients was 46.6 ± 13.6 years and 135 (47.9%) patients were older than 45 years. Out of the total 282 hypertensive patients 152 (53.2%) were men and 151 (53.5%) of the respondents were rural residents. A hundred and seventy eight (63.1%) were illiterate while 66 (23.4%) had primary education. Seventy six (27.0%) were farmers.Two hundred and twenty eight (80.9%) were married while 21 (7.4%) were single. Among 122 (43.3%) Christian patients, 83 (68.0%) and 39 (32.0%) were orthodox and protestant respectively (Table 1).

Table 5: Socio-demographic characteristics of hypertensive patients on follow up at JUSH, March – August, 2014.

Variable	Category	Frequency (%)
Age	18-30	39 (13.8)
	31-45	108 (38.3)
	46-60	95 (33.7)
	>60	40 (14.2)
Sex	Male	150 (53.2)
	Female	132 (46.8)
Residence	Rural	151 (53.5)
	Urban	131 (46.5)
Occupation	Farmer	76 (27.0)
	House-wife	81 (28.7)
	Gov't employee	61 (21.6)
	Merchants	30 (10.6)
	Others*	34 (12.1)
Religion	Muslim	160 (56.7)
	Christian**	122 (43.3)
Marital status	Married	228 (80.9)
	Single	21 (7.4)
	Divorced	33 (11.7)
Educational level	No formal education	178 (63.1)
	Primary school	66 (23.4)
	Post primary school	38 (13.5)
Family size	≤5	150 (53.2)
	6-10	126 (44.7)
	>10	6 (2.1)
Income per month (birr)	≤600	42 (14.9)
	601-1200	118 (41.8)
	>1200	122 (43.3)

**Christian = Orthodox (68%) and Protestant (32%)

* Others = daily labor, retired, self employee, student

5.2 Clinical and related characteristics of study patients.

The mean duration ± SD of hypertension was 5.51 ± 5.65 years. In 150 (53.2%) of hypertensivepatients, the duration of hypertension was less than or equal to 5 years while only 10 (2.1) had hypertension for more than 10 years. Forty four (15.6%) patients had central obesity and 39 (13.8%) respondents had family history of hypertension. The majority, 222 (78.7%), of hypertensive patients had body mass index (BMI) with in normal range while 23 (8.2%)patients were underweight.Twenty three (8.2%)patients had smoking history and 17 (6.0%) respondents were drunker. Among the 28 patients who had comorbid illness, 13 (46.4%) had ischemic heart disease (IHD) while the others had diabetes mellitus (DM) and chronic kidney disease (CKD) each accounts for 9 (32.2%) and 6 (21.4%) respectively

Table 6 Clinical and related characteristics in hypertensive patients on follow up at JUSH, March – August, 2014.

Variable	Category	Frequency (%)
Body mass index (BMI)	Underweight	23 (8.2)
	Normal	222 (78.7)
	Overweight	30 (10.6)
	Obese	7 (2.5)
Central Obesity	Yes	44 (15.6)
	No	238 (84.4)
Duration of hypertension (years)	≤5	185 (65.6)
	6-10	59 (20.9)
	>10	38 (13.5)
Comorbidity	Yes	28 (9.9)
	No	254 (90.1)
Family history of hypertension	Yes	39 (13.8)
	No	243 (86.2)
Drunker	Yes	17 (6.0)
	No	265 (94.0)
Smoker	Yes	23 (8.2)
	No	259 (91.8)
Khat	Yes	70 (24.8)
	NO	212 (75.2)
Coffee	Yes	65 (23.0)
	NO	217 (77.0)
Walking habit	Yes	101 (35.8)
	No	181 (64.8)

5.3 Magnitude and distribution of dyslipidemia among hypertensive patients

The prevalence of dyslipidemia among hypertensive respondents, who had follow up at hypertensive follow up clinic at JUSH, was 27.7 % (Figure 1).

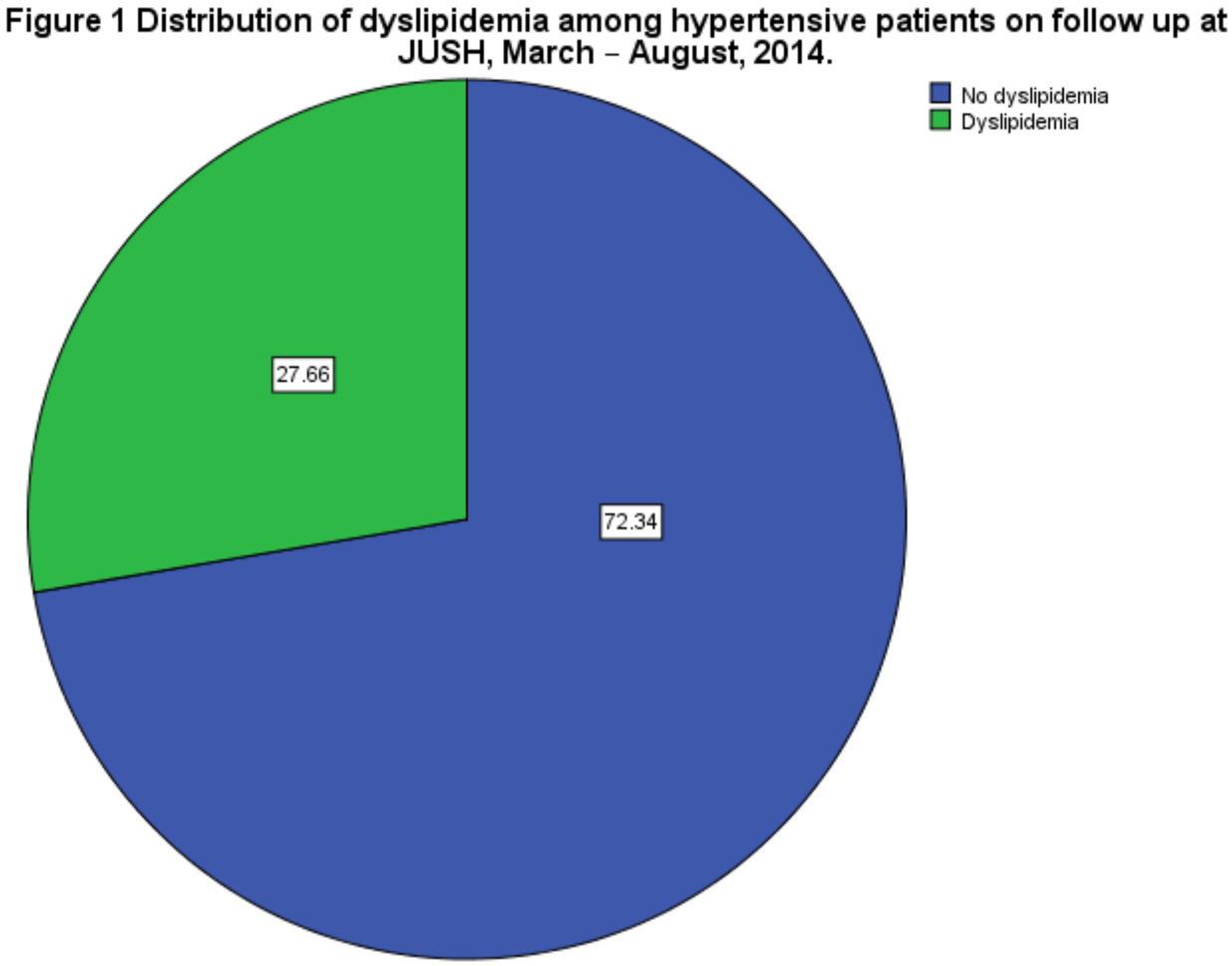

Figure 3 Prevalence of dyslipidemia among hypertensive patients who had follow up at hypertensive follow up clinic March to August 2014

Total cholesterol was the most common lipid abnormality, found in 58 (29.7%) of the patients, which was followed by HDL-C 52 patients (26.7%) and the least one was LDL-C in36 patients (18.5%) (Figure 2)

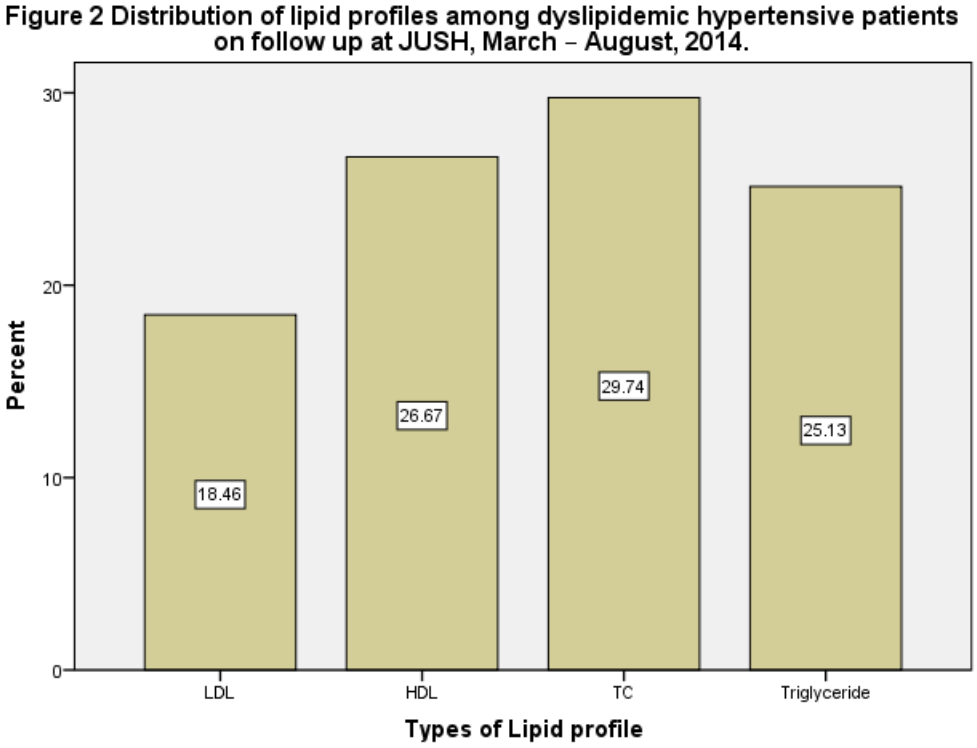

Figure 4 Pattern of abnormal lipid profile among hypertensive patients who had follow up at hypertensive clinic of JUSH March to August 2014

5.4 Factors associated with dyslipidemia in study patients

Using the Chi-square test bivariate association of variables with dyslipidemia among hypertensive patientswas analyzed and has showed the association of the following variables with dyslipidemia:-age (COR=32.91: 95% CI, p-value <0.00), marital status (COR=17.73: 95% CI, p-value <0.001), duration of hypertension (COR=29.40: 95% CI, p-value <0.001), income (COR=12.64: 95% CI, p-value 0.002), family history of hypertension (COR=5.74: 95% CI, p-value 0.017), drinking status (COR=8.78: 95% CI, p-value 0.003), smoking status (COR=58.94: 95% CI, p-value <0.001), central obesity (COR=47.72: 95% CI, p-value <0.001), BMI (COR=36.92: 95% CI, p-value <0.001), and comorbid- illness (COR=25.76: 95% CI, p-value <0.001). However sex, religion, occupation, exercise, khat chewing, coffee, residence, educational status and family size were not associated with dyslipidemia among hypertensive patients on follow up at JUSH (Table 3).

Table 7 Bivariate regression result of risk factors associated with dyslipidemia in hypertensive patients on follow up at JUSH, March – August, 2014.

Variables	Category	Total	Non-dyslipidemia (%)	Dyslipidemia (%)	Chi-square value	P-value
Age (years)	18-30	39	34 (87.2)	5 (12.8)	32.912	< 0.001
	31-45	108	93 (86.1)	15 (13.9)		
	46-60	95	37 (38.9)	37 (38.9)		
	>60	40	19 (47.5)	21 (52.5)		
Sex	Male	150	110 (73.3)	40 (26.7)	0.158	0.691
	Female	132	94 (71.2)	38 (28.8)		
Residence	Rural	151	106 (70.2)	45 (29.8)	1.355	0.852
	Urban	131	98 (74.8)	33 (25.2)		
Religion	Muslim	160	122(76.2)	38(23.8)	0.880	0.348
	Christian	122	87(71.3)	35(28.7)		
Occupation	Farmer	76	58(76.3)	18(23.7)	1.355	0.852
	House wife	81	57(70.4)	24(29.6)		
	Government employee	61	45(73.8)	16(26.2)		
	Merchants	30	20(66.7)	10(33.3)		
	Others	34	24(70.6)	10(29.4)		
Educational status	No formal education	178	126(70.8)	52(29.2)	0.634	0.728
	1-8 grade	66	49(74.2)	17(25.8)		
	≥9^{th} grade	38	29(76.3)	9(23.7)		
Family size	1-5	150	117(78.0)	33(22.0)	5.132	0.077
	6-10	126	83(65.9)	43(34.1)		
	≥11	6	4(66.7)	2(33.3)		
Marital status	Married	228	172(75.4)	56(24.6)	17.731	<0.001
	Single	21	18(85.7)	3(14.3)		
	Divorced	33	14(42.4)	19(57.6)		
Duration of hypertension	1-5	185	148(80.0)	37(20.0)	29.395	<0.001
	6-10	59	42(71.2)	17(28.8)		
	≥11	38	14(36.8)	24(63.2)		
Monthly income	≤600	42	21(50.0)	21(50.0)	12.635	0.002
	601-1200	118	88(74.6)	30(25.4)		
	>1200	122	95(77.9)	27(22.1)		

Walking habit	Yes	101	74(73.3)	27(26.7)	0.068	0.795
	No	181	130(71.8)	51(28.2)		
Habit of exercise	Yes	9	8(88.9)	1(11.1)	1.272	0.259
	No	273	196(71.8)	77(28.2)		
Family history of hypertension	Yes	39	22(56.4)	17(43.6)	5.740	0.017
	No	243	182(74.9)	61(25.1)		
BMI	<18.5	23	11(47.8)	12(52.2)	36.917	<0.001
	18.5-24.9	222	179(80.6)	43(19.4)		
	25-29.9	30	12(40.0)	18(60.0)		
	≥30	7	2(28.6)	5(71.4)		
WC	Normal	138	191(80.3)	47(19.7)	47.718	<0.001
	Central obesity	44	13(29.5)	31(70.5)		
Comorbidity	Yes	28	9(32.1)	19(67.9)	25.755	<0.001
	No	254	196(77.2)	58(22.8)		
Stimulants	Yes	123	91(74.0)	32(26.0)	0.183	0.669
	No	159	114(71.7)	45(28.3)		
Smoking status	Yes	23	1(4.3)	22(95.7)	58.935	<.001
	No	259	204(78.8)	55(21.2)		
Drinking Status	Yes	10	7(41.2)	10(58.8)	8.781	0.003
	No	272	197(74.3)	68(25.7)		

To determine the independent predicator variables for dyslipidemia in hypertensive patients on follow up, a multivariable logistic regression analysis using SPSS-20 entero method was done. During this time all independent variables with p- value less than 0.25 during chi-square analysis were selected and entered to this final model. The result showed that marital status, comorbidity, BMI, central obesity and smoking were independently associated with dyslipidemia in hypertensive patients. Where-as family history of hypertension, income, drunker, duration of hypertension, age, and family size were not independently associated with dyslipidemia.The risk of dyslipidemia was decreased by 85% for married patients as compared to the divorced one (AOR=0.15, 95% CI; 0.04–0.52). The risk of dyslipidemia was also reduced by 89% among single patients, who never married before, as compared to the divorced one (AOR=0.11, 95% CI: 0.01-1.0).The risk of dyslipidemia was seven times greater for patients who had comorbid illness as compared to the study subject who did not have (AOR=7.70, 95% CI: 2.38-24.85). This study showed that smoking was strongly associated with the development of dyslipidemia among hypertensivepatients as compared to those who never smoked, Central obesity wasassociated with increased risk of dyslipidemia by 7 folds as compared to who did not have central obesity (AOR=7.90, 95% CI: 2.68-23.32). On the other hands this study was showed that not having the central obesity had decreasethe risk of dyslipidemia by 87% as compared to those who had central obesity. (AOR=0.13, 95%: 0.04-0.37, p-value<0.001).At same time underweight was independently associated with increased risk of developing dyslipidemia by 6 times as compared to respondents who had normal BMI (AOR=6.63, 95% CI: 1.93-22.79) (Table 4).

Table 8 Multivariable logistic regression result of risk factors associated with dyslipidemia in hypertensive patients on follow up at JUSH, March – August, 2014

Variables	Category	Non-dyslipidemia(%)	Dyslipidemia (%)	AOR(95% CI)	P-value
Age (years)	18-30	34 (87.2)	5 (12.8)	1.89(0.30-11.71)	0.496
	31-45	93 (86.1)	15 (13.9)	0.47(0.12-1.81)	0.274
	46-60	37 (38.9)	37 (38.9)	1.42(0.42-4.86)	0.574
	>60	19 (47.5)	21 (52.5)	1	
Family size	1-5	117(78.0)	33(22.0)	4.24(0.7-274.65)	0.498
	6-10	83(65.9)	43(34.1)	10.20(0.16-638.71)	0.271
	≥11	4(66.7)	2(33.3)	1	
Marital status	Married	172(75.4)	56(24.6)	0.15(0.04-0.52)	0.003
	Single	18(85.7)	3(14.3)	0.11(0.01-1.00)	0.05
	Divorced**	14(42.4)	19(57.6)	1	
Duration of hypertension	1-5	148(80.0)	37(20.0)	0.36(0.11-1.20)	0.095
	6-10	42(71.2)	17(28.8)	0.61(0.17-2.17)	0.443
	≥11	14(36.8)	24(63.2)	1	
Monthly income	≤600	21(50.0)	21(50.0)	1.09(0.33-3.55)	0.891
	601-1200	88(74.6)	30(25.4)	0.89(0.34-2.28)	0.802
	>1200	95(77.9)	27(22.1)	1	
Family history of hypertension	Yes	22(56.4)	17(43.6)	2.22(0.77-6.40)	0.139
	No	182(74.9)	61(25.1)	1	
BMI	<18.5	11(47.8)	12(52.2)	6.63(1.93-22.79)	0.003
	18.5-24.9	179(80.6)	43(19.4)	1	
	25-29.9	12(40.0)	18(60.0)	2.93(0.86-9.98)	0.086
	≥30	2(28.6)	5(71.4)	3.82(0.36-40.45)	0.266
WC	Normal	191(80.3)	47(19.7)	1	
	Overweight	13(29.5)	31(70.5)	7.90(2.68-23.32)	<0.001
Comorbidity	Yes	9(32.1)	19(67.9)	7.70(2.38-24.85)	0.001
	No	196(77.2)	58(22.8)	1	
Smoking status	Yes	1(4.3)	22(95.7)	117.60(10.36-1334..46)	<0.001
	No	204(78.8)	55(21.2)	1	
Drinking Status	Yes	7(41.2)	10(58.8)	4.43(0.86-22.86)	0.076
	No	197(74.3)	68(25.7)	1	

CHAPTER SIX: DISCUSSION

Concerning socio-demographic and clinical characteristics of the study patients this paper was showed that age, income, family history of hypertension and duration of hypertension were associated with dyslipidemia during bivariate analysis using chi-square or as crude odds ration as shown above (Table 5). These findings were agreed with different study done across over the world. [] However the study showed that residence, religion, family size, occupation, sex, occupation and stimulants (like coffee and khat) were not associated with dyslipidemia among the study subject. This study was partially agreed with some study done across the world. [4, 11-14] .In this study, the prevalence of dyslipidemia among hypertensive patients was 27.7 %, which is comparable to the study done in other country and the prevalence of dyslipidemia was reportedas follows: in rural Southern Nigeria 31.7% [15], rural Saudi Arabia30.1%[16], Jordan 24.6% [17],semi-urban south Indian was 32.2%[18], Ireland 34.3 [19], rural Guangzhou34.8 [20] and suburban Beijing residents 35.3%.[21] However the prevalence reported in this study was low compared with the one done in urban southern Nigeria 46.5%. [22] Furthermore, in a community study that involved an urban and a rural community in Abuja, North -Central Nigeria, the prevalence of dyslipidemia was 58.1% and 59.5%.[23] This difference can be explained by the differences in the study settings, urban, upper social class and also different study population that include people with different under lying comorbid illness including hypertension and even also include normal individual.This prevalence was also different from the one done in rural Southern Nigeria (31.7%), from the same country itself so it may also depend on study design and socio demographic characteristics. The prevalence of dyslipidemia that done in China was also higher (45.1% and 56.3%) than the one reported in this study.[24,25] The difference can be due to the difference in age of the patientsparticipated in the study starts from 35 years old and above. It is in agreement with the general increase in the prevalence of dyslipidemia in China with increasing urbanization; change in lifestyle and with fast economic growth.The prevalence of dyslipidemia done in southeastern New England communities was 38% and the conjoint frequency (dyslipidemic hypertension) was 15.0%, which is 1.49 times the expected value if the two diseases were independent $P < .05$).[26]Overall the prevalence of dyslipidemia varies greatly across the world from 20% to 60% and the prevalence of dyslipidemia in the community also vary markedly across the world from 5% to 50% according to different literature review.[5-8, 17- 19]. The pattern of lipid abnormality among hypertensive patients in this study was elevated total cholesterol (TC) 29.7%, low high density lipoprotein-cholesterol (HDL –C) 26.7%, high triglyceride 25.1% and high low density lipoprotein-cholesterol (LDL-C)18.5%in descending order. This finding was agree with the work done in rural Southern Nigeria and urban southern Nigeria in which elevated TC was the commonest pattern of dyslipidemia, 31.7% and 32.1% respectively. [15, 22]In the Framingham prospective Study demonstrated that higher levels of plasma TC, was the most common pattern of dyslipidemia, in hypertension patients. Elevated lipid levels appear to predate the onset of hypertension by years. The relationship between lipids and hypertension is preserved even after adjustment for multiple confounders and after the exclusion of men with

diabetes and obesity. This finding led to early recommendations to treat elevated cholesterol in patients with hypertension. [4, 27] Similar results were also found in the study done in Turkey, which involved 4309 patients, was found TC was the most common pattern of dyslipidemia, 43%, and followed by low HDL-C 41.5%, triglyceride 36.2%, and high LDL-C 35.7% in descending order. [28] In the Inter Asia Collaborative Study, a cross-sectional survey in a nationally representative sample of 15,540 Chinese adults 35 to 74 years of age, 23.8% of the patients had borderline high total cholesterol (200 to 239 mg/dL), and 9.0% had high total cholesterol (≥240 mg/dL). The population estimates for borderline high LDL-C (130 to 159 mg/dL), high LDL-C (160 to 189 mg/dL), and very high LDL-C (≥190 mg/dL) was 17.0%, 5.1%, and 2.7%, respectively. In addition, 19.2%, had a low HDL-cholesterol (<40 mg/dL). [21] This Chinese study was also showed TC was the most common pattern of lipid abnormality, even though they followed different classification method of for lipid abnormality, definition for HDL-C abnormality and differ in study population as well.However, there were also other studies done in Abuja and in south east Nigeria were found low HDL has been reported often as the most common pattern of dyslipidemia.[23, 29] This difference can be explained by it was done among urban and higher economic individualin Abuja and the second one also done in apparently healthy women attending a meeting and both studies were measured for random lipid profiles. There may be also other under lying comorbid illness in the participants (this means different in study population and measurements). Laboratory error was also possible as well as method and machine used can determine the results. Other study done in China was found hyper-trigylceridemia was the most common pattern lipid profile, 35.5. [25]This can also due to different study population by body constitution, rapid rising economy, life style as well as the difference in method and materials: which can also due to laboratory error. This study was showed that cigarette smoking was strongly associated with the risk of developing dyslipidemia among adult hypertension patients and even the association was continued after adjustment for other variables were made as compared to those who had never smoked cigarette. This finding was agreed with a lot of study conducted at different countries across the world. The study done at multisite on children those who had history of exposure to cigarette smoking in the household had increased risk of dyslipidemia, out the dyslipidemia lower HDL-C was the most common pattern and even after adjustment for potential confounders, including dietary fat intake, serum triglyceride level, and exercise, only minimally changed the magnitude of difference in HDL-C among those who had history of exposure to cigarette smoking. [30] A number of studies were confirmed that in general population, smoking habits was associated with increased TC levels and prevalence of abnormal TC that is one part of dyslipidemia, and smoking cessation was associated with decreased TC and decreased risk for abnormal TC which means cessation of smoking decreases risk of dyslipidemia. [31, 32] In the study done at 7 economically developing countries including china, as many as 78%, 46%, 50%, and 20% of adults in 1 or more countries were current cigarette smokers, had a high cholesterol level, were overweight, and had hypertension, respectively. [33] These risk factors have emerged as important characteristics in predicting CVD morbidity and mortality in economically developing countries, including China. [34]

This study was showed both BMI and central obesity was independently associated with the risk of developing dyslipidemia among the hypertensive patients. As shown above in multivariate logistic regression results central obesity was more associated with dyslipidemia among the hypertensivepatients than BMI, Our study was showed that central obesity was increased the risk of dyslipidemia by 7 folds as compared with those who did not have central obesity (AOR=7.90, 95%: 2.68-23.32).our finding was consistent with several published studies. Although overweight and obesity are linked to abnormalities in lipoprotein metabolism, it is now well established that it is excess intra-abdominal fat that has the strongest ties to these abnormalities [35-41]. It has been known for several decades that obesity is frequently associated with a dyslipidemic state that includes increased triglyceride concentrations and reduced HDL-C levels. However, because obesity is remarkably heterogeneous, not every obese patient is dyslipidemic while some moderately overweight individuals clearly are. Studies conducted over the last two decades have shown that in both men and women, obese patients matched for total adiposity but with either low or large amounts of intra-abdominal adipose tissue were markedly different in their fasting lipoprotein-lipid profile [41, 43]. For instance, obese patients with low levels of intra-abdominal adipose tissue had a normal lipoprotein-lipid profile compared to lean controls, while equally obese patients with high levels of intra-abdominal fat had the high triglyceride, high apolipoprotein B, low HDL cholesterol, and small, dense LDL and HDL atherogenic dyslipidemic state. This dyslipidemic state of intra-abdominal obesity is a key feature of dyslipidemia and the clustering abnormalities of the metabolic syndrome. [41-43] Subcutaneous fat in the abdominal region is thought to be the main source of increased systemic (general circulation) fatty acid levels. Fatty acids are readily taken up by tissues. When levels are too high inside cells, fatty acid derivatives are toxic to tissues such as muscle, liver, heart, and pancreas and may seriously harm their function. This dyslipidemia therefore contributes to lipotoxicity and plays an important role in the development and maintenance of insulin resistance. [44, 45] Jansen *et al* have shown that obesity related health risks are explained by waist circumference and not BMI. [46]. Our study was demonstrated that the comorbid illness such as DM, CKD and IHD were independently associatedwith the risk of developing dyslipidemia among hypertensive patients(AOR=7.70, 95% CI: 2.38-24.85 with p-value of 0.001) compared to those who did not have comorbidity. This results were agrees with a lot of study done in different parts of the world.Among thesethe study done in JUSH, southwest Ethiopia, in 2007, was showed that gender, DM, and hypertension were independently associated with dyslipidemia. [47] The study done in Saudi Arabia and Turkey were showed the association of dyslipidemia independently with DM, IHD and CKD. [16, 28]These finding were also consistent with the study done in Malaysia, Saudi Arabia, Basrah (Southern Iraq) andJorden. [48-51]. Alcohol users were less likely to be dyslipidemic. (OR =4.42, 95% CI: .86-22.86 and p-value 0.0760). This study was demonstrated the result with study done in JUSH among DM patients in 2007 (OR =4.25, 95% CI: 3.50 -3.56 and p-value 0.39). [47]

Our studywas showed that the marital status was significantly associated with the risk of developing dyslipidemia. Divorce have independently increased the risk of dyslipidemia compared to the married and the singlepatients (married AOR=0.15 95% CI: 0.04-0.52 with p-value 0.003) and (for the single AOR=0.11 95% CI: 0.01-1.00 with p-value 0.05). This study was showed that Divorce increase risk of dyslipidemia by 6 fold compared with the married one (AOR=6.78, 95% CI: 1.91-24.07). This finding was agreed with the study done in Saudi Arabia that showed, the widowed class had presented higher prevalence of metabolic syndrome (74.2%) and (AOR=25.4 95% CI: 15.4-45.9) as well as the divorced patientshad also increase the risk of metabolic syndrome by 45% and (AOR=8.4 95% CI: 6.1-11.6) as compared to other classes (single and married). [52] However the study done in Iran and Morocco were demonstrated that as full Metabolic syndrome were associated significantly with marital status in female. [53, 54] The difference can be explained due to the difference in method of the study and study population, different population as well it compared with metabolic syndrome not directly with dyslipidemia.

6.1 LIMITATION

This study had several limitations. The first and on the top is a financial issues. Since it is a hospital based study and limited sample size of patients were collected due decreased number of patients at follow up during sample size collection, the findings may not be applicable to the general population. Errors of measurement are possible but we had provide orientation about questionnaires and measurements, pretest and supervision to ensure data quality.

CHAPTER SEVEN CONCLUSION AND RECOMMENDATIONS

7.1 CONCLUSION

This study has shown that lipid abnormalities were highly prevalent among hypertensive patients in Jimma, South West Ethiopia. Among the lipid abnormality pattern hypercholesterolemia was the most common one. Central obesity, comorbidity, smoking and divorce were common as well as strongly associated with dyslipidemia among hypertensive patients in JUSH, Jimma, South West Ethiopia. On the other hand underweight was also associated with dyslipidemia among hypertensive patients.

7.2 RECOMMENDATIONS

- Efforts should be intensified to fully evaluate Ethiopian with hypertension from a lipid and lipoprotein standpoint, and any abnormalities detected are to be taken into consideration during therapy of this group of high-risk patients.
- We recommend screening and management for the possible risk factors of dyslipidemia among hypertensive patients.
- It can serve as the entry point as well as reference for subsequent investigation.

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ASSURANCE OF PRINCIPAL INVESTIGATOR

I, the undersigned, declare that this thesis is my original work and has not been in any other university even it is the first report in Ethiopia, and all sources used for this thesis have been full acknowledged.

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