MAGNITUDE OF BOTH DIAGNOSED AND UNDIAGNOSED DIABETES MELLITUS AND ASSOCIATED FACTORS AMONG ADULT HYPERTENSIVE PATIENTS IN DESSIE REFERAL HOSPITAL

NORTH EAST ETHIOPIA.

BY

MEKURIAW WUHIB (BSc)

A RESEARCH THESIS SUBMITTED TO JIMMA UNIVERSITY, INSTITUTE OF HEALTH, FACULTY OF HEALTH SCIENCE, SCHOOL OF NURSING AND MIDWIFERY IN PARTIAL FULFILLMENT OF THE REQUIREMENT FOR MASTERS OF SCIENCE DEGREE IN ADULT HEALTH NURSING

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JIMMA ETHIOPIA

JIMMA UNIVERSITY
INSTITUTE OF HEALTH
COLLEGE OF HEALTH SCIENCES
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BY:

MEKURIAW WUHIB (BSc)

ADVISORS:-

1. FIKADU BALCHA (BSC, MSC, ASSISTANT PROF, PHD FELLOW)
2. MILLION ABERA (BSC, MSC)

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JIMMA ETHIOPIA

Abstract

Background: *Hypertension and diabetes mellitus are among the non-communicable chronic diseases that threaten human being throughout the entire world. The presence of Hypertension is associated with increased risk of type 2 diabetes mellitus. Hypertension and diabetes are now challenging the developing world including Ethiopia. However Limited studies were conducted to screen hypertensive patients for diabetes mellitus in sub-Saharan country and no study were conducted in this study area.*

Objectives: *The objective of this study was to assess magnitude of both diagnosed and undiagnosed diabetes mellitus and associated factors among adult hypertensive patients in attending hypertension clinic of Dessie referral hospital, North east Ethiopia 2019.*

Methods and materials*: Institution based cross-sectional study was conducted from April 8 to May 22 2019. A total of 407 respondents were included in the study using simple random sampling. Interviewer administered structured questionnaire adapted from world health organization steps instrument was used to collect data. Finally, descriptive statistics and logistic regression were conducted to assess the magnitude of diabetes and associated factors. P value of less than 0.05 was declared as level of significance.*

Result*: The magnitude of newly diagnosed diabetes mellitus was 6.8% and the total magnitude of diabetes mellitus among Dessie referral hospital hypertensive patients were 29.2 %. Family history of diabetes mellitus, waist to height ratio and waist circumference were significantly associated with increased risk of overall diabetes mellitus among hypertensive patients. Hypertension duration, past daily smoker, diastolic blood pressure, educational label and waist circumference were significantly associated with increased risk of diagnosed diabetes mellitus.*

Conclusion*: Out of the total hypertensive patients on follow-up, around one in fourteen were diagnosed newly for diabetes and one third of all were diabetes. The magnitude of newly diagnosed diabetes mellitus and the total magnitude of diabetes mellitus were positively associated with smoking, high waist circumference, diastolic blood pressure, family history and hypertension duration. To reduce the burden of diabetes among hypertensive patients such behaviors and modifiable biological factors should be controlled and modified.*

Key words: *Magnitude, Hypertension, diabetes mellitus, Ethiopia*

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Acronyms and Abbreviations

BMI: Body Mass Index

CVD: Cardiovascular Disease

CI: Confidence Interval

DBP: Diastolic Blood Pressure

DM: Diabetes Mellitus

DRH: Dessie Referral Hospital

FPG: Fasting Plasma Glucose

HPN: Hypertension

IDF: International Diabetes Federation

IFG: Impaired Fasting Glucose

IGT: Impaired Glucose Tolerance

NCD: Non Communicable Disease

PI: Principal Investigator

STEPS: STEPwise Approach to Surveillance

SBP: Systolic Blood Pressure

WC: Waist Circumference

WHO: World Health Organization

Chapter One: Introduction

1.1 Background

Hypertension (HTN) and Diabetes mellitus (DM) are among the non-communicable chronic diseases (NCD) that threaten human being throughout the entire world (1). Hypertension is defined as persistent elevation of systolic blood pressure at or above 140 mmHg and/or a diastolic blood pressure at or above 90 mmHg (2, 3). However, the 2017 American guidelines for the prevention, detection, evaluation, and management of high blood pressure in adults, defined hypertension as persistent elevation of systolic blood pressure at or above 130 mmHg and/or a diastolic blood pressure at or above 80 mmHg (4).

Diabetes mellitus is a group of various metabolic disorders of carbohydrate, protein and fat which is associated with a broad range of clinical presentations, from being asymptomatic to ketoacidosis or coma (5). Diabetes requires a continuous treatment with multifactorial risk-reduction strategies beyond glycemic control (5, 6). The disease occurs either due to decreased insulin secretion, insulin resistance or both (7, 8). The presence of HTN is associated with increased risk of type two diabetes mellitus among the pre-diabetes population (9). The two chronic diseases have significant connection as evidenced by up to 75% of adults with diabetes also have hypertension and hypertensive patients alone often show evidence of insulin resistance (10, 11).

Hyperglycemia can lead to raised blood pressure and high cholesterol which in turn leads to different complications like heart disease, stroke, blindness, renal failure and premature death. Among patients with T2DM (type two diabetes mellitus) especially those with poor glycemic control, co-morbidity with HTN is high (12, 13). Undiagnosed diabetes can progress to development of worsening condition, but Earlier detection through opportunistic screening and management of diabetes is associated with great importance (14, 15). Screening for early diagnosis of diabetes can be a blessing. Because it can force the patients to take care of their health and prevent fatal diseases such as high blood pressure, coronary heart disease and obesity related disorders (16).

1.2 Statement of problem

NCDs (Non Communicable Disease) are pandemic conditions affecting a significant numbers of populations worldwide. Developing countries are particularly facing a new challenge from an increase in NCDs which are among the largest global health emergencies of the 21st century (17, 18). Diabetes is emerging as a major global health problem with the estimated number of people aged 20-70 years that lived with DM in 2017 globally was 425 million, which is estimated to increase by 48% to reach 629 million in 2045 (8). Approximately 90% of the total cases of diabetes is T2DM (19).

The morbidity of DM between age 20 and 70 in Africa in 2017 was 16 million but, it is expected to project to 41 million in 2045 by 156% growth rate. Sub- Saharan countries are the fastest growth in DM proportion in the world. IDF (International Diabetes Federation) report showed that the proportion of DM in Africa in 2017 was 3.3%. Ethiopia is one of the most populous countries in Africa having the highest numbers of people with diabetes where 2.6 million are living with DM in the country. IDF report showed that the prevalence of DM in Ethiopia in 2017 was 5.2 % (20). WHO (World Health Organization) report showed that the proportion of DM in Ethiopia in 2014 was 3.8% which is slightly lower than 2017 IDF report (18, 20). The prevalence of diabetes in Ethiopia in 2018 was 5.7% (21). Study conducted in 2016 in East Gojjam showed that prevalence of undiagnosed DM was, 11.2% (22). Study conducted in North West Ethiopia Gondar, showed that the prevalence was double in urban compared to rural areas (5.1% vs. 2.1%) (23).

Prevalence of DM among hypertensive patients had different figure in different parts of the world. One third of hypertensive patients have DM in China (24). Similarly a quarter of hypertensive patients have DM in Kampala (25). In Cameroon the proportion of DM among HTN patient was 7.7% (26). Similarly in Kenya the proportion of DM among HPN patient was 14% (27). Higher blood pressure was associated with higher risk of new-onset diabetes (28). From Pakistan Case report showed that HTN patient had developed DM without any other risk factor, which may be suggestive of the association between the two diseases (29).

In 2012 globally 3.7 million people died of DM and its CVD (Cardiovascular Disease) complication whereas 9.4 million people died of HTN. Mortality related to diabetes increased to 5 million in 2015 which is higher than the summation of death caused by HIV/AIDS, TB and malaria in 2013 (2, 8, 30). HTN is one of the CVS diseases as leading cause of death among diabetes patients where 40% of deaths in people with diabetes are caused by raised BP (2, 31). In 2017, more than 6% of all mortality in Africa are attributed to diabetes whereas in Ethiopia DM related mortality accounts more than 6,430 deaths (20).

DM reduces the ability of an individual to regulate the level of glucose in the blood stream resulting in a number of major and some minor complications (19). Co morbidity of hypertension and T2DM are complex with high chance of complications if not well-managed (32). Proportion of micro vascular complication diagnosis was higher in T2DM patients with hypertension than those without hypertension (33). Hypertension and T2DM co morbidity is highly associated with macro vascular complication like coronary artery disease, myocardial infarction, stroke, congestive heart failure, and peripheral vascular disease or increased chance of micro vascular complication like retinopathy, nephropathy, and neuropathy (10, 33).

Some researchers are providing evidence that HTN and insulin resistance has an association but there is inconsistency of findings and the result may not be similar to all human races (34). Office and masked hypertension are associated with a long-term greater progression of blood glucose abnormalities and an increased risk of developing diabetes. This is largely accounted by the metabolic abnormalities that are frequent components of these conditions (35).According to WHO recommendations hypertensive patients should undergo diabetes screening based on their risk profile (36).

The two chronic diseases, hypertension and diabetes are now challenging the developing world including Ethiopia. The epidemic is driven by many factors like unhealthy eating, physical inactivity, tobacco use, harmful alcohol consumption and obesity. Undiagnosed DM covers half of the diagnosed cases (18, 32, 37). Unhealthy eating reduced physical activity, smoking, sedentary behavior, non-current smoking and current alcohol drinking were significantly associated with DM (22, 32, 39, 45, 46). BMI >25kg/m2, abdominal obesity (waist circumference >90cm for men and

>80cm for women), higher heart rate, hypertension, waist to height ratio above 0.5 (WHR) and systolic blood pressure (SBP) over 140 mmHg have significant association with DM (25, 34, 39, 42, 45, 48).

Limited studies were conducted to screen hypertensive patients for DM in sub-Saharan country. To our knowledge, in Ethiopia there has been no study on the prevalence of DM among HTN patient. There is also scarcity of a well-documented data on prevalence of DM among high risk groups, such as hypertensive patients in Ethiopia. Similarly, the prevalence of DM among hypertensive patients is not assessed in the study area. Therefore, this study was conducted to determine the magnitude of DM among hypertensive patients and its associated risk factors.

1.3. Significance of the study

The finding of this study would be used for better understanding of the proportion of DM among hypertensive patients in Dessie referral hospital. Moreover, stakeholders and community partners working on alleviation of both conditions like Ethiopian diabetic association will use the result. It may also help patients for early screening and diagnosis which farther help to reduce or prevent complications. It will also be used as baseline information for further related studies.

Chapter Two: Literature Review

2.1 General overview

Reports are indicating that in 2013, 382 million people had diabetes (DM); this number is expected to rise to 592 million by 2035 (38).The prevalence of DM among hypertensive patient in large most populous countries like china range from 13.2% to 32% (24, 39, 40). Proportion of DM is associated with increasing of age, BMI, weight, history of a first degree relative with DM, Male sex and low formal educational status. On the contrary having a controlled blood pressure below 140/90 mmHg is protective against DM (26, 27, 39, 41).

2.2 Prevalence of DM among hypertensive patients

The higher the blood pressure and the less control over it will result the more chance of developing DM and other CVS problems due to common pathological factors (13, 28, 29, 42, 43). In UK a cohort of 4.1 million adults, free of DM & CVD, age 30-90 years was identified using validated linked electronic health records, complemented by a meta-analysis of prospective studies and the final finding shows that a 20 mm Hg higher SBP (systolic blood pressure) was associated with a 58% higher risk of new-onset diabetes, whereas a 10 mm Hg higher DBP (diastolic blood pressure) was associated with a 52% higher risk of developing diabetes (42). Cross-sectional study conducted in Spain Valencia on 5,347 hypertensive and 7,833 obese individuals showed that the FBG (fasting blood glucose) has a direct negative influence, associated with a greater cardiovascular risk and worse control of blood pressure (28). Screening conducted in Denmark to see the overall results of a study prevails that screening for diabetes identifies two times more people at high risk of diabetes & six times more people at high cardiovascular risk than people with diabetes (14). Study conducted in Pooja Bamrara India showed that hypertensive patients had fasting blood glucose level higher than normal healthy controls (43). A study conducted in Nigeria among 35 hypertensive and 35 normotensives showed that hypertensive subjects had significantly higher fasting insulin and insulin resistance compared with normotensives (34).

The prevalence of DM among hypertensive patients in large most populous countries like China ranges from 13.2% to 32% (24, 33, 39, 40). Community based crosectional

study conducted in china on 4021 hypertensive patients aged 40 to 79 years shows that the prevalence of DM was 32% which accounts 11.2% previously known DM and 20.8% was newly diagnosed. Similar study conducted in China showed the prevalence of DM among HTN patient was 24.3% &15.9% are previously diagnosed having DM but 8.4% are newly diagnosed (24, 39). Another crosectional study conducted among 17,184 Chinese hypertensive adults aged 45–75 years founds that a high prevalence of diabetes in Chinese hypertensive adults and about three out of every four diabetic adults were undiagnosed. The prevalence of previously diagnosed diabetes, undiagnosed diabetes, and IFG were 3.4%, 9.8%, and 14.1%, respectively. About 74.2% of the participants with diabetes had not previously been diagnosed (40). Nationwide Cross-Sectional Study conducted in Thailand among 55,797 T2DM patients ,55.35% were co morbid for both DM and hypertension (33).

Prevalence of DM and undiagnosed DM among hypertensive patients in Africa ranges from 2.19% to 24% (15, 25-27, 44). Institution based cross sectional study conducted in Kenya among 334 hypertensive patients above 18 year shows the prevalence of undiagnosed DM was fourteen percent while 18 % were pre-diabetic and similar study in Nigeria among 182 respondents only 4 have hypertension and DM co morbidity which is less than the Nigerian national hypertension and diabetes co morbidity rate of 10.5% (15, 27). Population-based cross-sectional study conducted in four major Cameroon cities among 2025 adults age 15 years and above in 2011 showed that prevalence of DM was 10.1% for male and 11.2 % for females and prevalence of undiagnosed diabetes is very high which indicates the need for more proactive policies of screening and early detection of the disease (28, 44). Another crosectional study conducted in Kampala among 320 hypertensive patients showed that abnormal glucose tolerance was found in 237 (74%) patients,50% had IGT and 24% had type 2 diabetes (25). Another cross sectional study conducted in Cameroon among 839 newly hypertensive patients from January to December 2012 showed that abnormal glucose homeostasis was 38.3%, while 7.7% of patients had known diabetes. A total of 23.7% had impaired fasting glycaemia (26).

In Ethiopia the prevalence of DM is increasing time to time from 3.9 % to11.2% (21-23). In Ethiopia cross sectional survey was done on 9,788 participant's age 15-69 years from mid-April to end-June 2015 using WHO steeps instrument shows that 5.9

% had elevated blood sugar greater than or equal to 110 mg/dl, with 6% in men, and 5.8 % in women. From this 5.7% were newly diagnosed for DM and only 3% had history of measured their blood sugar level before this survey (21). Study conducted in North West Ethiopia Gondar; showed that prevalence of DM is 2.1% in rural areas and 5.1% in urban areas respectively (23). A community-based cross-sectional study conducted in Gojjam, Ethiopia showed that prevalence of undiagnosed DM was 11.5% (22).

2.3 Risk factors for DM

2.3. 1 Socio demographic risk factor for DM

Sex, age and income label have significant association with DM (22, 24, 26, 39, 44, 45). Cross-sectional study conducted in Cameroon on newly diagnosed hypertensive patient showed that male sex (OR: 1.53) and age older than 55 years (OR:1.55) at 95% CI (confidence interval) were independently associated with abnormal glucose homeostasis (26). Crosectional study conducted in Canada reported that higher income was positively significantly associated with diabetes mellitus prevalence (45). According to study conducted in China hypertensive men had higher weight and waist circumferences compared with hypertensive women. On the other hand females had higher BMI and FPG compared with male (24). A community-based cross-sectional study conducted in West Gojjam, Ethiopia showed that prevalence of undiagnosed DM was significantly associated with the age of the participants and their marital status (22). Study conducted in China showed that the prevalence of DM was increased with age, from 11.1% in those age <45 to 30.7% to those aged >65 (39). Another study conducted in similar country reported older age and men were significantly associated with, total diabetes prevalence, previously undiagnosed diabetes and IFG (impaired fasting glucose) (40). Study conducted in Cameroon showed that prevalence of DM among hypertensive patients was increased with age for both sex (44). Crosectional study done in China on hypertensive patient showed that 417 (37%) were newly diagnosed and those with age < 45 are more numerous. According to this study DM case were also higher in low economic status and low educational label (39). Crosectional study conducted in China and Uganda on hypertensive patients showed that the association between DM prevalence and education level was negatively related (27, 39). Study conducted in India on 300

hypertensive patients showed that age and gender had no statistically significance association with type 2 diabetes mellitus (46).

2.3.2 Behavioral risk factors of DM

Unhealthy eating reduced physical activity, smoking, sedentary behavior, non-current smoking and current alcohol drinking were significantly associated with DM (22, 32, 40, 46, 47). Study conducted in China showed that non-current smoking and lower physical activity levels were significantly associated with both total diabetes and previously undiagnosed diabetes. In this study current alcohol drinking was an independent associated factor for previously undiagnosed diabetes. At the same time non-current smoking and current alcohol drinking were important independent associated factors for IFG (40). Another crosectional study conducted in Kampala among 320 hypertensive patients showed that physical inactivity (p=0.001) and alcohol consumption (p=0.01) were significantly associated with abnormal glucose regulation (25). A study done in India on 900 samples showed that the modifiable risk factors such as sedentary physical activity and alcohol consumption were significantly associated with type 2 diabetes mellitus (46). DM epidemic is driven by many factors such as unhealthy eating, reduced physical activity and smoking (32). A community-based cross-sectional study conducted in West Gojjam in Ethiopia showed that prevalence of undiagnosed DM was significantly associated with current smoking practices and sedentary behavior (22).

2.3.3 Family related risk factors of DM

Having family history of DM is significantly associated with current DM status (22, 46, 48). A study conducted in India showed that family history of DM had significant association with current DM status (46). Family history of diabetes was associated with increased risk of diabetes and these associations were independent of other risk factors, such as obesity, insulin resistance and lifestyle factors in Japanese men and women (48). Another crosectional study conducted in Kampala among 320 hypertensive patients showed that family history of diabetes (p=0.002) was significantly associated with abnormal glucose regulation (25). A community-based cross-sectional study conducted in West Gojjam in Ethiopia showed that proportion of undiagnosed DM was significantly higher when associated with diabetes family history (22).

2.3.4 Biological risk factors of DM

BMI >25kg/m^2, abdominal obesity (waist circumference >90cm for men and >80cm for women), higher heart rate, hypertension, waist to height ratio above 0.5 (WHR) and systolic blood pressure (SBP) over 140 mmHg have significant association with DM (25, 34, 40, 43, 46, 49). Crosectional study conducted in China showed that Obesity (BMI >25kg/m2), abdominal obesity (waist circumference >90cm for men and >80cm for women) and higher heart rate were significantly associated with both total diabetes and previously undiagnosed diabetes. Abdominal obesity, higher heart rate were important independent associated factors for IFG (40). Study conducted in India showed that hypertensive patients had fasting blood glucose level higher than normal healthy controls (43). Another study done in India showed that presence of hypertension, and obesity were significantly associated with type 2 diabetes mellitus (46). Study conducted in Nigeria showed that BMI, waist and hip circumference among subjects with hypertension showed significant correlation with insulin resistance (34). Study conducted in China showed that waist to height ratio is new, important and an optimal indicator of diabetes mellitus (49). Another crosectional study conducted in Kampala among 320 hypertensive patients showed that a systolic blood pressure (BP) over 140 mmHg and (BMI) over 28.0 kg/m2 (p=0.003) were significantly associated with abnormal glucose regulation (25). A community-based cross-sectional study conducted in West Gojjam in Ethiopia showed that proportion of undiagnosed DM was significantly higher when associated with history of hypertension (22).

Conceptual frame work for Diabetes mellitus status

This conceptual framework was developed by referring different literatures (22, 25, 32, 40, 46, 47). It shows dependent variables with different factors in order to indicate relationships between the dependent variable and independent variables. This frame work provided guidance for this study.

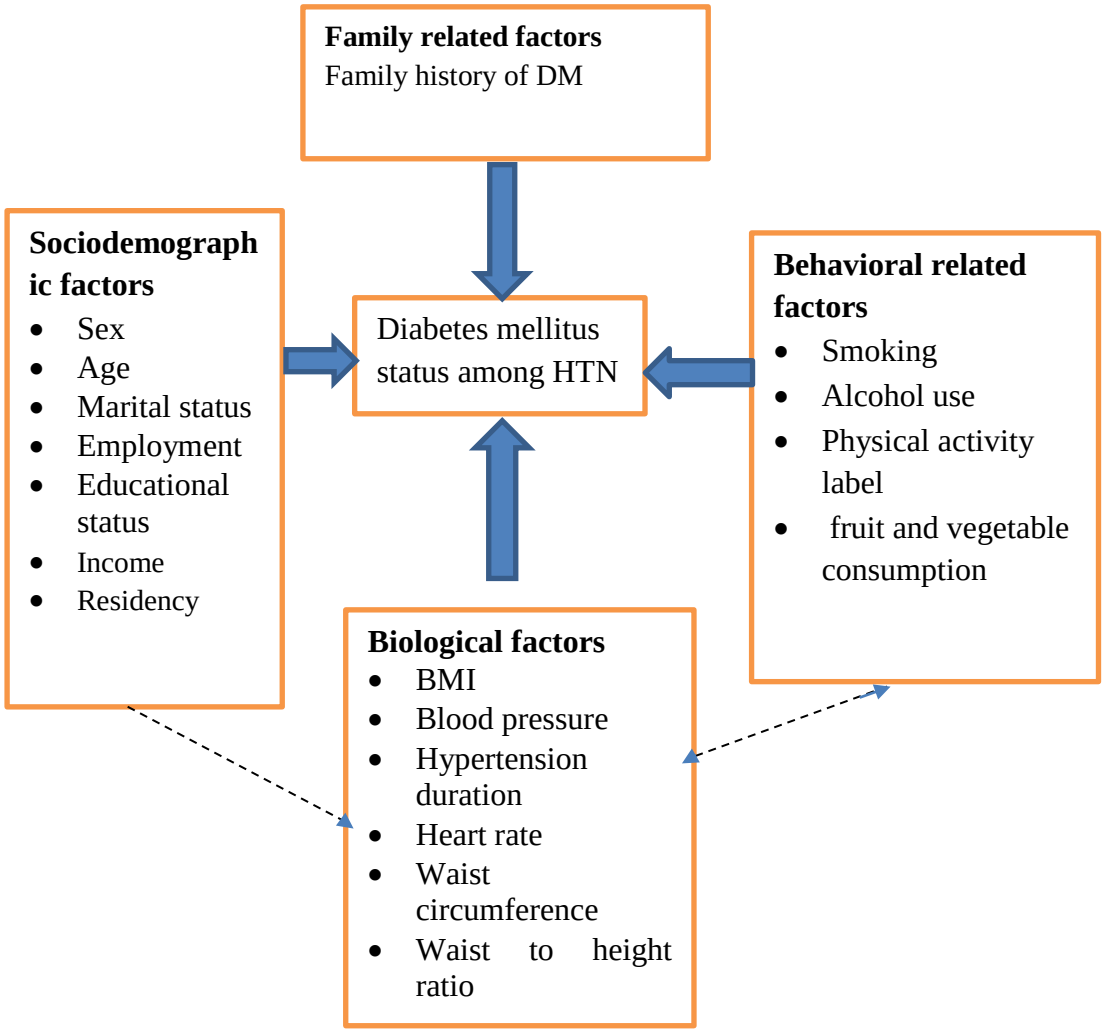

Figure 1 Conceptual frame work for diabetes mellitus status

Source: Developed by reading different literature as cited above.

N.B only the bold line direction was the focus of this study.

Chapter Three: Objectives

3.1 General Objective

To assess magnitude of both diagnosed and undiagnosed diabetes mellitus and associated factors among adult hypertensive patients in Dessie referral hospital, North east Ethiopia 2019.

3.2 Specific objectives

1. To determine the magnitude of diabetes mellitus among adult hypertensive patients in Dessie referral hospital, North east Ethiopia 2019.
2. To determine the magnitude of undiagnosed diabetes mellitus among adult hypertensive patients in Dessie referral hospital, north east Ethiopia 2019.
3. To identify factors associated with diabetes mellitus among adult hypertensive patients in Dessie referral hospital, North east Ethiopia 2019.
4. To identify factors associated with undiagnosed diabetes mellitus among adult hypertensive patients.

Chapter Four: Method and Materials

4.1. Study area and period

The study was conducted in Dessie referral hospital in Dessie Town, North East Ethiopia. Dessie is the capital city of south Wollo zone and have 16 Kebeles, the smallest administrative unit. It is around 401 Km from Addis Ababa, capital of Ethiopia. Dessie referral hospital has 630 staffs like 15 senior doctors, 60 general physicians, 241 nurses and 150 other health professionals. The hospital is serving around 7 million people with 240 beds capacity and giving services such as surgery, maternal and child health, emergency care, outpatient service and in patient service. From the outpatient service hypertension clinic is one of them and is giving follow up service in two outpatient service offices for 934 registered patients. This study was conducted from April 8 to May 22, 2019.

4.2. Study Design

Institution based cross sectional study was conducted.

4.3. Population

4.3.1. Source Population

All hypertensive patients in DRH (Dessie referral hospital) chronic follow up unit.

4.3.2. Study Population

A sample of hypertensive patients in chronic follow up unit of DRH (Dessie referral hospital)

4.3.3 Inclusion Criteria

Hypertensive patients aged 18 years and above who were on follow up in DRH hypertension unit during the study period.

4.3.4 Exclusion Criteria

Pregnant mother, patient who developed hypertension secondary to diabetes mellitus or who diagnosed at the same time for both diseases, patient that were unable to give

response due to severe illness either physically or mentally was excluded from the study.

4.4. Sample size and Sampling procedures

4.4.1 Sample size Determination

The assumptions made for the sample size calculation are 95% confidence interval (two sided), 5% margin of error, and 10% was added to compensate potential non-response rate. Since there is no study done in Ethiopia with similar topic, we took proportion 50% and the sample size was calculated as follows.

$$n_o = \frac{(Z\alpha/2)^2 p\,(1-p)}{d^2}$$

$$n_o = \frac{(1.96)^2 0.5\,(1-0.5)}{0.05^2} = 385 (aproximated)$$

Where: n_o is the maximum possible sample size

$Z_{\alpha/2}$ is standard score value for 95 % confidence level for two sides normal distribution

p = is the proportion of population

d = is margin of error

By adding 10% non-response rate, the final sample size was **423.**

4.4.2 Sampling technique and procedure

There were 934 registered patients on regular follow-up in DRH hypertension clinic chronic follow up unit. Majority of patients come monthly for follow up but some patients were appointed every two month. The patients' card number recorded in hypertensive registration book was used as sampling frame. Then the patients' card number from hypertensive patients' registration book was entered into SPSS and using simple random selection card numbers of 423 patients were selected randomly. Charts with comorbidity for HPN and DM were reviewed to determine which comes first either hypertension or diabetes mellitus to determine inclusion and exclusion criteria.

4.5. Data collection tools and procedures

Structured questionnaire adapted from WHO STEPwise Approach to Surveillance for chronic disease and translated to Amharic by Jimma University Gilgel Gibe research project was used (50) (published project reference). Data was collected by interviewer administered structured questionaries' with objectively taken physical measurements. Selected show cards were translated to Amharic and color print was prepared. The questionnaire also included height, weight, waist circumference, blood pressure, fasting blood sugar level and heart rate.

Data was collected by four bachelor holder professional nurses trained for one day and who has the experience of data collection. Comorbid patients were also asked which disease was diagnosed first for inclusion and exclusion criteria before data collection retrospectively. The responsibility of data collectors was filling the structured questionnaire and taking different biological measurements. After getting consent from the participants socio-demographic and behavioral risk factors data were collected through structured interviewer administered questionnaires. Next, the physical measurements were conducted in the order of blood pressure, heart rate, weight, height, waist circumference, and lastly fasting blood sugar after the completion of monthly follow up.

Blood pressure (BP) was measured with digital BP measuring instrument model Omron Hem-7121 made in China. Three intermittent blood pressure readings were taken with 5 minutes of rest intervals, with the BP machine cuff placed mid - arm and an average of the readings was used for the study. Heart rate reading was taken from digital BP measuring instrument. Height (cm) was measured using vertical measuring board. The participant was requested to remove his/her shoes, cape/hat and stand on flat surface/board with weight distributed evenly on both feet, heels together maintaining a fully erect position; and the measurement was read at the exact point & recorded to the nearest 0.5cm.

Weight (Kg) was measured using an ordinary weight scale. The participant was asked to remove their foot wear, take off coat or jacket and heavy clothing, while standing in center of the platform with body weight evenly distributed between both feet, weight was recorded.

Waist circumference (WC) was determined by using a non-extensible/non-stretchable tape measure that were placed around in the mid-axillary line midway between the last rib and the superior iliac crest and the recording was taken at the point of normal expiration. Venous blood was drawn after 8 or more hours of fasting. By taking their phone number from card room, they were informed that to come with fasting to be tested for sugar during their appointment. Then blood glucose was determined by using chemistry machine model Dirrul CST-240 made in China. For those first blood sugar label >125mg/dl, the test was repeated in the next day again in fasting state by using similar machine.

Body-mass index (BMI) was calculated as weight (kg) divided by height (in meters) squared. Waist to height ratio (WHR) was calculated as Waist circumference (cm) divided by height (cm). The questionnaire and physical measurement took 15-20 minute on average to complete. Flow diagram of data collection steps was showed as below

.

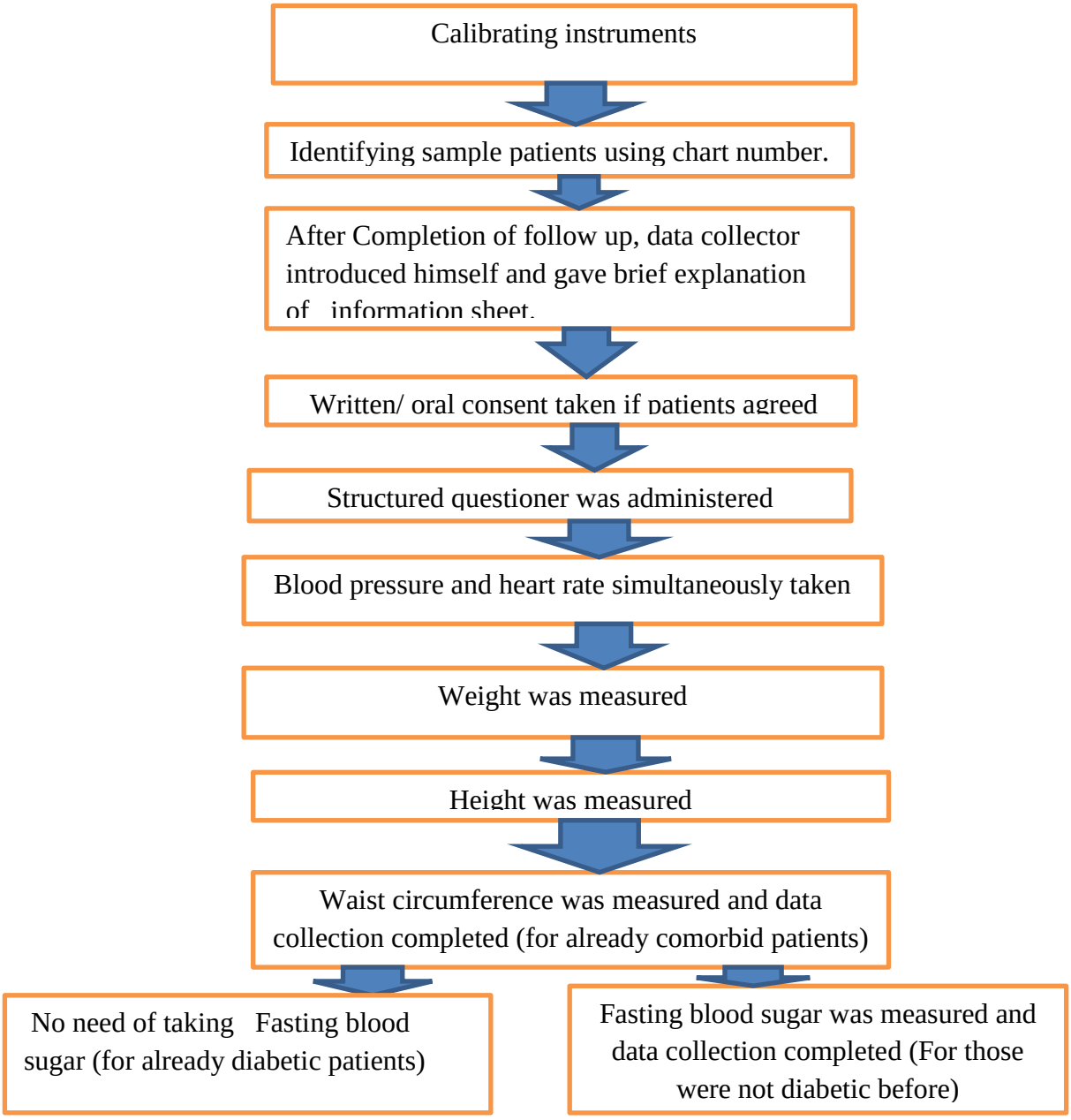

Figure 2: Flow diagram of data collection among hypertensive patients in chronic follow up unit of DRH May 2019.

4.6. Study Variables

4.6.1 Dependent Variables

Magnitude of diagnosed and undiagnosed diabetes mellitus

4.6.2. Independent variables

Socio-demographic characteristics: - age, educational status, income, marital status, employment, sex and residence.

Behavioral measurements: tobacco use, alcohol consumption, physical activity label, diet and sedentary behavior

Biological variables: -heart rate, diastolic BP, systolic BP, BMI, waist circumference and waist to height ratio

Family related variable: Family history of DM.

Hypertension related variable: Duration of hypertension, use of traditional healer for hypertension, use of prescribed medication or advice for hypertension.

4.7. Operational definitions and definition of terms

Patient was categorized as **diabetic** if two fasting plasma glucose with the same machine (FPG) ≥126 mg/dL(≥7.0mmol/l) or with a previous diagnosis (20, 51).

Patient was categorized as pre **diabetic** if (FBS) fasting plasma glucose is 100-125 mg/dL (51).

Patient was categorized as **Overweigh**t if body mass index is between 25.0 and 29.9 kg/m^2.(51)

Patient was categorized as **Obese** if body mass index is greater than or equal to 30.0 kg/m^2 or more (51).

Waist circumference of <94cm for male and <80cm for female was acceptable range.

Waist circumference >94 for male and >80 cm for female was Increased risk.

Waist circumference >102 cm for male and >88 cm for female was Substantially increased risk.(51)

Patient was categorized as having normal waist to height ratio if waist circumference (cm)/height (m) less than 0.5 and Patient were categorized as waist to height ratio above normal if it is above 0.5 (49)

Tobacco use: tobacco use is defined as the daily use of smoked or smokeless tobacco, in the form of cigarettes, cigars, pipes, snuff and other local tobacco products (52)

Highly physically active: when one person's metabolic equivalent(MET)(53)was greater than or equal to 3000 MET.

Physically active: when one person's MET was equal to 600-2999 MET.

Physically inactive: when one person's MET were less than 600 MET.

Insufficient fruits and vegetables consumption: When an individual consumes less than the recommended five servings of fruits or vegetables daily (52)

One serving of vegetable: Was considered as 1 bowel of raw green leafy vegetable or 1/2 cup of other vegetable (cooked or chopped raw) (52)

One serving of fruit: One medium sized banana ,apple ,mango or orange(1/2 cup of fruit from juice) (52).

4.8 Data quality management

For data collection 4 baccalaureate professional nurses and 1 supervisor who can communicate in Amharic language were recruited. Training was given for them for one day on the objectives, relevance of the study, and confidentiality of the study, respondent's right and data collection process. They were trained on how to conduct the physical measurements and correct application of the instruments. The tool was used repeatedly in our country. Instruments were checked for functionality before data collection and calibrated for each participant. For chemistry machine quality control was done every morning. Daily supervision was held by supervisor and the investigator. Supervisor was used to check all procedures and completeness of formats randomly. To ensure data quality, pre-test was conducted on 5% of total sample size in another hospital, Boru hospital. Discussion was held based on the result of the pre-test and accordingly, jump errors were corrected on the questionnaire.

At the end of the day filled out questionnaires were checked for completeness and consistency of information by the supervisor and principal investigator and errors were manually edited. Any ambiguity and other encountered problems were addressed. Interviewed patients' question chart was given unique identification number to revisit in case of incomplete and inconsistent responses based on the given number of the code. To ensure confidentiality, access to data was restricted by passwords, only available to the principal investigator as well as questionnaires was kept under secured board by the principal investigator and only availed to authorized

persons. Double entry of data was implemented to reduce data entry error on daily basis after checkup.

4.9. Data analysis procedures

Data was coded and entered in to the computer using Epi Data entry client 4.2.1. Then the data was exported by Epi Data manager 4.4.1 to SPSS version 23 for further analysis. The data was checked for missing values and incompleteness. Multicolleanearity was checked by using VIf (variance inflation factor). Missing value was treated by nearby means. Descriptive statistics which involve frequency and percentage for the dependent and independent variables was used. Measures of central tendency was calculated and utilized for appropriate continuous data variables to describe the data. Variables observed in bivariate analysis at P value 0.25 and less were candidate for multivariable logistic regression analysis. Logistic regression was used to explore the potential risk factors and P value < 0.05 was considered significant with odds ratio. The strength of statistical association was measured by adjusted odds ratios and 95% confidence intervals. Independent t test was used to compare means. Backward logistic regression was used to develop final model and model fitness was checked. Finally, results were summarized and presented by using texts, tables and graphs.

4.10. Ethical consideration

After approval of the proposal, ethical clearance and formal letter was obtained from Jimma University institute of health review board. The necessary permission letter was obtained from South Wollo zone health office and Dessie referral hospital administrative office. Co-operation latter was obtained from Jimma University school of nursing and midwifery. Informed written consent was obtained from the study participants after explaining full information of the study for those who gave blood for sugar determination. But only informed oral consent was taken for already comorbid respondents. The study purpose, procedure, duration and other detail explanation of the study and participants writes was clearly explained for study participants by reading Amharic translated full participant information sheet. For this purpose, a consent form was attached as a cover page of each questionnaire stating about the general objective of the study and issues of confidentiality which was discussed by the data collectors before proceeding with the data collection.

Confidentiality was assured by excluding their name during the period of data collection. The sample taken for blood for sugar determination was discarded immediately after blood sugar determination as per the hospital sample discarding protocol.

After the test each patient who gave blood for blood sugar determination were told their diabetic status. Those who were newly diagnosed diabetic and pre diabetic were counseled on life style modification and linked to the hospital choric diabetic follow up unit. We recommend of the hospital choric diabetic follow up unit to encourage patients with pre-diabetic sugar level to check regularly their blood sugar level.

4.11. Dissemination of result

The findings of the study will be disseminated through presentation to Jimma University staffs and invited guests. Discussion will be held with South Wollo health office and DRH (Dessie referral hospital) administrative office. Finally, written documents will be submitted to Jimma university institute of health, health research and post graduate director office of the institute, school of nursing and midwifery, DRH and South Wollo health office. It will be presented in different conference and will be published on reputable peer reviewed scientific journal.

Chapter 5: Results

Four hundred seven known adult hypertensive patients were included in this study with a response rate of 96.2 %. Sixteen respondents were not considered for the analysis because of missing of responses for outcome variable. The result includes socio demographic characteristics, behavioral measurements, proportions and associated factors.

5.1 Socio-demographic Characteristics

Out of 407 respondents 206 (50.6%) were males. The age of the respondents ranges from 24-90 years. The mean (±SD) age of the respondents was found to be 60 (±12.099) years. Regarding their marital status, 289 (71 %) was married. Concerning the educational status 227 (53.8%) had not attended formal school, but 97 (23.8 %) had completed college and above. From all respondents 155 (38.1 %) were house wives. Farmer and government employed have similar magnitude each accounting 141 (34.5 %). Almost half of the respondents earn 1000- 2000 Ethiopian birr monthly 192 (47.2%). Majority, 344(84.5%) live in urban

Table 1Socio-demographic characteristics of the study participants in DRH, May 2019

Variable	Category	Total	
		N^{o}	%
Gender	Male	206	50.6
	Female	201	49.4
Educational status	no formal schooling	227	55.8
	primary school completed	38	9.3
	Secondary school completed	45	11.1
	college and above	97	23.8
Residence	Urban	344	84.5
	Rural	63	15.5
Marital status	not married	8	2.0
	Married	289	71.0
	Divorced	30	7.4
	Widowed	80	19.7
Occupation	Farmer	71	17.4
	government employed	70	17.2
	private employed	15	3.7
	Merchant	19	4.7
	house wife	155	38.1
	Retired	57	14.0
	un employed	17	4.2
	Other	3	0.7

Age	18-40	32	7.9
	41-65	239	58.7
	Above 65	136	33.4
Monthly income	Less than 1000 Birr	177	43.5
	1000-5000 Birr	192	47.2
	Above 5000 Birr	38	9.8

5.2 Behavioral measurements of respondents among DRH hypertensive patients

The number of current smokers' was 4 (0.98 %) and all smoked manufactured tobacco products whilst the number of past smokers' was 16 (3.9 %) and smoked manufactured tobacco products. The mean duration after stopping of smoking was 13.2 years (SD± 11.7). Current alcohol consumers were 35 (8.6%) and of which 17 (4 %) of them drink less than once a month and only one respondent drinks daily. From all respondents 256 (62.9 %) use solid oil at room temperature , 141 (34.6%) use liquid oil at room temperatures ,9 responded as non in particular oil selection and only 1 person responded as non-user of oil. From all respondents 232 (57.1%) are physically inactive, 155(38.1%) are moderately active and 20 (4.9%) are highly physically active. Except one respondent 406(99.7) respondents were inadequate fruit/ vegetable consumer. None of the respondents were traditional healer user now.

Table 2 Behavioral measurement characteristics of the study participants in DRH, May 2019.

Variable	Category	Total	
		N^{o}	%
Current smokers	Yes	4	0.8
	No	403	99.02
Past smokers	Yes	16	3.9
	No	391	96.1
Last year alcohol use	Yes	35	8.5
	No	372	91.5
Last month alcohol use	Yes	16	45.7
	No	19	54.3
Physical activity label	Physically Inactive	232	56.5
	Physically moderately active	155	38
	Physically highly active	20	5
Fruit/vegetable use	Adequate	1	0.2
	Inadequate	406	99.8
Oil type at room temperature	use solid oil	256	(62.9%)
	use liquid oil	141	(34.6%)
	Non in particular	9	2.2
	Non user at all	1	0.2

The mean weight and BMI were higher among females than males but not statically significant. Systolic blood pressure, diastolic blood pressure and pulse were higher among males than females but not statically significant. Continuous data of respondents were compared using independent t test based on sex and summarized in the table below.

Table 3 Anthropometric and clinical characteristics of hypertensive patients in DRH, May 2019

	Total(N=407)	Female(N=201)	Male(N=206)	P value
Variable	mean(SD)	mean(SD)	mean(SD)	
Age	60.39(12.099)	60.16(12.107)	60.61(12.118)	0.73
Monthly income mean	2085.97(4795.885)	2320.25(6563.011)	1857.37(1850.231)	0.33
Duration of sitting per day in minute	419.41(130.749)	420.00(126.996)	418.83(134.616)	0.9
Weight (kg)	61.6720(12.28414)	62.4428(11.24846)	60.9199(13.20087)	0.21
Waist circumference cm	89.2187(13.60161)	89.6269(12.89283)	88.8204(14.27950)	0.55
Pulse	85.65(36.111)	83.80(14.249)	87.45(48.764)	0.3
Systolic Blood pressure	131.43(20.029)	130.80(19.440)	132.05(20.617)	0.52
Diastolic blood pressure	83.41(13.014)	82.37(13.067)	84.42(12.913)	0.11
BMI	23.6772(4.16196)	23.7300(3.86177)	23.6258(4.44419)	0.88
Duration of hypertension in years	4.6043(5.48208)	4.3156(5.16971)	4.8860(5.76928)	0.29

5.3 Magnitude of Diabetes mellitus

The Magnitude of newly diagnosed diabetes mellitus was 6.8% (29). The Magnitude of previously diagnosed diabetes mellitus was 22.35 % (91) and the total magnitude of diabetes mellitus among DRH hypertensive patients was 29.2 % (119).

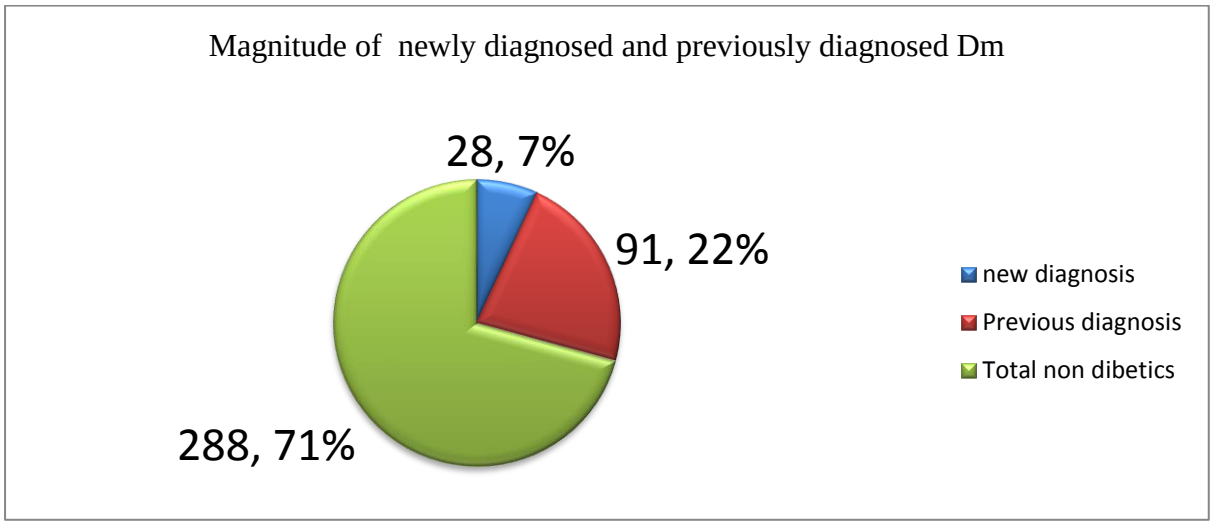

Figure 3 Proportion of newly diagnosed and previously diagnosed DM in DRH

The magnitude of pre-diabetics was 21.37 % (87) from all hypertensive patients. From newly diagnosed DM patients 19(67.9%) were male and 9 (32.1%) are females. Respondents who have no formal schooling covers 47(39.5) from total DM. Urban residence covers 108 (90.8%) from total DM but married accounts 92(77.3%). Magnitude of previously diagnosed and newly diagnosed DM among different socio-demographic characteristics of the study participants were shown in the table below.

Table: 4 Magnitude of diabetes mellitus among different socio-demographic characteristics of the study participants in DRH, May 2019

Variable	Category	Previously diagnosed	Newly diagnosed	Total DM
Sex	Male	46(50.5%)	19(42.9%)	65(56.3%)
	Female	45(49.5%)	9(57.1%)	54(43.7%)
Educationa l status	no formal schooling	37(40.7%)	10(35.7%)	47(39.5)
	primary school completed	15(16.5%)	4(14.3%)	19(16.0%)
	secondary school completed	12(13.2%)	2(7.15)	14(11.8%)
	college and above	27(27.8%)	12(42.9%)	39 (32.8%)
Residence	Urban	82(90.1%)	26(92.9%)	108(90.8%)
	Rural	9(9.9%)	2(7.1%)	11(9.2%)
Marital status	not married	0(0%)	2(7.1%)	2(1.7%)
	Married	74(81.3%)	18(64.3%)	92(77.3%)
	Divorced	3(3.3%)	3(10.7%)	6(5.0%)
	Widowed	14(15.4%)	5(17.9%)	19(16.0%)
Occupation	Farmer	9(9.9%)	3(10.3%)	12(10.1%)
	government employed	23(25.3%)	9(32.1%)	32(26.9%)
	private employed	6(6.6%)	0(0)	6(5.0%)
	Merchant	7(7.7%)	1(3.6%)	8(6.7%)
	house wife	29(31.9%)	6(21.4%)	35(29.4%)
	Retired	14(15.4%)	6(21.4%)	20(16.8%)
	Un employed	3(3.3%)	2(7.1%)	4.2(3%)
	Other	0(0)	1(3.56%)	1(0.8)
Income	Below 100 ETB	36(39.9%)	9(32.1%)	45(37%)
	1000-5000 ETB	42(21.9%)	13(46.4%)	57(47%)
	Above 5000 ETB	13(14.3%)	6(21.4%)	19(16%)
Age	18-40	4(4.4%)	4(14.3%)	8(6.6%)
	40-65	58(63.7%)	19(64.9%)	79(65.2%)
	Above 65	29(31.9%)	5(17.9%)	34(28%)

The Magnitude of DM among non-current smokers was 29.9 %(119). From this magnitude 28 (8.9%) were newly diagnosed and 91(22.8%) are previously diagnosed. All current smokers' respondents were free from DM until this data collection period. The magnitude of DM among past daily smokers were 60 %(10) and it covers 4.7% from all DM magnitude.

There were 35(8.5%) alcohol users and from these 20(4.9%) became diabetic which makes the magnitude of DM among alcohol users is 20.6%. From this magnitude 7 (30.4%) were newly diagnosed and 13 (37.1%) are previously diagnosed. The proportion of DM among non- alcohol users was 57.2 % (99).

The proportion of DM among physically inactive, moderately physically active and highly physically active respondents were 69(29.7%), 45 (29%) and 5 respectively. The proportion of newly diagnosed DM were 13 (7.3%) and 15 (12%) both in physically inactive and moderately physically active respondents.

Table 5:Magnitude of diabetes mellitus among different behavioral characteristics of the study participants in DRH, May 2019

Variable	Category	Number	Newly Diagnosed DM	previously Diagnosed Dm	Percent
current smoker	No	403	28(8.9%)	92 (22.8 %)	119(29.2%)
	Yes	4	0	0	0
Past daily smoker	No	391	24(7.8 %)	85(21.7%)	109(27.9%)
	Yes	16	4(0.9%)	6(3.6&)	10(4.7%)
Alcohol	No	35	7 (30.4%)	13 (37.1%)	20(26.6%)
	Yes	372	21 (7.1%)	78(21%)	99(57.2%)

The magnitude of new previous and overall DM among WHR above 0.5cm is 28(6.8%), 87 (21.3%) and 115(28.2) respectively. The magnitude of new previous and overall DM among WHR 0.5cm and below and BMI below 18.5 are 0(0%) 4(1%) and 4(1%) respectively**.**

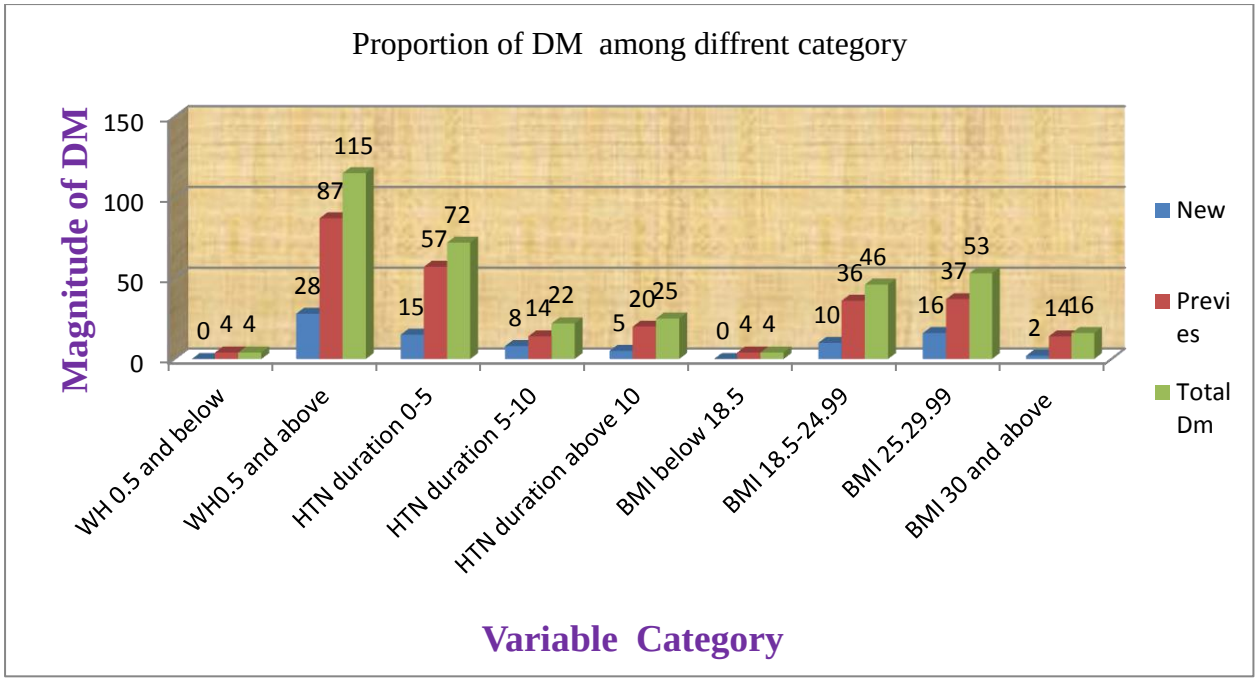

Figure 4: Proportion of new, previous and total DM among different biological factors in DRH

5.4 Factors associated with total Diabetes mellitus

By running binary logistic regression we have seen government employee, merchant, ,retired ,urban residence ,Income above 5000, past daily smoker, alcohol use in the last one year , primary school completed, college completed, liquid oil user , having Family history of DM,WHR above 0.5,WC above 102cm for male and above 88cm for female, HTN duration 5-10 , HTN duration above 10 years , SBP above 140 mmhg DBP 90 above mmhg BMI 25-29.9and above BMI 30 were significantly associated with diabetes mellitus.

At bivariate label employment, residence, educational label, income, past daily smoker, alcohol use in the last one year ,types of oil, family history of DM,WHR,WC,HTN duration,SBP, BMI and DBP were candidate for multivariate analysis because their P value was less or equal to 0.2500 during binary logistic regression.

Table 6: Binary logistic regression analysis showing factors of diabetes mellitus patients among hypertensive patients in DRH, May 2019.

Variables	Category	DM status		P value	COR (95%CI)
		Yes	No		
Educational label	No formal schooling	47	180		1
	Primary school completed	19	19	0.000	3.83(1.87,7.8)
	Secondary school completed	14	31	0.129	1.73(0.85,3.51)
	College and above	39	58	0.000	2.57(1.53,4.32)
Residence	Urban	108	236	0.028	2.16(1.08,4.3)
	Rural	11	52		1
Income	Below 1000	45	132		1
	1000-5000	55	137	0.487	1.17(0.74,1.86)
	Above 5000	19	19	0.003	2.93(1.42,6.02)
Employment	Farmer	12	59		1
	Government	32	38	0.00	4.14(1.90-9.02)
	Private employed	6	9	0.054	3.27(0.98-10.93)
	Merchant	8	11	0.023	3.57(1.18, 10.76
	House wife	35	120	0.330	1.43(.69-2.96)
	Retired	20	37	0.020	2.65 (1.16, 6.06)
	Unemployed	6	14	0.247	2.04(0.60-6.89)
Past daily smokers	No	109	282		1
	Yes	10	6	0.006	4.31(1.53,12.15)
Alcohol use in last 1 year	No	99	273		1
	Yes	20	15	0.000	3.67(1.81,7.46)
Types of oil most often used	Solid at room temperature	60	196		1
	Liquid at room temperature	56	85	0.001	2.15(1.38,3.35)
	Non in particular selection	3	7	0.008	0.14(0.03,0.6)
DM family history	No	84	265		1
	Yes	35	23	0.000	4.8(2.69,8.58)
BMI	Below 18.5	4	29		1
	18.5-24.99	46	203	0.373	1.64 (0.55, 4.9)
	25-29.99	53	46	0.000	8.35(2.73 ,25.54)
	30 and above	16	10	0.000	11.60(3.13,4.3.07)
WHR	0.5 and below	4	135		1
	Above 0.5	115	153	0.000	25.36(9.12,17.58)
HTN duration	Below 5 year	72	224		1
	5-10 year	22	33	0.002	0.39(0.22,0.72)
	Above 10 year	25	31	0.621	0.82(0.38,1.75)
Systolic BP	Below 140 mmhg	58	185		1
	Above 140 mmhg	61	103	0.004	1.88(1.22, 2.91)
Diastolic BP	Below 90 mmhg	52	196		1
	Above 90 mmhg	67	92	0.000	2.74(1.77,4.25)
Waist circumference	102 and below for male And 88 and below for female	67	261		1
	Above 102 and for male And above 88 and for female	52	27	0.000	7.5(4.38,12.83)

By selecting variables that have P value 0.25 and less we entered to multiple logistic regressions. By running multiple logistic regressions we found that family history of Dm, waist to height ratio and waist circumference were significantly associated with Diabetes mellitus.

The odds of developing DM among hypertension patients with waist circumference above 102 cm for males and above 88 cm for females were three times more likely comparing to hypertension patients with waist circumference 102 cm or below for males and 88 cm and below for females (AOR: 3.2,95%CI:1.58, 6.53).

Presence of history of diabetes mellitus in the family increases the chance of developing DM by nearly five times comparing to those who have no family history of diabetes mellitus (AOR: 4.6, 95%CI: 2.2,9.48). Similarly those who have waist to height ratio above 0.5 were nearly twenty two times more likely to develop DM comparing to those who have waist to height ratio 0.5 and below (AOR: 21.55, 95% CI: 5.62, 82.67).

Table 7: Multivariable logistic regression analysis showing factors of total diabetes mellitus patients among hypertensive patients in DRH, May 2019.

Variable	Category	DM		COR (95%CI)	AOR(95%CI)
		Yes	No		
Family history of Dm	Yes	35	23	4.8 (2.68,8.56)	4.6 (2.2,9.48)**
	No	84	265	1	1
Waist to height ratio	0.5 and below	4	135	1	1
	Above 0.5	115	153	25.37(9.12,70.8)	21.55(5.62,82.67)**
WC	≤88cm for female and ≤102 male	67	261		
	Above 102 for male and Above 88	52	27	7.5(4.38,12.83)	3.2 (1.58, 6.53)*

NB. P value<0.001 =**, P value = 0.001 = *, 1= reference, Over all statistics = 0.76

Model fitness =0.29

5.5 Factors associated with newly diagnosed diabetes mellitus

By running binary logistic regression we have seen some variables were significantly associated with newly diagnosed Diabetes mellitus. There were many common variables that were candidate and significant both in total diabetes mellitus and newly diabetes mellitus. Variables like type of oil, employment, BMI and waist to height ratio were not candidate at bivariate label for newly diabetes mellitus unlike total diabetes mellitus. Variables like, age, number of days with fruit consumption per

week and other variables listed in the table below was candidate for multivariate analysis because their P value was less or equal to 0.2500 during binary logistic regression.

Table7: binary logistic regression analysis showing factors of new diabetes mellitus patients among hypertensive patients in DRH, May 2019.

Variables	Category	New DM status		P value	COR (95%CI)
		Yes	No		
Educational label	No formal schooling	10	179		1
	Primary school	4	21	0.053	3.4(0.98,11.8)
	High school completed	2	30	0.825	1.19(0.25,5.7)
	College and above	12	59	0.004	3.64(1.49,8.85)
Age	18-40	4	24		1
	40-60	19	161	0.56	0.708(0.22,2.2)
	Above 60	5	104	0.079	0.288 (0.88,6.77)
Residence	Urban	26	237	0.162	2.85(0.07,1.15)
	Rural	2	52		1
Income	Below 1000	9	131		1
	1000-5000	13	139	0.493	1.36(0.56,3.29)
	Above 5000	6	19	0.009	4.59(1.47,14.36)
Past daily smokers	No	24	283		1
	Yes	4	6	0.002	7.861(2.07,29.78
Alcohol use in last 1 year	No	21	273		1
	Yes	7	16	0.001	5.6(0.06,0.47)
DM family history	No	22	267		1
	Yes	6	22	0.019	3.31(1.21,9.01)
HTN duration	Below 5 year	15	226		1
	5-10 year	8	34	0.385	3.54(1.39,8.99)
	Above 10 year	5	29	1.365	2.59(0.879,7.67)
Systolic BP	Below 140 mmhg	10	187		1
	Above 140 mmhg	18	102	0.004	0.3(0.13,0.68)
Diastolic BP	Below 90 mmhg	8	198		1
	Above 90 mmhg	20	91	0.000	5.4(0.08,0.43)
Waist circumference	102 and below for male And 88 and below for female	15	264	0.109	9.15(0.05-0.2
	Above 102 and for male And above 88 and for female	13	25		1
Fruit use days	Below 3 day	25	278	0.042	0.329(1.05,16.89)
	Above 3 days	3	11	1	

By selecting variables that have P value 0.25 and less we entered to multiple logistic regressions. By running multiple logistic regressions we found that hypertension duration, past daily smoker, educational level, DBP and WC were significantly associated with newly diagnosed Diabetes mellitus.

The odds of being new diabetic patient was nearly eight times more likely in past daily smokers comparing to non-past daily smokers (AOR: 7.77, 95% CI: 1.47,4.09). The odds of developing new DM among hypertension duration between 5 and 10 years was nearly four times more likely comparing to duration less than 5 years. (AOR= 3.52:95% CI: 1.18, 10.46). The chance of being newly diagnosed diabetes mellitus patients was three times more likely among college and above comparing to those who had no formal schooling. (AOR: 3.142, 95% CI: 1.116, 8.847). The chance of being new diabetic were four times more likely among hypertensive respondents with BP 90mmhg and Above comparing to Diastolic BP below 100 mmhg (AOR: 4.003, 95% CI: 1.561,10.264). Similarly those who have waist to height ratio above 0.5 were eight times more likely to develop newly diagnosed diabetes mellitus comparing to those who have waist to height ratio 0.5 and below (AOR: 7.98, 95% CI: 3.006, 21.21).

Table 8:Multivariable logistic regression analysis showing factors of new diabetes mellitus patients among hypertensive patients in DRH, May 2019

Variable	Category			COR (95%CI)	AOR (95%CI)
Past daily smoker	Yes	4	6	7.861(2.07,29.78)	7.77(1.47,4.09)*
	No	24	283	1	1
DBP	below 90mmhg	8	198		
	90mmhg and Above	20	91	0.3(0.13,0.68)	4.003(1.561,10.264)**
Educational label	No formal schooling	10	179		1
	Primary school	4	21	0.27(0.11,0.6)	1.758,(0.427,7.229)
	High school completed	2	30	0.93(0.27,3.22)	0.539(0.073,3.974)
	College and above	12	59	0.32(0.07,1.56)	3.142(1.116,8.847)*
duration with HTN	below 5 years	15	226	1	1
	5-10 years	8	34	3.54(1.39,8.99)	3.52(1.18,10.46)*
	above 10 years	5	29	2.59(0.879,7.67)	1.84(0.52,6.49)
WC	≤102 for male And ≤ 88 for female	15	264	1	1
	>102 for male And >88 for female	13	25	9.15(3.92,21.37)	7.98(3.006,21.21)**

NB. P value<0.001 =**, P value < 0.05 = *, 1= reference, Over all statistics =0.7

CHAPTER SIX: DISCUSSION

This study was conducted with the aim of assessing magnitude and associated factors of diabetes mellitus among hypertensive patients in DRH. The findings of this study showed that there is significant burden of diabetes mellitus comorbidity among hypertensive patients. This study found that 29.23 % (95% CI: 24.8, 33.6) over all diabetes mellitus and 6.8% (95% CI: 6.6, 7.12) had never diagnosed for DM.

6.1 Magnitude of Overall Diabetes Mellitus

The current study showed the overall magnitude of diabetes mellitus among adult hypertensive patients were 29.2% (95% CI: 24.8, 33.6). The magnitude of overall diabetes reported in our study was in line with the magnitude reported by other study conducted in China, where 32% hypertensive patients were diabetics (27).

This finding was greater than the prevalence of diabetes reported by the study conducted among newly diagnosed hypertensive patients in Cameron (7.7%) (26). The possible reason for greater prevalence in our study would be due to the reason that the study subjects in Cameroon study participants were newly diagnosed hypertensive patients. There were also study period differences between the two studies which may lead to prevalence difference. In addition to this the mean age was 50.8±11 years in Cameroon study which is smaller than our study participant mean age of 60.39 ±12 which might contribute to less prevalence (26).

This magnitude is also slightly larger than study done in China in 2013 which was 24% and the possible reason for this difference might be that due to socioeconomic differences. The socio economic difference between the two communities may lead to difference in health seeking behavior and follow up quality. There may be poor follow up quality and less health seeking behavior in our community leading to high chance of developing DM.

Our study magnitude was slightly greater than 21.8% prevalence reported from Algeria (54) and the possible difference may be that our study participants mean age is greater than the Algeria study participants and higher age may be associated with higher diabetes prevalence. Additionally there may be socio economic difference between the two communities which may lead to difference in health seeking

behavior and follow up quality. There may be poor follow up quality and less health seeking behavior in our community leading to high chance of developing DM. Proportion of previously diagnosed DM among hypertensive patient was 22.35 % (91). This magnitude was slightly higher than study conducted in China 15.86% (42). This may be due to lack of prevention of DM after diagnosed for HTN in our community but better risk reduction and strict control of BP in Chines may contribute this difference. There may be poor follow up quality and less health seeking behavior in our community leading to high chance of developing DM.

6.2 Magnitude of Newly Diagnosed Diabetes Mellitus

The current study showed magnitude of newly diagnosed diabetes mellitus among adult hypertensive patients was 6.8% (95% CI: 6.6, 7.12). Our new DM Proportion is exactly the same to study done in Cameroon both of them 6.8% (29)

Our study was slightly less than study done in in China 8% (39). One reason for this may be that Chines are more smoker than Ethiopians which may increase the risk of being diabetic. Our new DM magnitude was less than study done in Kenya 14% (27). The reason to this difference is that study done in Kenya used glycated hemoglobin (HbA1C) to determine diabetes status, which may raise DM cases due to better diagnostic quality, but we used FBG method. From Kenya study respondents over half (56.3%; 188/334) of the respondents had truncal obesity, 40 % (134/334) were found obese according to their BMI and almost a quarter of the respondents (21.3%-71/334) reported a history of familial diabetes. These key risk factors are more prevalent than our study counterpart. These key risk factors may make DM prevalence higher in Kenya study than ours. Magnitude of newly detected DM in our study area is also smaller than study done in Uganda Kampala (25) and the possible difference may eight year time gap between the two studies. Another reason for the difference is that the two study area setup is different that means our study site is zonal referral hospital but the Uganda one is national referral hospital which may contribute magnitude difference.

Magnitude of unrecognized DM were 20.8% in hypertensive patients aged 40 to 79 years in Southwest China which is much larger than our newly detected 6.8% Dm magnitude. The possible justification for this difference may be due to usage of an

oral glucose-tolerance test (OGTT) for assessments. This study also reported that 65% of DM cases would be missed if only FBS used. Another reason for the two study difference is the study done in China limited the minimum age to above 40 years and this may contribute for larger magnitude (24). Our study revealed that newly diagnosed diabetes magnitude was less than study conducted in America Minnesota that reported 19.6% new diabetes mellitus diagnosis among hypertensive patients (55). The reason for this difference could be presence of high magnitude of DM and HTN in America. There were also extreme gap of socioeconomic difference between the two communities which may contribute high DM magnitude gap. Our finding may reflect the low awareness of the community, the public and primary health care providers about DM.

6.3 Associated Factors for Total Diabetes Mellitus

Among biological variable waist circumference was significantly associated with total Diabetes mellitus. Because our study showed that the odds of developing DM among hypertension patients with waist circumference above 102 cm for males and above 88 cm for females were three times more likely comparing to hypertension patients with waist circumference 102 cm or below for males and 88 cm and below for females

This result was in line with similar study conducted in China (24).This finding is similar with the idea that waist circumference is better indicator of chronic disease risk compared to body mass index. Based on our study waist circumference was important predictor of diabetes mellitus, but BMI is not statically significant.

Similarly those who have waist to height ratio above 0.5 were more likely to develop DM comparing to those who have waist to height ratio 0.5 and below. Our study showed that those who have waist to height ratio above 0.5 were nearly twenty two times more likely to develop DM comparing to those who have waist to height ratio 0.5 and below. This finding is supported by study conducted in china (49). This finding also supported the idea that waist circumference is a better predictor of cardiovascular diseases and type II diabetes compared to BMI and waist to hip ratio (36). The possible reason for the two factor being significance may be that if waist

circumference is higher, then waist to height ratio will be higher than normal. This could be due to change in dietary habits and physical inactivity of study participants which may contribute higher central obesity and increased risk of DM. Obese individuals', adipose tissue may release increased amounts of non-esterified fatty acids, glycerol, hormones, pro-inflammatory cytokines and other factors that are involved in the development of insulin resistance. Insulin resistance is accompanied by dysfunction of pancreatic islet β-cells the cells that release insulin to control blood glucose levels. Abnormalities in β-cell function are therefore critical in defining the risk and development of DM (16).

Our study showed that presence of history of diabetes mellitus in the family increases the chance of developing DM by nearly five times comparing to those who have no family history of diabetes mellitus. This is supported by similar study conducted in East Gojjam, Kenya, Uganda, China and Japan (22, 25, 27, 39, 48). The genetic hereditability and predisposition of DM was supported by our study.

6.4 Associated Factors for Newly Diagnosed Diabetes Mellitus

This finding revealed that from behavioral measurements history of previous daily smoking was significantly associated with new diabetes mellitus diagnosis. The odd of being new diabetic patient was nearly eight times more likely in past daily smokers comparing to non-past daily smokers. This is supported by similar study conducted in China and in east Gojjam Ethiopia (22). The relationship between smoking and diabetes mellitus is multi-factorial and may involve genetic and environmental factors and pancreatitis. Smoking may also predispose to insulin resistance and finally diabetes mellitus.

The probability of developing new diabetes among hypertension patients was significantly associated with hypertension duration. Our study showed that the odds of developing new DM among hypertension duration between 5 and 10 years was nearly four times more likely comparing to duration less than 5 years. The possible reason for this would possible longer duration HTN leads insulin resistance and finally leads to DM.

Our study showed that DBP of 90 mmhg and above were predictor of new diabetes mellitus. From our study we have seen that chance of being new diabetic were four

times more likely among hypertensive respondents with BP 90mmhg and above comparing to Diastolic BP below 100 mmhg. This is in line with study conducted in United Kingdom and India (49). The reason might be that higher blood pressure and the less control over it may result more chance of developing DM and other CVS problems due to common pathological factors (45). Higher blood pressure might predispose to higher fasting blood sugar and insulin resistance which may definitely change to DM.

Higher educational label was positively associated with new diabetes mellitus comparing to those who had no formal schooling. Possible justification could be higher educational labels are related with higher monthly income and higher physical inactivity. This in turn may lead to high waist circumference and high waist to height ratio that may lead diabetes mellitus. Another reason might be that 48% our college and above completed respondents were physically inactive which is much high physical inactivity comparing to uneducated group. From 97 college and above respondents only 4(4.1%) were highly physically active. This might lead to less energy utilization, more fat accumulation, and central obesity and decreased insulin sensitivity. Such mechanism might contribute for the association between higher educational label and DM. Here our finding is on the opposite side of study conducted in China and Kenya on hypertensive patients that reported the association between DM prevalence and education level was negatively associated (27, 39). Possible justification could be our higher educational labels are related with higher physical inactivity and mild office work but the physical exercise and work habit of our study population and the two communities is different.

6.5 Strength and Limitations

6.5.1 Strength

The use of waist to height ratio as one independent variable is considered as strength because this variable is less affected by ethnicity and sex difference and not commonly used in Ethiopia.

6.5.2 Limitations

The study findings can't be generalized to the population as this was a hospital based cross-sectional study. Obesity parameters such as WC and BMI cutoff sizes may be different for low-income countries like Ethiopia. Moreover, fasting blood glucose test that we have used for diagnoses of diabetes is weak in identifying diabetes mellitus. In addition, older study population may affect the diabetes estimate in our study. Related to its design, it is difficult to establish cause effect relationship between hypertension and diabetes mellitus using crosectional study.

CHAPTER SEVEN: CONCLUSION and RECOMMANDATION

7.1 Conclusion

The prevalence of newly diagnosed and known diabetes was significantly heigher among hypertensive patients. Around 1 in 14 hypertensive patients were diagnosed newly for diabetes and 1 in 3 of hypertensive patients were diabetes patients. Having family histories of diabetes, waist to height ratio above 0.5 and high waist circumference were significantly associated increased chance of developing overall diabetes mellitus. Longer hypertension duration, being daily smoker, raised diastolic blood pressure; higher educational label and high waist circumference were significantly associated with increased chance of newly diagnosed diabetes mellitus patients.

7.2 Recommendation

For federal ministry of health

- Since the prevalence of diagnosed and undiagnosed diabetes mellitus was higher, ministry of health should need to focus on diabetes mellitus and hypertension comorbidity prevention, screening and early treatment.

For Amhara Regional health office

- The regional health office should give emphasis to non-communicable disease especially hypertension and diabetes mellitus comorbidity like communicable disease.

For Dessie Referral Hospital

- DRH should focus on screening prospectively on screening of diabetes among hypertensive patients and vis-à-vis.
- Hypertensive patients who have risk factors like smoking, family history of DM and longer duration with hypertension should be strictly followed.
- Health professional should aware their patient about the complication and health impact of the two giant non communicable diseases.
- Routine public education campaigns should be conducted to create awareness about lifestyle modification and the necessity of central obesity reduction

For Researchers

- We recommend other researcher to conduct cohort study to identify causal relationship between hypertension and diabetes mellitus

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Appendix

Appendix A: Participant information sheet

My name is Mekuriaw Wuhib and I am Adult health nursing student at Jimma University. I am doing a research entitled "magnitude of both diagnosed diabetes and undiagnosed diabetes mellitus and associated factors among adult hypertensive patients in DRH, North east Ethiopia 2019.

Purpose: The objective of the study is to determine the Magnitude of Diabetes and undiagnosed diabetes mellitus among adult hypertensive patients in DRH, North east Ethiopia 2018.

What it is involved: The interview will take 15-20 minute and we will measure your height, weight, waist circumference, blood pressure, heart beat and blood sugar label by taking blood from your finger after you fast more than 8 hours. We will take 2 ml of blood from your vein and your blood sugar label will be determined. The he sample will be immediately discarded without further storing of it. This may cause some mild pain.

Random selection: You have been randomly selected to be part of this survey and this is why we would like to interview you.

Study procedures: You're approached to the study team member(s) who will explain the details of the study to you and ask for your consent to participate in the study. If you are willing to participate in this study, you will be asked to sign on a consent form.

Benefits: The knowledge gained from this work is believed to help the government to tackle this problem.

Confidentiality: the result of the study and related information only will be used for the purpose of this study. Your name will not be used on the sample questionnaire and/or any report that might result from the study. We will use codes specific to the study and only the principal investigator can access the link of the code with the participant's information.

Sharing the result: At the end of this study, we will write a report about the results of the study through publication or any other means. The reports won't bear any information relevant to your personality. We assure you the confidentiality of such information.

Right to refuse: Since participation in this study is entirely voluntary. You can refuse to participate in this research at any time. Your refusal to participate in this study will not affect any of the benefits you are supposed to get from the center.

Freedom to ask question or raise concerns: If you have any question(s) or concern(s) regarding the study; you can forward them with the address indicated below any time at:

Principal investigator Mekuriaw Wuhib

Phone: - 0921268193E-mail: -eyasuwuhib@gmail.com

Appendix B: Consent Form and questioners

Consent form: For the survey, physical measurement and for Biochemical value determination

I have been informed about the objectives, risks and benefits of the study on Magnitude of Diabetes and undiagnosed diabetes mellitus among adult hypertensive patients in DRH. I have also been informed about my rights not to participate in the study and withdraw any time without any consequences. I was also given opportunity to ask questions. Based on the information provided above,

I have agreed to participate in the study. ☐

I haven't agreed to participate in the study ☐

Name of data collector _____ Signature ……. Date: ------

Unique identification (if agreed) _____ Signature……

Jimma university school of nursing and midwifery

I. Socio demographic information

Socio demographic information		Response	Code
201	Sex (Record Male/Female as observed)	Female Male	
202	How old are you (years)	_____	
203	What is the highest level of education you have completed?	1.No formal schooling 2.Primary school completed 3.Secondary school completed 4.College /University completed	
204	Which of the following best describes your main work status over the last 12	1.Farmer	

	months?	2.Government employee 3.Non-government employee 4.Merchant 5.House wife 6.Retiered 7.Unemployed 8. Other	
205	What is your marital status?	1 .Single 2. Married 3 Divorced 4 Widowed	
206	Taking the past year, can you tell me what the average earnings of the household have been per month (in birr)?	Per month _____	
207	Residence	Urban 1 Rural 2	

II. Risk factors: Tobacco use now I am going to ask you some questions about various health behaviors. This includes things like smoking, drinking alcohol, eating fruits and vegetables and physical activity. Let's start with tobacco.

Questions		Response	Code
301	Do you currently smoke any tobacco products, such as cigarettes, cigars or Shisha?	Yes No If No, go to 306	T1
302	If Yes, do you currently smoke tobacco products daily?	Yes No If No, go	T2

		to 306	
303	How old were you when you first started smoking daily?	Age (years) _____ Don't remember ____ If known, go to 305	T3
304	If you don't remember, do you remember how long ago it was?	In Years _____ If known, go to 305	T4a
		OR in months _____ If known, go to 305	T4b
		OR in Weeks _____	T4c
305	On average, how many of the following do you smoke each day?	Manufactured cigarettes _____	T5a
		Hand –rolled cigarettes _____	T5b
		Shisha full of tobacco _____	T5c
		Cigars _____	T5d
		Other (specify) _____	T5e
306	In the past, did you ever smoke daily?	Yes No If No, go to 315	T6
307	If yes, how old were you when you stopped smoking daily?	Age (years) _____ Don't remember _____	T7
308	If you don't remember how long ago did you stop smoking daily?	Years ago_____	T8a
		Or Mothers ago _____	T8b

		OR Weeks ago _____	T8c

Alcohol Consumption: The next questions ask about the consumption of alcohol.

	Questions	Response	Code
309	Have you consumed alcohol (such as beer, wine, Tella, Tej, Katikala)	Yes No If No, go to 315	A1
310	In the past 12 months, how frequently have you had at least one drink?	Daily 5-6 days per week 1-4 days per week 1 –3 days per month Less than once a month	A2
311	When you drink alcohol, on average, how many drinks do you have during one day? (show the standard measuring unit)	Number _____ Don't know _____	A3
312	Have you consumed alcohol (such as beer, wine, Tella, Tej, Katikala) with in the Past 30 days?	Yes No if No, go to 314	A4
313	During each of the past 7 days, how many standard drinks of any alcoholic drink did you have each day?	Monday _____	A5a
		Tuesday _____	A5b
		Wednesday _____	A5c
		Thursday _____	A5d
		Friday _____	A5e
		Saturday _____	A5f

		Sunday _____	A5g
314	In the past 12 months what was the largest number of drinks you had on a single occasion, counting all types of standard together?	Largest number _____	A6

Diet habit: The next questions ask about the fruits and vegetables that you usually eat. I have a nutrition card here that shows you some examples of local fruits and vegetables. Each picture represents the size of a serving. As you answer these questions please think of a typical week in the last year.

Questions		Response	Code
315	In the typical week, on how many days do you eat fruit (defined during interview)?	Number of days _____If zero day's go to317 Don't know _____	D1
316	How many servings of fruit do you eat on one of those days?	Number of servings _____ Don't know _____	D2
317	In a typical week, on how many days do you eat vegetables?	Number of days _____If zero day's go to 319 Don't know _____	D3
318	How many servings of vegetables do you eat on one of those days?	Number of servings _____ Don't know _____	D4

319	What type of oil fat is most often used for meal preparation in your household?	1.Vegetable oil (solid at room temperature) 2.Palm oil(liquid at room temperature 3.Butter or ghee 4.Other (specify)_____ 5.None in particular 6.None used 7.Don't know	D5

Physical Activity: Next I am going to ask about the time you spend doing different types of physical week. Please answer these questions even if you do not consider yourself to be a physical active person.

Think first about the time you spend doing work. Think of work as the things that you have to do such as paid or unpaid work, study/training, household chores, harvesting food/crops, fishing or hunting for food, seeking employment. In answering the following questions 'vigorous – intensity are activities that require hard physical effort and cause large increases in breathing or heart rate, 'moderate – intensity activities' are activities that require moderated physical effort and cause small increases in breathing or heart rate.

Questions		Response	Code
Activity at work			
320	Does your work involve vigorous – intensity activity that causes large increases in breathing or hart rate like for at least 10 minutes continuously?	Yes No If no, go to 323	P1

321	In a typical week, on how many days do you do vigorous intensity activities as part of your work?	Number of day's _____	P2
322	How much time do you spend doing vigorous – intensity activities at work on a typical day?	-----hrs ---minutes	P3a/b
323	Does your work involve moderate –intensity activity, that causes small increases in breathing or heart rate such as brisk walking for carrying light loads] for a least 10 minutes continuously?	Yes No If no, go to 326	P4
324	In a typical week, on how many days do you do moderate intensity activities as part of your work?	Number of day's _____	P5
325	How much time do you spend doing moderate – intensity activities at typical day?	hrs _____ minutes ____	P6a/b
326	Do you walk for at least 10 minutes continuously to get to and from places?	Yes No If no, go to 329	P7
327	In a typical week, on how many days do you walk for at least 10 minutes continually to get to and from places?	Number of day's _____	P8
328	How much time do you spend walking or bicycling for travel on a typical day?	Hrs_____ Minutes_____	P9a/b

Recreational activities: The next questions exclude the work and transport activates that you have already mentioned. Now I would like to ask you about sports, fitness and recreational actives (leisure).

329	Do you do any vigorous – intensity sports, fitness or recreational (leisure) activities that cause large increases in breathing or heart rate like [running of football,] forat	Yes No If no, go to	

	least 10 minutes continuously?	332	P10
330	In a typical week, on how many days do you do vigorous intensity sports, fitness or recreational (leisure) activities?	Number of day's _____	P11
331	How much time doing vigorous – intensity sports, fitness or recreational activates on a typical day?	hours _____ minutes____	P12 a/b
332	Do you do any moderate-intensity sports, fitness or a recreational (leisure) activity that causes a small increase in breathing or heart rate for at least 10 minutes continuously?	Yes No If No, go to 335	P13
333	In a typical week, on how many days so you do moderate-intensity sports, fitness or recreational (leisure) activities?	Number of days _____	P14
334	How much time do you spend doing moderate-intensity sports, fitness or recreational (leisure) activities on a typical day?	hrs ---------- minutes--------	P15 a/b
Sedentary behaviors			
335	How much time do you usually spend sitting or reclining on a typical day?	hrs ---------- minutes-------	P16 a/b

Diabetes mellitus: Now I would like to you question history of diabetes mellitus, treatment or medical care that you may have received.

History of diabetes		
Questions	Response	Code

401	Do you have family history of DM?	Yes No	H1
402	During the past 12 months, have you ever been told by a doctor or other health worker that you have diabetes? (are well known DM patient)	Yes No	H2 If no, go to 404
403	Are you currently receiving any of the following treatments for diabetes prescribed by a doctor or other health worker as well as any advice?		
	Insulin	Yes No	H3a
	Oral drug (medication) that you have taken in the last 2 weeks	Yes No	H3b

Raised Blood pressure: Now I would like to ask you question history of hypertension, treatment or medical care that you may have received

Questions		Response	Code
404	How long ago do you diagnosed for hypertension (fill only one of them).	In year------- In month------ In week-----	
410	Are you currently receiving any of the following treatments for raised blood pressure prescribed by a doctor or other health worker as well as any advice?		
	Drugs (medication) that you have taken in the last 2 weeks	Yes No	H7a
	Special prescribed diet	Yes No	H7b

	Advice or treatment to lose weight	Yes No	H7c
	Advice or treatment to stop smoking	Yes No	H7d
	Advice to start or do more exercise	Yes No	H7e
411	During the past 12months have you seen a traditional healer for raised blood pressure or hypertension	Yes No	H7f
412	Are you currently taking any herbal or traditional remedy for your raised blood pressure?	Yes No	H7g

Physical measurement Weight and Height measurement recording form

500	Weight (kg)	
501	Height (cm)	
502	Waist circumference (cm)	
503	Pulse	

600	BP measurement	1st measurement	2nd measurement	3rd measurement	Average
	.				

	Blood sugar Measurements	Response/Result	Code
700	During the last 12 hrs have you had anything to eat or drink, other than water	Yes 1 No 2	
701	Fasting blood glucose	____:____ ____mg/dl	

ተጨማሪመግለጫ

አባሪ: ለተሳታፊየመረጃዝርዝር

እኔመኩሪያዉዉሂብበጅማዩኒቨርሲቲውስጥየአዋቂጤናነርሲንግተማሪነኝ. "

በDRHውስጥበአዋቂዎችደምግፊትታካሚዎችመካከልየስኩአርምርምራማድረግስለሚለውምርምርዓላማ

ቃለ-መጠይቁ 10 ደቂቃይወስዳልእንዲሁምየእርስዎንቁመት, ክብደት, የወገብዙሪያ, የደምግፊት, የልብምትእናየደምስኳርመለያከ 8
ሰዓታትበላይከጾመበኋላደምመውሰድይለካል.ይህአንዳንድቀላልሕመምሊያስከትልይችላል.

በአጋጣሚወይምበእድልምርጫመካሂዱንስለማሳዎቅ:
በዚህየዳሰሳጥናትአካልለመሆንበአጋጣሚማለትምበእድልየተመረጡስለሆነለዚህነውለቃለመጠይቅልናነጋግርዎየምንፈልገው.

የጥናትቅደምተከተሎች-
በዚህጥናትለመሳተፍፈቃደኛከሆኑበፈቃደኝነትቅጹላይእንዲፈርሙይጠየቃሉ.

ጥቅማጥቅሞች-
ከስራውየምንገኘነውእውቀትመንግስትይህንንችግርለመወጣትእንደሚረዳታምኖበታል.

ሚስጢራዊነት - የጥናቱውጤትእናተዛማጅመረጃብቻለዚህጥናትዓላማጥቅምላይይውላሉ.
መረጃዉሚስጢራዊእንደሆነእናረጋግጣለን.

ውጤቱንማጋራት:
በዚህጥናትመጨረሻላይየጥናቱንውጤቶችንበህትመትወይምበሊላበማንኛውምመንገድሪፓርትእንል ካለን.

የመቃወምመብት: በዚህጥናትመሳተፍበሙሉበፈቃደኝነትላይየተመሰረተነው.

ጥያቄመጠየቅወይምየሚያሳስቡጉዳዮች: ጥናቱንበተመለከተማንኛውምጥያቄ (ዎች) ወይምስጋት (ቶች) ካጋጠሙ; ከታችበተጠቀሰውአድራሻመጠየቅይችላሉ:

ዋናተመራማሪውመኩሪያዉሂብስልክ: - 0921268193 ኢ-ሜል--eyasuwuhib@gmail.com

ለቃለ-መጠይቅ, የአካልልኬትናለባዮኬሚካልምርምራፈቃደኛመሆንንስለመግለጽ

በDRHውስጥበአዋቂዎችደምግፊትታካሚዎችመካከልየስኩአርምርምራማድረግስለሚለውም ርምርዓላማዎች,

ስጋቶችእናጥቅሞችበቂመረጃአለኝ.በጥናቱላይተሳታፊላለመሆንናምንምውጤትሳያስከትልለ ማቋረጥመብትእንዳለኝምተነግሮኛል.

ጥያቄዎችንለመጠየቅእድልተሰጥቶኝሁሉምነገርግልፅሆኖልኛል.

ከላይበተሰጠውመረጃመሰረትም

በጥናቱለመሳተፍተስማምቻለሁ. ☐

በጥናቱለመሳተፍአልስማማሁም ☐

የመረጃሰብሳቢውስም _____ ፊርማ ..... ቀን: ----------

(ID) _____ ፊርማ ..... ቀን ----------

የጅማዩኒቨርሲቲየነርስእናየአዋላጅትምህርትቤት

ቃለ-መጠይቅ

የማህበራዊና ሥነ-ህዝብ መረጃዎች

1. ፆታ 1 ወንድ 2 ሴት
2. እድሜ----------
3. የደረሡበትከፈተኛው የትምህርት ደረጃ ቢነግሩኝ
   1. መ□ሰኛ ትምህርት አልተማርኩም 2. የአንደኛ ደረጃ ት/ት አገባድጃለሁ
   3.□ሁለተኛ ደረጃ ት/ት አገባድጃለሁ 4. ኮሌጅ/ዩኒቨርሲቲ አጠናቅቂያለሁ
4. ባለፉት 12 ወራት ውስጥ ዋነኛ ሥራዎ ምንድ ነው ?
   1 ገበሬ 2.የመንግሥት ሠራተኛ 3. መንግሥታዊ ያልሆነ ተቀጣሪ4.ነጋዴ
   5. የቤት ዕመቤት 6. ጡረታ□□□ ሌላ / □ፃልን/---
5. መኖሪያአድራሻዎየትነው; 1 ከተማ 2 ገጠር
6. የጋብቻሁኔታዎምንድነዉ1. ያላገቡ2. ያገቡ3. አግብቶየፈታ4. ባል/ሚስትበሞትየተለየዉ
7. ባለፈው ዓመት ውስጥገቢዎ በወር በአማካይስንት ነበር ----------/በብር/

አጋላጭ ሁኔታዎች

ትምቢሆማፊ ስ **አሁን ከጤና ጋር ስለሚያያዙ አንዳንድ ባህሪያት □እ□□ቆታ- ስሁ:: □□□ም ማጨስ፣መጠጣት፣ የአመጋገብ ሁኔታና አካላዊ □□እንቅስቃሴዎችን ያካትታል:: ከትምቢሆ አጠቃቀም □እንጀምር**			
	ጥያቄዎች	**መልሶች**	
301	**በአሁኑ ወቅትእንደ ሲጋራ፣ጋያ፣ ወይም ሺሻ የመሳሰሉትን የትምቢሆ ውጤቶችን ያጨሳሉ?**	**0. አይ□ለም → □□ ቁዓር 306 □ሄ□ሉ** **1. አዎ**	
302	**□ሚያጨሱ ከሆነ በየቀኑያጨሳሉ?**	**0. አይደለም → ቁዓር 306 □ሄ□ሉ** **1. አዎ**	
303	**በየቀኑማጨሰበጀመሩበት ወቅት ዕድሜዎ ስንት ነበር? ይህ ጥያቄ የሚመለከተው በየቀኑ የሚያጨሱ ወይም ትምባሆ የሚጠቀመትን ነው::**	**□□እድሜ /በአመት/ ---------** **88. አላስታ□ስም → ካወቁት ወደ ቁዓር 305 □ሄ□ሉ**	
304	**ካላስታወሱ በየቀኑማጨሰ ከጀመሩ ስንት ጊዜ ሆነዎት? ይህ ጥያቄ የሚመለከተው በየቀኑ የሚያጨሱንና ወይም ደግሞ የትምባሆ ምርቶችን የሚጠቀሙትን ብቻ ነው:: ጥያቄመላሹበትክክል በስንት ዓመትማጨስ□እንደጀመረ ካላስታ□ሰ ትከክለኛ ብለህበምትገመተ□ብሳምንት ወይም በ□ር □□ም በአመት አስቀም□□::**	**በአመት ----------** **ወይንም በወራት ----------ወይንም በሳምንት --** **ካ□ቁ □□ ዓ□ቁ** **305 □ሂዐ**	
305	**ከሚከተሉት የትምቢሆ ውጤቶች ውስጥበአማካይበቀን ስንትያጨሳሉ? በምርጫው ላይ ያሉትን የማ□□ቀ□ከሆነ □ሮብለህ ሙላ ባ□ ቦታ□ አትተው::**	**የፋብሪካ ሲጋራዎች --------** **በፀ □ዙ□ቀለሉ ሲጋራዎች------** **በትምቢሆ የተሞሉ ሺሻዎች--** **ፉ□ ---------- ሌላ ካለ □□ቀስ ----------**	
306	**በአሁነ ወቅትባይሆንም ከዚህ በፊት በየቀኑ አጭሰው □□ቃሉ**	**0. አይደለም → □□ ቁዓር 309** **1. አዎ**	
307	**አዎን ካሉ በየቀኑማጨስዎን ሲያቆሙ ዕድሜዎ ስንት ነበር?** **ማጨስ መቼ □እንዳቆመ□□ቅ**	**ዕድሜ /በአመት/ ----** **88. አላስውስም**	
308	**ዕድሜዎን ካላስታወሱከስንት ጊዜ በፊት ነበር በየቀኑማጨስ የተውት?**	**ከ ---------ዓመትበፊት ወይም ከ--------ወራት በፊት ወይም ከ ------ ሳምንትበፊት**	

አልኮል ስለመጠጣት፡ ቀጣዮቹ ጥያቄዎች በአልኮል አጠቃቀም ላይ ያተኩራሉ::			
	ጥያቄዎች	**መልሶች**	

309	□እንደ ቢራ፣ወይን፣ጠላ፣ጠጅ፣አረቂ የመሳሰሉትን መጠጦች ይጠጣሉ?(ፎቶ ኣሳይ)	0. ኣይደለም → 315 1. ኣዎ	
310	ባለፉት አሥራ ሁለት ወራት በየስንት ጊዜው ቢያንስ አንድ መጠጥ ይጠጣሉ? ያለፈውን አመት ብቻ ጠይቅ	1. በየቀኑ 2. በሳምንት ከ5 እስከ 6 ቀናት 3. በሳምንት ከ1 □እስከ 4 ቀናት 4. በወር ከ1 □እስከ 3 ቀናት 5. በወር ከአንድ ጊዜ ያነሰ	
311	በሚጠጡበት ጊዜ በቀን በአማካይ ምን ያህል ይጠጣሉ? /መጠኑበታወቀ የመጠጥ መለኪያ /ያለፈውን አመት ብቻ □□ቅ	በቁ□ር ---------- 88. ኣላውቀውም	
312	ባለፉት ሠላሣ ቀናተ ውስጥ ጠጥተው ያውቃሉ? ባለፉትሰላሣቀናት ብቻ አተኩር	0. ኣይደለም →314 1. ኣዎ	
313	በያንዳንዱ የሳምንቱ ቀናት ምን ያህል /በታ□ቀ □መ□ዓ መለኪያ/የአልኮል መጠጥ ይጠጣሉ? ያለፈውን ሣምንት ብቻ አስብእያንዳንዱ ቀን ምንያህል □እንደሚ□□ለእያንዳንዱ የአልኮል መጠጥአይነት ሙላ ምንም ካል□□ □ሮ ተብሎ□ሞላ።	ሰኞ ---------- ማክሰኞ ---------- ረቡ□ ---------- ሐሙስ ---------- □ርብ ---------- ቅ□ሜ ---------- □እሁ□ ----------	
314	ባለፉት 12 ወራት ውስጥበአንድ ጊዜ ብቻ ብዙበጠጡበት አጋጣሚ ምን ያህል ጠጥተዋል ሁሉንም የመጠጥ መለኪያ መጠኖች በመደመር በጣም ብዙ የጠጡበትን ቀን መጠን □ፅለፍ	ትልቁን ቁ□ር ----------	

የአመጋገብ ልማድ

ቀጣዮች ጥያቄዎች ዘወትር ስለሚመገቧቸውፍራፍሬዎችና አክልት አንዳንዶቹን □ሚ□ሳ□ □ምፅብ ካርት □□□ል- ። □እያንዳንዱ ሥዕል የሚጠቀሙትን □ዝርዝፍራፍሬዎችና አክልትያሳያል።ቀጣዮችን ጥያቄዎች ሲመልሱ ካለፈው ዓመት ውስጥ አንዱን ሳምንት □እንደ ናሙና ያስቡ።

	ጥያቄዎች	መልሶች	
315	በዚያ ሳምንት ውስጥስንትቀናትፍራፍሬ በልተዋል? /በቃለ መጠየቁ ወቅትይብራራ/ ካርድ አሳይ።	የቀናቶቹ ብዛት ------ □ሮ ካሉ→317 88. ኣላውቅም	
316	ከሳምንቱ ቀናት ውስጥበአንዱ ቀን ምን ያህል የፍራፍሬ □	□አ□ራአ□ሬ-	

	መጠን /በሥዕል □እንደተገለፀው/ ይጠቀማሉ	ች መጠን በቁጥር ---- 88. አላውቅም	
317	በዚያውሳምንት ውስጥስንትቀናት አትክልትበልተዋል? ማንኛውንም አትክልትመመገቡን ጠይቅ ወይም ካርድ አሳይ።	ቀናቶች በብዛት ---- ዜሮ ቀናት ካሉ→319 □ሂዐ 88. አላውቅም	
318	ከሳምንቱ ቀናትበአንዱ ቀን ምን ያህል የአትክልት መጠን ተ□ቅመኻል? ተ□□ቂ□ □ሚ□ስታ□ሰ□ን ጠይቅ	የአትክልት መጠን በቁጥር------ 88 አላውቅም	
319	በቤትዎ ውስጥለምግብ ዝግጅት የሚውለው የዘይት ቅባት ዓይነት የትኛው ነው? ትክክለኛ□መልስ □በብ	1. የአትክልት ዘይት 2. ቅቤ 3. ሌላ /□□ቀስ/ --- 4. አንዱን ለይተን አንጠቀምም 5. ምንም አንጠቀምም 88. አላውቅም	

አካላዊ □እንቅስቃሴ

ቀጥሎ አካላዊ □እንቅስቃሴዎች በማድረግ ስለሚያሳልፉት ጊዜ አጠቃቀም፤፤ □እባክዎን አካላዊ □እንቅስቃሴ አደርጋለሁብለውባያስቡ □እንኳን ይመልሱ።።

በመ□መሪ□ ሥራ □□እ□ሠሩ ሰለሚያሳልፉት ጊዜ ያስቡ።። ስራ ሲባል ተከፍሎዎትም ሆነ ሳይከፈልዎትመስራትያለበዎትን ወይም የሚሠሩትን ያካትታል።። □እንዲሁም ጥናት/ ሥልጠና፣ የቤት ውስጥ ሥራ፣ □□እህል ወይም አዝመራ መሠበሰብ፣ ዓሣ ማስገር፣ማደን፣ሥራ ፍለጋመንቀሳቀስ የመሳሰሉትምበስራ □እንቅስቃሴ ውስጥ □ካተታሉ።።በቀ□ዮቹ ጥያቄዎች ውስጥ □እጅግ አድካሚ የስራ □እንቅስቃሴዎች ሲባል ጫን ያለ ጉልበት የሚጠይቁና የትንፍሽና የልብ ምትፍጥነትን በጣም የሚጨምሩ □ስራ እንቅስቃሴዎችን ማለት ነው፤በመጠኑ አድካሚ □እንቅስቃሴዎች ስንል ደግሞ በመጠነኛ ጉልበት የሚከናወኑና የትንፋሽንና የልብ ምትፍጥነትን በጥቂቱ የሚጨምሩ □እንቅስቃሴዎችን ነው።።

	ጥያቄዎች	መልሶች	
320	□ሚሠሩት ሥራ □□እፀፅ አድካሚ □እንቅስቃሴዎችን ማለትም ቢያንሥ በተከታታይ ለ 10 ደቂቃ ያህል የትንፋሽና የልብ ትርታን የሚጨምሩ □እንቅስቃሴዎችን ያካትል? □ሚሠሩት ሥራዎች ከባድ ናቸው የሚባሉት በከፍተኛ ሁኔታ□□ልብ ትርታ□□□ም ትንፋሽ ሲፊ ምሩ ነው።።	0. አይደለም→323 1. አዎ	
321	በአማካይበአንድሳምንት ውስጥስንትቀናትእጅግ አድካሚ □እንቅስቃሴዎችን በሥራዎ ያካትታሉ።	የቀናቱ ብዛት ------	

322	ከነዚህ ቀናቶች ውስጥበአንዱ ቀን እጅግ አድካሚ □እንቅስቃሴዎችን ለምን ያህል ሰዓት ወይም □ቂቃ □ሠራሉ	ሰዓት ------ □ቂቃ-------	
323	ትንፋሽንና የልብ ትርታን በመጠኑ የሚጨምሩና በመጠኑ አድካሚ የሆኑ □እንቅስቃሴዎችን በተከታታይ ቢያንሥ ለ10 □ቂቃ □ሚ□ቆ□ □እንቅስቃሴዎችን ይሠራሉ? ሥራዎች መጠናኛ ክብደት ያላቸው የሚባሉት የልብ ትርታንናየትንፋሽ መጠንን በትንሹ ሲፊ ምሩ ነው።	0. አይደለ ም→32 6 1. አዎ	
324	በአማካይበአንድሳምንት ውስጥበስንትቀናት □እነዚህን ዓይነትበመጠኑ አድካሚ የሆኑ □እንቅስቃሴዎችን በሥራዎ ያካትታሉ	የቀናቱ ብዛት ---	
325	ከነዚህ ቀናቶች ውስጥበአንዱ ቀን በመጠኑ አድካሚ የሆኑ □እንቅስቃሴዎችን ለስንትሠዓት ወይም ደቂቃ ይሠራሉ?	ሰዓት ------ □ቂቃ-------	
326	በተከታታ□ ቢያንስ ለአሥር ደቂቃ ያህል ከቦታ□ ቦታ□ መራመድ ይችላሉ? ለመዝናናት የምንጠቀምባቸው□እንቅስቃሴዎች በ□ምከፍተኛ □ሚባሉት የመተንፈስ መጠን ሲፊ ምሩ □□ም □ልብ ትርታን□በደንብ ሲፊ ምሩ ነው።	0. አይደለ ም→ □□ 329 1. አዎ	
327	ከሳምንቱ ቀናት ውስጥስንትቀናት በተከታታይ ቢያንስ ለ10 ደቂቃ ከአንድ ቦታ□ □□ ሌላ ቦታ□ □ራመ□ሉ?	የቀናቱ ብዛት ------ ---	
328	በቀን ውስጥለስንትሠዓትበግር በመራመድ ወይም ብስክሌትበመንዳትያስልፋሉ?	ሰዓት ------ ---- □ቂቃ ------ ----	

የመዝናኛ □እንቅስቃሴዎች ቀጣዮቹ ጥያቄዎች ከላይ ከተጠቀሱትን የሥራና የጉዞ □እንቅስቃሴዎችን አያካትትምቀጥሎ የምጠይቅዎት □እንደስፖርት የአካል ብቃት □እንቅስቃሴ፣ የመዝናኛ ወይም የትርፍ ጊዜ ማሳለፊያ የመሳሰሉትን □እንቅስቃሴዎች ይሆናል።			
	ጥያቄዎች	መልሶች	
329	እጅግ አድካሚ የሆኑና ትንፋሽንና የልብ ትርታን በጣም □ሚፊ ምሩ የመዝናኛ □እንቅስቃሴዎችን /ለምሳሌ □□እ□ሮ□ ·□□እግር ኳስ መጫወት/ በተከታታይ ቢያንስ ለ10 ደቂቃ ያከናውናሉ? □ሚሠሩት የአካል ብቃትእንቅስቃሴ ከባድ ናቸው□ሚባሉትበከፍተኛ ሁኔታ□ □ልብ ትርታን□ ሲፊ ምሩ ነው።	0. አይደለም → 332 1. አዎ	
330	በአንድሳምንትለሥንት ቀናተ ያህል □□እነዚህን □□እፀፅ አድካሚ የመዝናኛ □እንቅስቃሴዎችን ያከናውናሉ?	የቀናቱ ብዛት ---------	
331	ከነዚህ ቀናትበአንዱ ቀን ለሥንትሠዓት/ ደቂቃእነዚህን □እፀፅ አድካሚ የመዝናኛ □እንቅስቃሴዎችን ያከናውናሉ	ሰዓት -------- □ቂቃ --------	
332	በመጠኑ አድካሚ የሆኑና ትንፋሽንና የልብ ትርታን በመጠኑ	0. አይደለም	

	□ሚፊ ምሩ የመዝናኛ የአካል ብቃት □እንቅስቃሴዎችን በተከታታይ ቢያንስ ለ10 ደቂቃ ያከናውናሉ? የአካል ብቃት□እንቅስቃሴዎች መካከለኛናቸወ ·□ሚባለትየትንፋሽን ናወይም □ልብ ትርታንበመጠኑሲፊ ምሩ ነው፡፡	→ 335 1. አዎ	
333	በአንድሳምንትለሥንትቀናት □□እነዚህን በመጠኑ አድካሚ የሆኑ የመዝናኛ □እንቅስቃሴዎችን ያከናውናሉ?	የቀናቱ ብዛት ---------	
334	ከነዚህ ቀናት ውስጥበአንዱ ቀን ለሥንትሠዓት □እነዚህን በመጠኑ አድካሚ የሆኑ የመዝናኛ □እንቅስቃሴዎችን ያከናውናሉ	ሰዓት ---------- □ቂቃ ----------	
335	ያለመንቀሳቀስባህርይ፡ በአማካይበቀን ለሥንትሠዓት ተቀምጠው □□ም ተፉትመ□ □ሳልኛሉ? ጠቅላላበቢሮ የዋለነ የሚያነብ ተሌቪዥን የሚያይ ኮምፒውተር የሚጠቀምከባድ የእፀ ዓበብ ሙያዎችን ወዘተ (ለመኝታ□ □ለ□ን ቂ□ አትጨምር)፡፡	ሰዓት ---------- □ቂቃ ----------	

□ስኳር በሽታ ህክምናውናእክብካቤውን በተመለከተ፡፡			
	ጥያቄዎች	መልሶች	
401	□ስኳር በሽታያለበትዘመድኣለዎት;	0. አይ □ለም 1. አዎ	
401	በጤና ባለሙያ የስኳር በሽታምርመራ□ተደረጎልዎት□□·ቃል?(የታወቀየሰኩርታካሚነዎት)	0. አይደለም 1. አዎ	
402	በጤና ባለሙያ የተደረልዎት □□ም ምርመራ □ስኳር በሽታ□ እንዳለብዎትያሳያል?	0 አይደለም---□□ 404 ሂት 1 አዎ	
403	በአሁኑ ወቅት ከሚከተሉት የስኳር በሽታ□ መድኒቶች ወይም የምክር አገልግሎትበጤና ባለሙያ ታዞለዎትየቱን□እወሰዱነው(የታወቀየሰኩርታካሚከሆኑብቻ፡፡ካልሆኑግንወደ 404 ሂድ)		
	ኢንሱሊን የተባለውን የመርፌ መድሃኒት □እወሰዱነው?	0. አይደም 1. አዎ	
	የሚዋጡ ኪኒኖች /ባለፉት ሁለትሳምንት ውጠዋል?/	0. አይደም 1. አዎ	

የደም ግፊት መጨመር፡፡ አሁን የደም ግፊት መጨመር በሽታ ህክምናውንና እ□ብካቤ □እ□□ቆ- ተለሀ			
	ጥያቄዎች	መልሶች	
404	የደም ግፊትበሽተኛ ከሆኑ ምን ያክል ጊዜ ሆነዎት?	1. ----------ዓመት 2. ----------ወራት □□ም----------ሳምንት	
405	በአሁኑ ወቅት ከሚከተሉት ውስጥ የቱን ነውእወሰዱ ያሉት		
	ባለፉት ሁለትሳምንት መድሃኒት ወስደዋል?	0. አይደም 1. አዎ	

	በባለሙ□ □ቃ□□ □ተለ□ ምፅብ እየተመገቡ ነው?	0. አይደም 1. አዎ	
	ክብደትዎን □እንዲቀንሱ መድሃኒት ወይም ምክር ተሠጥቶዎታል?	0. አይደም 1. አዎ	
	ማፊ ስ □እንዲያቆሙ መድሃኒት ወይም ምክር ተሠጥቶዎታል?	0. አይደም 1. አዎ	
	አካላዊ □እንቅስቃሴ አንዲጀምሩ □□ም □ከለ□ □እንዲሠሩ ተመ□ረኻል?	0. አይደም 1. አዎ	
406	ለደም ግፊት መጨመር በሽታ- ባለፉት 12 ወራት የልምድ □□ም □ከህል □ዋሽ ፉር ሄ□ዋል	0. አይደም 1. አዎ	
407	በአሁኑ ወቅት ማንኛውንም የባህል ወይም የልምድ ፈውስ በመውሰድ ወይም በመከተል ላይ ነዎት?	0. አይደም 1. አዎ	
408	ባለፉት 12 ወራት ውስጥበፍጥነት እሲራመዱ ወይም ዳገት እሲወጡሳለ የትንፋሽ ማጠር ተሰምቶዎት ያውቃል?	0. አይደም 1. አዎ	

አካላዊ ልኬት መሙያ ቅፅ

501	ክብደት(kg)	503	ቁመት (cm)----
502	የወገብዙሪያ (cm)	504	የልብምት-----

601	የደምግፊትመጠን	የመጀመሪያልኬት	ሁነተኛልኬት	ሦስተኛልኬት	አማካይልኬት

	የደምስቁርመጠን	የደምስቁርመጠንለኬት	Code
701	ባለፉት 12 ሰኣታትምግብወይምሌላፈሳሥነገርወስደዋ ል(ውሃንአይጨምርም)	አይደለም 1. አዎ	
702	የደምስቁርመጠንለኬት(ስምንትሰኣትናከዛ በላይከያሙበሁኣላ)	└┴┘ └┴┘	

ASSURANCE OF PRINCIPAL INVESTIGATOR

I the undersigned agree to accept responsibility for the scientific ethical and technical conduct of the research project and for provision of required progress reports as per terms and conditions of the Faculty of health science effect at the time of grant is forwarded as the result of this application.

Name of the student: _____

Date. _____ Signature _____

Name of the institution Jimma University

Date of submission _____

APPROVAL OF THE ADVISOR

First advisor _____signature _____date

Second advisor_____ signature_____ date