PREVALENCE OF HYPERTENSION AND ASSOCIATED FACTORS AMONG ADULT DIABETES PATIENTS IN DEBRE TABOR GENERAL HOSPITAL, DEBRE TABOR, NORTHWEST ETHIOPIA, 2019.

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Prevalence of Hypertension and Associated Factors among Adult DM Patients in Debre Tabor General Hospital (DTGH), Northwest Ethiopia, 2019.

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Abstract

Background: *Despite being preventable disease, hypertension falls among top ten leading causes of death globally. Hypertension, which is the most prevalent and independent cardiovascular risk factor in the general population, is extremely common problem in diabetics. To date to the best of our knowledge there was no study done in DTGH to assess the prevalence of hypertension and associated factors among adult diabetes patients.*

Objective: *To assess the prevalence of hypertension and associated factors among adult diabetes patients in Debre Tabor General Hospital, Debre Tabor, Ethiopia, 2019.*

Methods: *Cross sectional study design was conducted on 228 diabetes patients selected by systematic random sampling. Face to face interview and observation techniques were used to collect data. Data were entered into Epi-data version 4.4.1 and exported to SPSS Version 20 for further analysis. Descriptive statistics was used to summarize data. A bivariate binary logistic regression model was used to select candidate variables for the final model. Multivariable binary logistic regression analysis was used to identify independently associated factors of hypertension among diabetes patients. Adjusted odds ratio and 95% CI were used to assess association between variables and statistical significance respectively.*

Results: *The overall prevalence of hypertension among diabetes clients in this study was 53.5% with 95% CI [47.7%-60.2%].Urban [AOR=2.6(1.3-5.4)], having family history of hypertension[AOR=3.2(1.3-7.7)],suffering from overt diabetes for more than five years(AOR=7.5(2.7-21.4)], not controlled Fasting blood sugar [AOR=4.5(2.1-9.8)], not frequently consuming fruits[AOR=2.7(1.1-6.5)] not frequently consuming vegetables[AOR=7.9(3.6-17.2)]) frequently adding salt to food(AOR=3.8(1.1-13.8)] and body mass index(Kg/m$^{2)}$≥25(AOR=2.9(1.4-6)] were independently associated with HTN.*

Conclusion and recommendation: *The prevalence of hypertension among diabetes patients in this study was high (53.5%). Therefore it is better to design strategies for diabetes clients to lower their blood pressure in addition to anti-hypertensive medication and home to home blood pressure screening program for diabetic patients should be considered.*

Key words: *Hypertension, diabetes mellitus, prevalence, factors, Ethiopia*

Abbreviations and Acronyms

AOR	Adjusted odds ratio
BMI	Body mass index
BP	Blood pressure
CDC	Communicable Diseases control
CHD	Chronic heart diseases
CI	Confidence interval
CKD	Chronic kidney diseases
COPD	Chronic obstructive pulmonary diseases
COR	Crude odds ratio
DBP	Diastolic blood pressure
DM	Diabetes mellitus
DTGH	Debre Tabor general hospital
FBS	Fasting blood sugar
GTCS	General tonic-clonic seizures
HTN	Hypertension
IRB	Institutional review board
MRN	Medical registration number
NCD	Non communicable disease
OR	Odds ratio
RA	Rheumatoid arthritis
SBP	Systolic blood pressure
SPSS	Statistical package for social sciences
SRS	Simple random sampling
T_1DM	Type one diabetes mellitus
T_2DM	Type two diabetes mellitus
WHO	World health organization

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Chapter One: Introduction

1.1 Background

Hypertension is defined as persistently elevated arterial blood pressure (BP), systolic BP (SBP) $\geq$ 140 mmHg and/or diastolic BP (DBP) $\geq$ 90 mmHg. These numbers apply to all adults older than 18 years and indicate the level of BP at which the institution of therapy reduces hypertension related morbidity and mortality(1,2).

Diabetes mellitus (DM) refers to a group of common metabolic disorders that share the phenotype of hyperglycemia or it is a clinical syndrome associated with insulin deficiency, inefficiency or both(1,3). Hypertension and diabetes substantially share common pathways such as obesity, inflammation, oxidative stress, insulin resistance, and mental stress(4). Hypertension is already evident in most patients with type 2 diabetes at the time of diagnosis and Hypertension in patients with diabetes is a well-recognized cardiovascular risk factor(1,3–6).

Blood pressure is essential to move blood from the heart through veins and arteries to all other parts of the body. However, when the pressure is too high, it becomes dangerous, making the heart work harder and increasing the risk for heart problems, such as heart attacks and strokes(1,2,7).Hypertension is a growing public health problem in many developing countries including Ethiopia. It is a silent killer and most patients are detected to have it incidentally when they are admitted to hospital for unrelated disease or subjected to pre-employment or preoperative medical checkups(8).There is a common misconception that people with high blood pressure always experience symptoms. Most people with high blood pressure actually have no symptoms at all and may not even know they have it. Sometimes high blood pressure can cause symptoms such as headache, shortness of breath, dizziness, chest pain, palpitations of the heart or nose bleeds. If people ignore measuring blood pressure because they think symptoms will alert them to the problem, it can be dangerous because high blood pressure is often a silent killer. Everyone should know his or her blood pressure numbers (7) .

The global prevalence of raised BP in adults aged 18 years and over was around 22% in 2014(9). The prevalence in Sub- Saharan Africa is in the range of 25.4%- 41.1% in men and 27.2%- 38.7% in women(10).Patients with T2DM frequently suffer with co morbidities, such as hypertension, obesity, and depression and all have been established as common in T2DM patients(11). The most common co morbidity associated with T2DM is hypertension. The prevalence of hypertension among T2DM patients varies across countries and is reported to range from 20.6% to 78.4% in the Southeast Asian region, and 9.7% to 70.4% in the African region(12). The reported prevalence of hypertension in different regions of Ethiopia varied widely(13,14). The prevalence in the country is estimated to be between 20% and 30%(15). Hypertension also clusters with other cardio-metabolic conditions, namely diabetes, dyslipidemia, insulin resistance, glucose intolerance and obesity which together increase cardiovascular disease risk(13–15).Up to 75% of adults with diabetes also have hypertension, and patients with hypertension alone often show evidence of insulin resistance(16).

1.2 Statement of the problem

Hypertension is said to affect about one billion people worldwide and the figure is estimated to rise to 1.56 billion by 2025(16). Globally, the prevalence of raised blood pressure in adults aged 25 and over was estimated at 40%, being highest in the African region at a prevalence of 46%(17).Data from several epidemiologic studies have suggested that the prevalence of hypertension in patients with diabetes mellitus is 70% and is approximately 1.5-2.0 times greater than in an appropriately matched non-diabetic population (18,19). Raised blood pressure is estimated to claim 7.5 million deaths attributing 12.8% of all deaths worldwide which accounts for 57 million disability-adjusted life years (DALYs)(12,20). Globally cardiovascular diseases accounts for approximately 17 million deaths a year nearly one third of the total, of these complications, hypertension accounts for 9.4 million deaths worldwide every year. Hypertension is responsible for at least 45%of deaths due to heart diseases and 51% of deaths due to stroke(2).

Recent studies have shown that, up to 75% of adults with diabetes also have hypertension in USA alone and patients with hypertension alone often show evidence of insulin resistance(16).In 2003–2004, 75% of adults with self-reported diabetes had blood pressure greater than or equal to 130/80 millimeters of mercury (mm Hg), or used prescription medications for hypertension(21).Hypertension is reported to be the second leading cause of all deaths in both developed and developing countries. The prevalence of hypertension has ever been increasing at an alarming rate among developing nations, especially the African region. In Ethiopia, 46% of adults aged 25 years or older are reported to have high BP making hypertension the 7thleading cause of death (3.5% of all deaths) in the country(22).

The prevalence of raised blood pressure in Ethiopia ranges from 8% in rural Butajira to 30% in Addis Ababa[27.3%(23),28.3%(8),(24),16.9%(25), 27.9%(26)] where,31.5% and 28.9% of males and females respectively were hypertensive in Addis(13). Another study in Addis showed hypertension prevalence of 20% among bank employees and teachers (17).

World Health Organization (WHO) estimated in 2011 that 34% of Ethiopian population is dying from non-communicable diseases, with a national raised blood pressure of 35.2% as a risk factor for this NCD mortality(27).While in 2014 the number decreases to 30% of NCD mortality with 25.9% raised blood pressure as a risk factor in both sexes (28.0% in males and 23.9% in females)(28)

Increasing age, the presence of obesity, and worsening renal function all contribute to an increased likelihood of hypertension in people with diabetes; which makes both crucial public health concerns for the twenty first century(1,2,6). Thus, hypertension and diabetes are common, intertwined conditions that share a significant overlap in underlying risk factors (including familial, dyslipidemia, and lifestyle determinants) and complications. Although micro vascular complications (retinopathy, nephropathy, and neuropathy) are conventionally linked to hyperglycemia, studies have shown that hypertension constitutes an important risk factor, especially for nephropathy(1).

The increasing incidence of non-communicable diseases will lead to greater dependency and mounting costs of care for patients and their families unless public health efforts to prevent these conditions are intensified. The economic impact of hypertension and diabetes is an enormous burden on society, with estimated annual costs of $174 billion for diabetes care and $76.6 billion for hypertension related problems hypertension (21).It is dangerous to ignore high blood pressure, because this increases the chances of life-threatening complications. The higher the blood pressure the higher the likelihood of harmful consequences to the heart and blood vessels in major organs such as the brain and kidneys. This is known as cardiovascular risk, and can also be high in people with mild hypertension in combination with other risk factors e.g., tobacco use, physical inactivity, unhealthy diet, obesity, diabetes, high cholesterol, low socioeconomic status and family history of hypertension. Low socioeconomic status and poor access to health services and medications also increase the vulnerability of developing major cardiovascular events due to uncontrolled hypertension(2).

Diabetes is an independent risk factor for cardiovascular disease, and the risk is markedly increased in the presence of hypertension. Hypertension among DM patients is associated with increased risk of end stage renal disease and cardiovascular death. Aggressive management of hypertension in the presence or absence of DM is associated with more health benefits and less risk of cardiovascular morbidity. Hypertension is a common condition which usually coexists with DM and aggravates DM complications and cardiovascular morbidity and mortality (1,29).

Different clinical and anthropometric factors of hypertension were studied in global and African studies, but these factors were not included in Ethiopian studies. Even though there was a study conducted in Nigist Ellen Mohamed Memorial Hospital, Hosanna, Southern Ethiopia, the study was prevalence and socio-demographic factors among T2DM patients, it didn't include T1 DM patients. The study also didn't include different variables like clinical variables (FBS, duration of DM, presence or absence of other NCDs), Anthropometric variables like BMI and the likes(30). In addition there may be difference in socio-demographic, clinical, behavioral and anthropometric characteristics of the study participants between the current study and other areas.

A research on associated factors of blood pressure control among 421 cases of hypertension was conducted in DTGH chronic illness follow up, but the prevalence of hypertension and associated factors among DM patients was not determined (22).The monthly report of the hospital showed that there was increment of hypertension patients from time to time. Also to date to the best of our knowledge there was no study done in Debre Tabor General Hospital, to assess the prevalence of hypertension and associated factors among adult diabetes patients.

Chapter Two: Literature Review

2.1 Prevalence of hypertension

Data from several epidemiologic studies have suggested that the prevalence of hypertension in patients with diabetes mellitus is approximately 1.5-2.0 times greater than in an appropriately matched non-diabetic population(18,19).A Study conducted in Iraq, revealed that Hypertensive diabetic patients constituted 89.6% of the study cohort, with 45.3% of them newly discovered in the center(31).The overall prevalence of hypertension among diabetes patients was found to be 2% in Nepal(32). Of 55,797 T2DM patients included in a study sample in a nationwide Cross-Sectional Study in Thailand 55.35% were hypertensive(6).Another study conducted in Benghazi, Libya reported (85.6%) prevalence of hypertension among diabetic patients(33).According to a study conducted in Gaborone City Council (GCC) clinics, Gaborone, Botswana, the study found that 61.2% of the DM patients had hypertension(34).A cross-sectional study carried out on 525 type 2 diabetics in three Moroccan regions showed that the prevalence of hypertension was 70.4%(35).Another study conducted in Nigist Ellen Mohamed Memorial Hospital Hosanna, Southern Ethiopia revealed that more than half (55%) of the type 2 diabetic clients were hypertensive(30).

2.2Associated factors of hypertension among DM patients

Different studies at different areas revealed variable findings in some extent. Associated factors include socio-demographic, clinical, behavioral and anthropometric factors

2.2.1 Socio-demographic factors

Factors in this group are age, sex, residence, marital status, religion, educational status, occupation, family income, family history of hypertension and diabetes. As different literatures revealed both socio demographic and economic factors affect the prevalence of hypertension among DM patients. According to studies conducted in Iraq and Botswana, hypertension was higher among women than men (91.0% vs. 88.0%, $p < 0.001$) and (64.4% vs. 53.1%, $P=0.0001$) male to female DM patients had hypertension respectively. I.e. Female sex was associated with increased risk of hypertension(31,34).In contrary to this Female gender was associated ($p< 0.05$) with less prevalence of hypertension among Benghazi, Libya and Nigist Ellen Mohamed Memorial Hospital Hosanna, Southern Ethiopia diabetic patients that revealed the prevalence rate of hypertension among female and male subjects was 17.14% and 37.86% respectively. Male subjects were 2.708 times (AOR=2.708, 95%CI: 1.696-4.325) more likely to have HTN as compared to female subjects and gender is significantly associated (p-value=0.000) with HTN (30,33). On the other hand a cross-sectional study carried out in three Moroccan regions showed that the prevalence among men was similar to that among women (P=0.31)(35).

Considering age according to a study conducted in Iraq, the mean age was higher in the hypertensive group (52.3 ± 13.1 vs. 43.5 ± 15.9, p < 0.001) (31). A study conducted in Nepal showed that taking age group 15 to 29 years as reference, people in age group 45-69 and 30 to 44 years were found to have 33 folds (AOR=33.06,95% CI=5.90- 185.35) and 6 folds (AOR=6.36, 95% CI=1.08-37.43) higher odds of developing hypertension among diabetics(32).Similarly age group was associated (p< 0.05) with prevalence of hypertension among Benghazi diabetic patients. As the age group increased there was an increase in the prevalence of hypertension among Benghazi diabetic patients. Older subjects had a higher percentage of those had hypertension. Likewise there were a greater percentage of subjects who do not have hypertension among younger diabetics. The rate of hypertension increased with age (P=0.001)(33).According to a study conducted in Gaborone City Council (GCC) clinics, Gaborone, Botswana, the percentage of hypertensive patients among the DM population increased to 70.9%(61.2% overall) in those who were older than 50 years. Older age was associated with hypertension (P=0.00)(34). Another study conducted in Nigist Ellen Mohamed Memorial Hospital Hosanna, Southern Ethiopia revealed that Participants who were in the age group of 35-44 years, 45-54 years and = 50 years were 2.3 times (AOR=2.287, 95% CI: 1.478 -10.936), 3 times (AOR=2.922, 95%CI: 1.694- 12.298) and 6.4 times (AOR=6.396, 95% CI: 1.22-33.496) respectively more likely to have HTN as compared to individuals who were at the age group of 25-34 years. Age groups 35-44 years (p-value=0.022), 45-54 years (p-value=0.003) and = 55 years (p-value=0.000) were statistically associated(30). Another study conducted in Kuwait showed that hypertension-onset age is higher in the diabetic population than in the non- diabetic population, with the difference being most prominent in natives (36).

As a study conducted in Nigist Ellen Mohamed Memorial Hospital Hosanna, Southern Ethiopia showed, married subjects were 15.17 times (AOR=15.167, 95%CI: 1.935-246.129) and divorced subjects were 6.9times (AOR=6.85, 95%CI: 1.821-57.185) more likely to have HTN as compared to unmarried subjects; and being married is among independent predictors of HTN (p-value=0.000)(30).

Regarding to educational status a study conducted in Nepal revealed that Compared to those who did not have any formal education, those who had completed primary education (AOR=2.86, 95% CI=1.52-5.36), secondary level education (AOR=3.96, 95% CI=2.05-7.66) and higher education (AOR=7.61, 95% CI=3.59-16.16) were found to have greater odds of developing hypertension(32). Another study conducted in Morocco also showed that Illiterate people were found to be at higher risk of hypertension compared to those with a high school or college education ($P<10^{-3}$) (32). Illiterates were 1.5times [AOR=1.494, 95%CI: 1.405-5.510], grade 9-10 completes were 1.85times [AOR=1.846, 95%CI: 1.313- 10.886] and college diploma graduates were about 2 times [AOR=1.993, 95%CI: 1.362-10.957] more likely to have HTN as compared to first degree and above graduates (30).

In the case of occupational status Merchants were 2.6 times [AOR=2.571, 95%CI: 1.269-24.554] and retired were 3.43 times [AOR=2.571, 95%CI: 1.372-31.589] more likely to have HTN as compared to government employee (30).

Considering residence Prevalence in urban areas was 2.88% (95% CI=1.85-4.48) while it was 1.83% in rural areas (95% CI=1.31-2.55) [23]. Rural residents were 54% (AOR=0.462, 95%CI: 1.178-1.198, P=0.002) less likely to have HTN as compared to urban residents(30).

The lower the income, the less likely an adequate and varied diet and medications will be used which increases the risk of developing hypertension [30]. From the total clients, 42.86% had HTN among those earning average monthly income greater than or equal to 1051 Ethiopian Birr(30).

According to an observational study conducted in Kuwait, family history is established risk factor for hypertension. As much as 47% of hypertensive patients have a family history of diabetes and/or hypertension(36). Similarly a study conducted in China showed those participants with Positive family history had a significantly higher prevalence of hyper-tension (67.5%, 95% CI: 63.3–71.7) than those without (47.9%, 95% CI: 45.2–50.6), and even among participants without hypertension, the blood pressure levels were higher with positive family history(37).

2.2.2 Clinical factors

According to a study conducted in Gaborone City Council (GCC) clinics, Gaborone, Botswana**,** hypertension was present in 41.2% of type 1 and 63.1% of type2 DM patients. Type 2 DM had significant risk of hypertension(chi-square=6.9, df=2, P=0.032)(34).Another study conducted in Morocco indicated that hypertension is associated with the duration of diabetes. Duration of diabetes is positively associated with the severity of macro- and micro-vascular complications, both of which contribute to the development of renal and/or atherosclerotic hypertension(35). A study conducted in Morocco revealed that diabetics with >10 years duration of diabetes were 2.87 times more likely to have chronic complications including HTN [AOR = 2.87, 95% CI: (1.20, 6.88)] than <5 years duration of diabetes. Additionally, Diabetic patients who did not monitored their blood sugar level were 15.22

times more likely [AOR = 15.22, 95% CI: (3.07, 75.48)] having hypertension than those who monitored their blood sugar level(35).

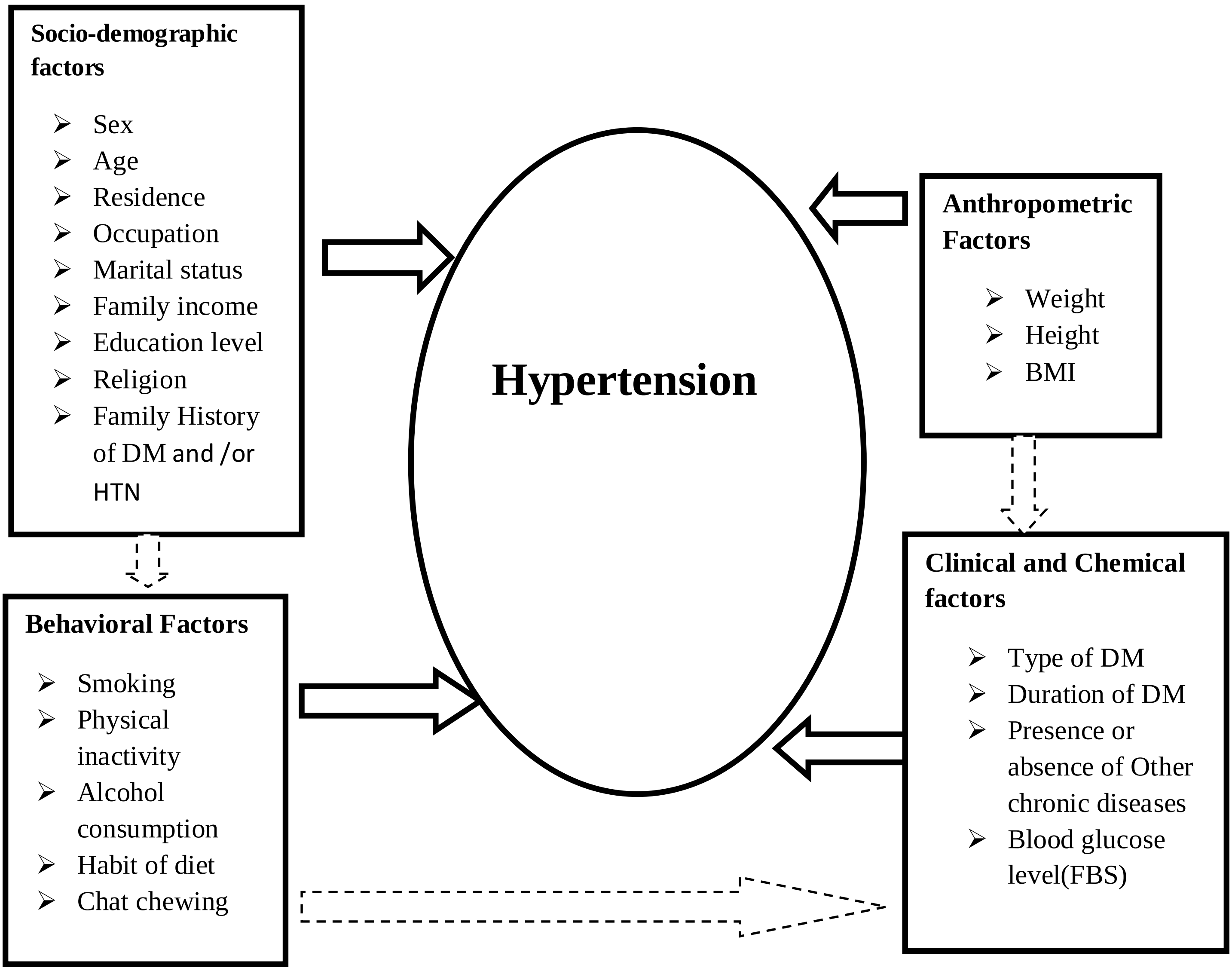
2.2.3 Behavioral Factors

A study conducted in Libya showed that among the self-reported physical activity characteristics, activity level was associated ($p<0.05$) with the prevalence of hypertension among Benghazi diabetic patients. The sedentary diabetic had greater percentage of hypertension. Among those who were active, a higher activity level was associated with a less prevalence of hypertension(33). A cross-sectional study carried out on 525 type 2 diabetics in three Moroccan regions showed that there is no significant association between hypertension and smoking(35).According to a study conducted in Botswana Only 18.3 % of hypertensive DM patients exercised, while 11.6% normotensive DM patients' exercised, there was no significant difference between the two groups (P-value=0.06) (Exercise was defined for the study as those exercising at least three Times a week for at least for thirty minutes in each session). Only 4% of DM patients admitted to smoking and 3.1% to taking alcohol(34).

2.2.4 Anthropometric Factors

According to a study conducted in Libya, BMI was associated ($p < 0.05$) with prevalence of hypertension among Benghazi diabetic patients. Subjects classified as underweight according to their BMI had the least percentage of having a hypertension. Nevertheless, even the normal BMI group had subjects who were hypertensive (33). Another study conducted in Morocco showed that obese and overweight patients have a higher risk of hypertension than ones with normal BMI (35). A study conducted in Botswana showed that 27.2% of the DM patients were overweight and 56.4%obese.The mean BMI for those who have hypertension was 31.7 (SD=6.2) while for DM patients who are normotensive were 30.8 (SD=6). Although there was no difference in mean BMI in normotensive and hypertensive DM patients (P-value=0.21), hypertension was strongly associated with overweight (P=0.00039) and obesity (P=0.0004) (34). Another study in Kuwait revealed that the higher the BMI, the lower the onset age: mean diabetes-onset age for the class III obese category is lower by 8.2 years (95% CI 5.2–11.2; P, 0.001) than that for the normal BMI category. At a given BMI, males have earlier onset of diabetes than females (36).

2.3 Conceptual Framework



Key Association between independent and dependent variable

(Assessed in this study)

Association between independent variables

(Not assessed in this study)

Figure 1 Conceptual Framework of prevalence of HTN and associated factors among adult DM patients in DTGH, Northwest Ethiopia, 2019 (Developed after reviewing different related literatures).

2.4 Significance of the Study

Nowadays, the global community is suffering from different non communicable diseases. Hypertension and Diabetes mellitus are among these non-communicable diseases. Since there are limited studies in the study area this study will have potential to assess the prevalence of hypertension and associated factors of hypertension among DM patients. The finding from this study will have its own contribution for evidence based communication and decision making for different organizations (stake holders) at different levels by revealing the magnitude of hypertension and its associated factors among DM patients. Currently as many literatures show in different areas of the world, the burden of non-communicable diseases, especially hypertension among diabetes is increasing from time to time. To confirm this fact in the study area and to take appropriate measures the study will play its own role. It will also provide base line information for future studies.

The community of DTGH, especially those working at chronic outpatient follow up will use the information from this study to increase and update their knowledge regarding the prevalence of hypertension and associated factors among adult DM patients and to provide quality care for their patients or clients. In addition, result from this study will help health service managers, policy makers and other stake holders in planning and provision of quality care of Hypertension and DM patients and/or clients. This study finding is also expected to be used by Regional, national and international governmental and nongovernmental health and health related organizations as well as other stake holders.

Chapter Three: Objectives

3.1 General Objective

- To assess the prevalence of hypertension and associated factors among adult diabetes patients in DTGH, Debre Tabor, Ethiopia, 2019.

3.2 Specific Objectives

- To assess the prevalence of hypertension among adult diabetes patients in DTGH, Debre Tabor, Ethiopia, 2019.
- To identify associated factors of hypertension among adult diabetes patients in DTGH, Debre Tabor, Ethiopia, 2019.

Chapter Four: Methods and materials

4.1 Study area and period

The study was conducted in Debre Tabor general hospital which is in the town of Debre Tabor, the administrative center of South Gondar zone. It is located 667km Northwest of Addis Ababa, the capital of Ethiopia and 103 km away from Bahir Dar, the capital of Amhara region. Debre Tabor is a town and a Woreda in north-central Ethiopia. Located in the Debub Gondar Zone of the Amhara Region of Ethiopia, about 100 kilometers southeast of Gondar and 50 kilometers east of Lake Tana, this historic town has a latitude and longitude of 11°51′N 38°1′E / 11.850°N 38.017°E with an elevation of 2,706 meters (8,878 ft) above sea level. The presence of at least 48 springs in the area contributed to the development of Debre Tabor(38).

Debre Tabor town consists of one general hospital (DTGH), three public health centers, three medium private clinics and many drug stores. The Hospital comprises of outpatient departments including chronic disease follow up, ophthalmology, emergency, delivery, laboratory, psychiatry, pharmacy, x-ray, physiotherapy, radiology and other services. It also provides inpatient medical, surgical, pediatrics, gynecological and obstetric services. Currently, the hospital has a catchment population of about 2.3 million people in the zone and nearby districts (22). The study was particularly conducted in the chronic outpatient follow up department which gives medical service for different types of chronic diseases including DM, hypertension, asthma, Rheumatoid arthritis, heart diseases, seizure and others. It was known that 456 adult DM patients/clients aged 18 years and above had follow-up in the study area. The study period was from March 4 to April 15/2019 among adult (aged 18 years and above) diabetes mellitus patients.

4.2 Study Design

Hospital based cross sectional study design was conducted.

4.3 Populations

4.3.1 Source Population

All diabetes mellitus patients aged 18 years and above who had follow-up in DTGH chronic outpatient follow up department were the source population.

4.3.2 Study population

All diabetes mellitus patients aged 18 years and above who had follow up in DTGH chronic outpatient follow up department from March 4 to April 15/2019 who fulfilled the inclusion criteria were the study population.

4.3.3 Study unit

DM Patient or client was the study unit.

4.4 Eligibility Criteria

4.4.1 Inclusion criteria

All adult (18years and above)diabetes mellitus patients who had follow up at least once in the study area during the study period were included.

4.4.2Exclusion criteria

- DM Patients who were critically ill (two patients) and unable to communicate or difficult to measure their anthropometric measurements (two patients) during the data collection period were excluded.
- DM patients recently transferred-in (one patient) and had not important profiles like onset of DM were excluded.
- DM Pregnant women (one pregnant) were excluded.

4.5 Sample size determination and Sampling Technique

4.5.1 Sample size determination

Sample size was determined for both objectives separately. For the first objective sample size was calculated using single population proportion formula based on the following assumptions. The prevalence of hypertension among DM patients (P), which is 55%, was taken from the study done on Prevalence of Hypertension among Patients with Type 2 Diabetes Mellitus and Its Socio Demographic Factors in Nigist Ellen Mohamed Memorial Hospital Hosanna, Southern Ethiopia(30), Z-value of 1.96 at 95% confidence interval (CI) and margin of error (d) 5%.

The minimum sample size was calculated as follows:

$$\mathbf{n} = \frac{(Z\alpha/2)^2[p(1-p)]}{d^2}$$

Where, n = Sample size

P = prevalence of hypertension = 0.55

Zα/2 = Critical value =1.96

d = Precision (marginal error) =0.05

$$\mathbf{n} = \frac{(1.96)^2[0.55(0.45)]}{(0.05)^2}$$

n=**380**' since the source population (N) was less than 10,000 = 456correction/adjustment formula was used $n_f = \frac{n}{1+(n/N)} = \frac{380}{1+(380/456)} = \mathbf{206.5} = \mathbf{207}$. Adding a 10 % non-response rate gave the required minimum sample size **228.**

For the second objective, "Epi info version 7" software for the determination of sample size was used. Factors associated with hypertension and respective parameters were obtained from study conducted in Morocco(35). In addition, two sided confidence level, 80% power, 5% significance level were used to calculate sample size for each associated factor as follows.

Table 1: Calculated sample size for associated factors of hypertension among DM patients in DTGH, Debre Tabor, Ethiopia 2019

Associated factors	Ratio (unexposed: exposed)	% of outcome in unexposed group	AOR	Calculated sample size (Fleiss w/CC)
Age (≥60 years)	0.17	34.62	7.26	82
BMI(30-35 Kg/m^2)	0.51	33.33	3.09	130
DM Duration (5-10 years)	0.73	45.83	2.57	168

From both objectives the first one provided maximum sample size i.e.228. Therefore the final sample size allocated for this study was **228** subjects.

4.5.2 Sampling technique

Systematic random sampling method was used to select 228 subjects from a total of 456 diabetic patients in chronic outpatient follow-up unit of DTGH. The sampling fraction was calculated as dividing the final sample size by the total source population. $n_f/N = 228/456 = 1/2$, therefore the sample interval K was 2. Starting from the first day of data collection the first study participant was selected by SRS (lottery method) from 1 and 2, number 2 was raised and then every other or second patient was selected until the sample size(228) was completed.

4.6 Data collection procedures (instruments/tools and techniques)

4.6.1 Data collection instruments/tools

Data was collected by using a structured interviewer administered questionnaire and observational format or checklist. The questionnaire was adapted from WHO step wise approach for surveillance of NCD risk factors(39) and combination of different related Literatures(3,8,10,23,30,31,33,35,40–42). Three trained nurses were conducted the interviews and necessary measurements using observation format.

4.6.2 Data collection techniques

Data were collected through face to face interview of the study participants and observation of the measurements for BP, weight and height and individual folders or cards for FBS, presence or absence of other chronic diseases. Blood pressure was measured at sitting position two times after the patient had taken a minimum of five minutes rest since the reaching of the unit. The two measurements had a gap of at least five minutes, recorded and the average of the two BP records was taken for analysis. Weight was measured using a standard weight scale in Kgs approximated to the nearest 0.1Kg reading by leveling at zero for each subject prior to measuring with bare foot and light clothing. Height was measured using a standard height measurement scale in meters with upright standing position and was approximated to the nearest 0.1cm reading.BMI was calculated as (weight (Kg)/height $(m)^2$.and classified as underweight (<18.5), normal (18.5_24.99), overweight (25_29.99) and obese (30-35), in addition it was also classified as <25 and ≥ $25Kg/m^2$(43). Patient (client) records (charts) were used to take some important variables like fasting blood glucose level and presence/absence of other chronic diseases in addition to hypertension and diabetes mellitus.

4.7 Study variables

4.7.1 Dependent Variable

- Hypertension status(Yes/No)

4.7.2 Independent Variables

Socio-demographic variables

- Sex
- Age
- Residence
- Occupation
- Marital status
- Household income
- Educational level
- Religion
- Family history of DM and/or HTN

Behavioral variables

- Smoking
- Physical activity
- Alcohol consumption
- Khat chewing
- Habit of diet

Anthropometric variables

- Weight
- Height
- BMI

Clinical variables

- Duration of DM
- Type of DM
- Presence or absence of Other chronic diseases
- Blood glucose level(FBS level)

4.8 Operational definitions

HTN; a study participant was classified as hypertensive if the average SBP/DBP was≥140/90mmHg and/or taking anti-hypertensive drug.

Average Monthly income; for those who earn their income other than in cash(in crop, animal breeding and others),first they were asked how much they produce per year and was changed in to monthly income in ETB then it was classified as:

High level; *those* with average monthly income of≥ 3000 ETB.

Medium level; *those with average monthly income of 1970_2999 ETB.*

Low level; *those with average monthly income of <1970 ETB.*

DM duration: the duration of DM was calculated as age at data collection minus age at onset of DM.

Alcohol drinking; a study participant was considered as drinker if he/she consumed at least one bottle of beer, or one tin of local "tela", or one cup of local "areki" (8-13 ml of ethanol) daily.

Current smoker; someone who has smoked greater than 100 cigarettes in his/her life time and has smoked in the last 28 days.

Previous smoker; someone who has smoked greater than 100 cigarettes in his/her life time but hasn't smoked in the last 28 days.

Nonsmoker: A study participant was considered as non-smoker if he/she took no/less than 100 cigarettes in his/her lifetime.

Food consumption frequency: different food items were asked and classified as **frequently** for those who consumed three days or more per week and **not frequently** for those who consumed less than three days per week.

Physical activity; the subject's physical activity was classified as high, moderate and low

High; a) Vigorous-intensity activity on at least 3 days achieving a minimum total physical activity of at least 1500 min/week OR

b) 7 or more days of any combination of walking, moderate-intensity or vigorous intensity activities achieving a minimum total physical activity of at least 3000 min/week

Moderate; a) 3 or more days of vigorous-intensity activity of at least 20 min per day OR

b) 5 or more days of moderate-intensity activity and/or walking of at least 30 min per day OR

c) 5 or more days of any combination of walking, moderate-intensity or vigorous intensity activities achieving a minimum total physical activity of at least 600 min/week.

Low; Low is the lowest level of physical activity. Those individuals who were not meet the criteria for moderate and high were considered.

4.9 Data quality management

Data quality was assured by developing assessment tools adopted from WHO stepwise approach of NCD for developing countries(44),from scientific journals(3,8,10,23,30,31,33,35,40,41) and from Joint National Committee 8 of hypertension guideline algorithm(42). The English version questionnaire was translated to Amharic version for interviewing and back to English after data collection. Two days training of data collectors (three BSc nurses) and one supervisor(Health officer) about the aim of the study, on the ways of data collection and how to measure, observe and record readings before data collection was undertaken. Pretest on 10% (23 subjects) of the sample population was conducted at Felege hiwot referral hospital and amendment of the questionnaire and checklist was done. Guidelines and protocols for measuring blood pressure were used. Repeated measuring of BP was undertaken and the data collected were checked for completeness before entry.

4.10 Data entry, processing and analysis

After coding and checking for completeness and consistency, data were entered into Epi-data Version 4.4.1and then were exported to SPSS version 20 for further analysis. First frequency distributions of socio demographic and behavioral characteristics of study subjects were explored and descriptive statistics were used to summarize and present the information in the form of mean, median, percentages and tables with 95% confidence intervals for prevalence estimates. A binary logistic regression model with backward likelihood ratio procedure was used to examine factors associated with Hypertension among the study participants. Variables which showed association with dependent variable in the bivariate analyses at $P<0.25$were entered into multivariate logistic regression model. Multiple binary logistic regression analysis was used to examine the association between independent variables and hypertension adjusting for other potential confounders. A p value of less than 0.05 was used to define statistical significance. Both crude and adjusted odds ratio were presented with a 95% confidence interval.

The Hosmer–Lemeshow goodness-of-fit and Omnibus tests of model coefficients tests with enter procedure was used to test for model fitness. The explanatory variables were tested for multi-co linearity before entering them into the multivariable model, using the variance inflation factor(The maximum VIF was 1.65).

4.11 Ethical Consideration

The study proposal was approved by institutional review board (IRB) of Jimma University. Formal support and ethical letters were obtained from IRB of Jimma University and was given to DTGH administrator office; and in turn the office wrote permission letter to chronic disease follow up clinic. Informed consent was obtained from concerning administrative body of the hospital. Oral informed consent was obtained from each study participant and confidentiality was assured by data collectors and supervisor. In addition patients' identifiers like medical registration numbers were excluded during the analysis. For those with average BP ≥ 140/90mmHg, antihypertensive medication and follow up was started according to the decision of the physicians working in the department while for those with pre-hypertension stage they were told to apply life style modifications like regular physical exercise, diet adjustment and cessation of alcohol consumption.

4.12Dissemination Plan

The findings of this study will be presented to Jimma University Department of Epidemiology, and then disseminated to Jimma university Epidemiology department, South Gondar Zone Health Department, DTGH and other concerned governmental and nongovernmental organizations working on NCDs. Conditions will be adjusted as much as possible to present it in various seminars and workshops and for publication on peer reviewed reputable journal.

Chapter Five: Results

5.1 Socio-demographic characteristics of diabetes patients.

Complete data were collected from 228 study participants with 100% respondent rate. The mean age of the respondents was 45.8, 95% CI [43.7-47.9] (±16.5SD) years with the age ranges between 18 and 89 years. More than half, 121(53.1%) of the participants were males. Among the respondents, 55(24.1%) joined/complete higher education whereas 42(18.6%) of them were unable to read and write. More than half (63.2%) of study participants were urban residents. The mean (SD)monthly income of the household of the respondents was 3013.1(2549.5) ETB with 450 minimum and 21500 maximum with 95% CI [2682.8-3347.7]and 84(36.8%) were earned more than or equal to 3000 ETB(Table2).

Table 2: Socio-demographic characteristics of Diabetes clients in Debre Tabor General Hospital, 2019

Variable	Category	Total (%))	HTN		COR [95%CI]	P-value
			Yes (%)	No (%)		
Age Category	18-40	92(40.4)	37(40.2)	55(59.8)	1*	
	41-60	93(40.8)	59(63.4)	34(36.6)	2.6[1.4, 4.7]	0.002**
	>60	43(18.9)	26(60.5)	17(39.5)	2.3[1.1, 4.8]	0.03**
Sex	Male	121(53.1)	67(55.4)	54(44.6)	1.2[0.7, 2.0]	0.55
	Female	107(46.9)	55(51.4)	52(48.6)	1	
Residence	Urban	144(63.2)	88(61.1)	56(39.9)	2.3[1.3, 4]	0.003**
	Rural	84(36.8)	34(40.5)	50(59.5)	1	
Marital status	Single	44(19.3)	16(36.4)	28(63.6)	1	
	Married	151(66.2)	84(55.6)	67(44.4)	2.2[1.1, 4.4]	0.026**
	Separated/Divorced/ Widowed	33(14.5)	22(66.7)	11(33.3)	3.5[1.4,9.1]	0.01**
Religion	Ortho. Christian	212(93)	112(52.8)	100(47.2)	1	
	Muslim	12(5.3)	7(58.3)	5(41.7)	1.3[0.4, 4.1]	0.71
	Others***	4(1.7)	3(75)	1(25)	2.7[0.3, 26.2]	0.4
	Total	121(53.1)	107(46.9)	228(100)		

Table 2: continued… Socio-demographic characterstics of Diabetes clients

Variable	Category	Total (%)	HTN		COR[95%CI]	P-Value
			Yes (%)	No (%)		
Educational status	Illiterate	42(18.4)	22(47.6)	20(52.4)	1	
	Read and write	22(9.6)	14(63.6)	8(36.4)	1.3[0.6, 2.9]	0.57
	Primary school	54(23.7)	27(49.1)	28(50.9)	0.8[0.4, 2]	0.82
	Secondary/pre.	55(24.1)	27(50)	27(50)	0.9[0.4, 1.9]	0.75
	Higher education	55(24.1)	32(58.2)	23941.8)	1.6[0.6, 4.6]	0.39
Occupation	Gov. employee	38(16.7)	22(57.9)	16(42.1)	1*	
	Private	32(14.1)	22(68.8)	10(31.2)	1.6[0.6, 4.3]	0.35
	Farmer	70(30.7)	37(52.9)	33(47.1)	0.8[0.4, 1.8]	0.62
	Merchant	51(22.4)	28(54.9)	23(45.1)	0.9[0.4, 2.1]	0.78
	Student	28(12.3)	11(39.3)	17(60.7)	0.5[0.2, 1.3]	0.14**
	Others****	9(3.9)	2(22.2)	7(77.8)	0.2[0.04, 1.1]	0.07**
Average monthly income	>=3000 ETB	84(36.8)	54(64.3)	30(35.7)	1.123[0.57,2.213]	0.74
	1970-2999	53(23.2)	26(49.1)	27(50.9)	2.1[1.144,3.855]	0.02**
	<1970	91(39.9)	42(46.2)	49(53.8)	1	
Family DM history	Yes	81(35.5)	48(59.3)	33(40.7)	1.4[0.8, 2.5]	0.19**
	No	147(64.5)	74(50.3)	73(49.7)	1	
Family HTN history	Yes	50(21.9)	38(76)	12(24)	3.5[1.7, 7.2]	0.001**
	No	178(78.1)	84(47.2)	94(52.8)	1	
	Total (%)	228(100)	122(53.5)	106(46.5)		

Key: *=Reference, ** = From socio-demographic variables in the bivariate logistic regression, Age, marital status, Occupation, Average monthly income of the household, Residence, Family history of DM and Family history of HTN were candidates for the final model (P<0.25).

*** = 2 Protestants and 2 Adventists,**** = 3 house wives, 2 daily laborers and 4 retired.

5.2 Clinical and anthropometric characteristics of diabetes patients

Majority of the clients 190(83.3%) had experienced DM for less than or equal to five years and most of them 151(66.2%) were not able to control their FBS. The mean DM duration and FBS of the clients were3.47 years (±2.36 SD) and 166.54 mg/dl (±74.05SD) respectively. Forty (17.5%) of the study participants were experienced other non-communicable diseases, excluding hypertensive patients (Table 3).The mean weight and height of the respondents were 64.03(±10.05 SD) Kg and 1.64($\pm 0.08\ SD$) m with 95% CI. [62.64-65.35, 1.63-1.65] respectively. The mean BMI was 23.89(±3.36 SD) with 95% CI [23.39-24.33]. More than half (58.8%) of the clients had normal BMI.

Table 3: Clinical and anthropometric characteristics of diabetes patients in Debre Tabor Hospital, 2019

Variable	Category	Total (%)	HTN		COR 95%CI	P-Value
			Yes (%)	No (%)		
DM Type	Type I	112(49.1)	56(50)	56(50)	1*	
	Type II	116(50.9)	66(56.9)	50(43.1)	1.3[0.8, 2.2]	0.29
DM Duration	<= 5 years	190(83.3)	94(49.5)	96(50.5)	1	
	>5 years	38(16.7)	28(73.7)	10(26.3)	2.9[1.3, 6.2]	0.008**
FBS	controlled	151(66.2)	29(37.7)	48(62.3)	1	
	Not controlled	77(33.8)	93(61.6)	53(38.4)	2.7[1.5, 4.7]	0.001**
Other NCD***	Yes	40(17.5)	32(80)	8(20)	4.4[1.9, 9.9]	0.000**
	No	188(82.5)	90(47.9)	98(52.1)	1	
Weight	<50 kg	19(8.3)	4(21.1)	15(78.9)	1	
	50-70 kg	155(68)	77(49.7)	78(50.3)	3.7[1.2, 11.7]	0.025**
	>70 kg	54(23.7)	41(75.9)	13(24.1)	11.8[3.3, 42]	0.000**
Height	<1.5 m	6(2.6)	2(33.3)	4(66.7)	0.2[0.03, 1.6]	0.13**
	1.5-1.75 m	208(91.2)	110(52.9)	96(47.1)	0.4[0.1, 1.5]	0.19**
	>1.75 m	14(6.2)	10(71.4)	4((28.6)	1	
BMI (kg/m$^{2)}$	<25	145(63.5)	65(44.8)	80(54.6)	1	
	>=25	83(36.5)	57(68.7)	26(31.3)	2.698[1.529,4.76]	0.001**
	Total (%)	228(100)	122(53.5)	106(46.5)		

*=Reference, **= from clinical and anthropometric variables in the bivariate logistic regression DM duration, FBS, other NCDs and BMI were candidates for the final model (P≤0.25). *** =16 CHD, 18 CKD 2 Cancer, 5 Asthma, 2 COPD 5 GTCS and 2 RA.

5.3 Behavioral characteristics of diabetes clients

Majority 197(86.4%) of the respondents were nonsmokers, 136(59.6%) alcohol drinkers, 8(3.5%) chat chewers, 104(45.6%) of them exercised low physical activity level (Table 4). One hundred sixty three (71.5%) were using saturated oil frequently for food, 69(30.3%) used fatty foods like meat frequently, 111(48.7%) ate sugar and sweets frequently, 52(22.8%) were frequently eating fruits and 143(62.7%) were eating vegetables frequently. Among the respondents majority (86.8%) of them were adding salt to their food frequently, among whom 56(24.6%), 124(54.4%) and 48(21.1%) of them had thought that they consume much, just right amount and little salt or salty sauce respectively.

Table 4: Behavioral characteristics of diabetes clients in DTGH, April 2019

Variable	Category	Total (%)	HTN		COR[95%CI]	P-Value
			Yes (%)	No (%)		
Alcohol drinker	Yes	136(59.6)	78(57.4)	58(42.6)	1.5[0.9, 2.5]	0.16**
	No	92(40.4)	44(47.8)	48(52.2)	1	
Smoking	Current smoker	8(3.5)	6(75)	2(25)	4.9[1.6, 14.9]	0.005**
	Previous smoker	23(10.1))	19(82.6)	4(17.4)	3.1[0.6, 15.7]	0.17**
	Non smoker	197(86.4))	97(49.2)	100(50.8)	1	
Khat chewer	Yes	8(3.5)	5(62.5)	3(37.5)	0.7[0.2, 2.9]	0.6
	No	220(96.5)	117(46.8)	103(53.2)	1	
Eat saturated oil	frequently	163(71.5)	100(61.3)	63(38.7)	3.1[1.7, 5.7]	0.000**
	Not frequently	65(28.5)	22(33.8)	43(66.2)	1	
Eat fatty foods	frequently	69(30.3)	40(58)	29(42)	1.3[0.7, 2.3]	0.374
	Not frequently	159(69.7)	82(51.6)	77(48.4)	1	
Fruit consumption	frequently	52(22.8)	15(28.8)	37(71.2)	1	
	Not frequently	176(77.2)	107(60.8)	69(39.2)	3.8[1.9, 7.5]	0.000**
Vegetable consumption	frequently	143(62.7)	57(39.9)	86(60.1)	1	
	Not frequently	85(37.3)	65(76.5)	20(23.5)	4.9[2.7, 8.9]	0.000**
Eat sugar and sweets	Frequently	111(48.7)	71(64)	40(36)	2.3[1.3, 3.9]	0.002**
	Not frequently	117(51.3)	51(43.6)	66(56.4)	1	
Add salt to food	frequently	198(86.8)	115(58.1)	83(41.9)	4.6[1.9, 11.1]	0.001**
	Not frequently	30(13.2)	7(23.3)	23(76.7)	1	
Salt consumption	Much	56(24.6)	39(69.6)	17(30.4)	2.5[1.3, 4.7]	0.006**
	Little	172(75.4)	83(48.3)	89(51.7)	1	
Physical activity level	High	31(13.6)	4(12.9)	27(87.1)	1	
	Medium	93(40.8)	30(31.6)	65(68.4)	3.1[1.1, 9.7]	0.05**
	Low	104(45.6)	88(86.3)	14(13.7)	42.4[12.9, 139.7]	0.000**

** = From behavioral variables in the bivariate logistic regression Smoking habit, Alcohol drinking, eating saturated oil, Eating sugar and sweets, Eating fruits, Eating vegetables and Adding salt to food were candidates for the final model ($P \leq 0.25$). Since physical activity had wide confidence interval it was not entered into the final model because it disturbed other important variables.

5.4 Prevalence of Hypertension

The mean systolic and diastolic blood pressure of the study participants was 124.01mmHg (±18.84SD) and 78.29mmHg (±11.39SD) respectively. Among the study participants 10(4.4%) were stage II HTN (SBP>=160mmHg) based on their systolic blood pressure and 16(7%) were stage II HTN based on their diastolic blood pressure (DBP>=100mmHg) (Table 5)

The overall prevalence of hypertension among diabetes mellitus clients in this study was 122 (53.5%) with 95% CI [47.7%- 60.2%].

Table 5: Blood pressure status of diabetes patients in Debre Tabor General Hospital, 2019.

Variable	Category	Frequency(n=228)	Percent (100%)
SBP (mmHg)	Stage II HTN(>=160)	10	4.4
	Stage I HTN(140-159)	67	29.4
	Pre HTN(120-139)	69	30.3
	Normal(<120)	82	36
DBP (mmHg)	Stage II HTN(>=100)	16	7
	Stage I HTN(90-99)	49	21.5
	Pre HTN(81-89)	73	32
	Normal(<80)	90	39.5
HTN	Yes	122	53.5
	No	106	46.5
New HTN	Yes	59	26.3
	No	169	73.7
	Total	228	100

5.5 Independently associated factors of Hypertension

Multivariable logistic regression model was fitted to identify independently associated factors of hypertension among DM patients at $P<0.05$. Accordingly residence, family history of hypertension, duration of diabetes mellitus, fasting blood sugar, eating saturated oil, fruit consumption, and vegetable consumption, salt addition to food and body mass index were independently associated factors of hypertension among adult diabetes patients

Table 6: Multivariate Logistic Regression analysis of factors associated with hypertension among diabetes patients in Debre Tabor General Hospital, 2019

Variable	Category	Hypertension status		COR[95%CI]	AOR[95%CI]
		Yes(%)	No (%)		
Age	18-40	37(40.2)	55(59.8)	1*	1
	41-60	59(63.4)	34(36.6)	2.6[1.4,4.7)	2.9[0.9, 8.2]
	>60	26(60.5)	17(39.5)	2.3[1.1,4.8]	1.8[0.5, 6]
Residence	Urban	88(61.1)	56(38.9)	2.3[1.3,4]	3.2[1.1, 9.7]**
	Rural	34(40.5)	50(59.5)	1	1
Marital status	Single	16(36.4)	28(63.6)	1	1
	Married	84(55.6)	67(44.4)	2.2[1.1, 4.4]	2.3[0.4, 12.6]
	Separated/divorced/widowed	22(66.7)	11(33.3)	3.5[1.4,9.1]	3.8[0.5, 26.8]
Occupation	Gov. employee	22(57.9)	16(42.1)	1	1
	Private	22(68.8)	10(31.2)	1.6[0.6, 4.3]	0.8[0.2, 4.1]
	Farmer	37(52.9)	33(47.1)	0.8[0.4, 1.8]	0.7[0.1, 4.0]
	Merchant	28(54.9)	23(45.1)	0.9[0.4, 2.1]	0.7[0.2, 2.8]
	Student	11(39.3)	17(60.7)	0.5[0.2, 1.3]	2.4[0.3, 20.1]
	Others	2(22.2)	7(77.8)	0.2[0.04, 1.1]	0.4[0.02, 7.5]
Family DM history	Yes	48(59.3)	33(40.7)	1.4[0.8, 2.5]	0.5[0.2, 1.2]
	No	74(50.3)	73(49.7)	1	1
Family HTN history	Yes	38(76)	12(24)	3.5[1.7,7.2]	4.3[1.4,13.3]**
	No	84(47.2)	94(52.8)	1	1
Average house hold Income(ETB)	High(>=3000)	54(64.3)	30(35.7)	1.1[0.6,2.2]	1.4[0.5, 3.9]
	Medium(1970-2999)	26(49.1)	27(50.9)	2.1[1.1,3.9]	1.1[0.4, 3.0]
	Low(<1970)	42(46.2)	49(53.8)	1	1
DM duration	<=5 Years	94(49.5)	96(50.5)	1	1
	>5 Years	28(73.7)	10(26.3)	2.9[1.3, 6.2]	5.8[1.8, 18.5]**
FBS (mg/dl)	Controlled (<=130)	29(37.7)	48(62.3)	1	1
	Not controlled (>130)	93(61.6)	53(38.4)	2.7[1.5, 4.7]	4.2[1.7, 10]**
Other NCDs	Yes	32(80)	8(20)	4.4[1.9, 9.9]	2.2[0.7, 6.8]
	No	90(47.9)	98(52.1)	1	1

Table 6 continued…Multivariate Logistic Regression analysis of factors associated with hypertension among diabetes patients in Debre Tabor General Hospital, April 2019

Variable	Category	hypertension		COR [95% CI]	AOR [95% CI]
		Yes (%)	No (%)		
Smoking	Current smoker	6(75)	2(25)	4.9[1.6, 14.9]	0.6[0.1, 9.2]
	Previous smoker	19(82.6)	4(17.4)	3.1[0.7, 15.7]	0.6[0.1, 3]
	Non smoker	97(49.2)	100(50.8)	1	1
Alcohol drinker	Yes	78(57.4)	58(42.6)	1.5[0.9, 2.5]	0.9[0.3, 2.7]
	No	44(47.8)	48(52.2)	1	1
Saturated oil consumption	Frequently	100(61.3)	63(38.7)	3.1[1.7, 5.7]	3.2[1.2, 8.7]**
	Not frequently	22(33.8)	43(66.2)	1*	1
Sugar and sweets	Frequently	71(64)	40(36)	2.3[1.3, 3.9]	1.6 [0.6, 3.9]
	Not frequently	51(43.6)	66(56.4)	1	1
Fruits consumption	Frequently	15(28.8)	37(71.2)	1	1
	Not frequently	107(60.8)	69(39.2)	3.8[1.9, 7.5]	2.5[1.1, 9.9]**
Vegetables consumption	frequently	57(39.9)	86(60.1)	1	1
	Not frequently	65(76.5)	20(23.5)	4.9[2.7, 8.9]	6.8[2.7,17.0]
Add salt to food	Frequently	115(58.1)	83(41.9)	4.5[1.9, 11.1]	3.6[1.2,12.8]**
	Not frequently	7(23.3)	23(76.7)	1	1
BMI(Kg/m^2)	<25	65(44.8)	80(54.6)	1	1
	>=25	57(68.7)	26(31.3)	2.7[1.5,4.8]	2.9[1.2, 6.7]**

1* = Reference, ** = significantly associated

Urban residents were about 3.2 times (AOR = 3.244[95% CI, 1.081, 9.738], P = 0.036) more likely to be hypertensive as compared to rural resident subjects. Study subjects who were having family history of hypertension were about 4.3 times (AOR = 4.255, 95%CI [1.359, 13.327] P = 0.011) at increased risk of hypertension as compared to their counterparts. Study subjects who experienced diabetes mellitus for more than five years were about 5.8 times (AOR = 5.838, 95% CI [1.845, 18.474], P = 0.003) at increased risk of hypertension as compared to those experienced for less than five years.

Study participants who were not controlled (FBS>130mg/dl) their FBS were 4.2 times (AOR = 4.158, 95%CI [1.731, 9.988], P = 0.001) at increased risk of hypertension as compared to patients with controlled FBS (≤ 130mg/dl). Study participants who consumed saturated oil frequently were about 3.2 times (AOR = 3.195, 95% CI [1.174, 8.698], P = 0.023) at increased risk of hypertension as compared to their counter parts. Study subjects who consumed fruits not frequently were 2.5 times (AOR = 2.523, 95% CI [1.011, 6.985], P =0.028) more at risk of hypertension as compared to those who consumed frequently. Study subjects who consumed vegetables not frequently were 6.8 times (AOR = 6.829, 95%CI [2.738, 17.036], P<0.001) at increased risk of hypertension as compared to those who consumed frequently. Study subjects who were in the practice of adding salt frequently to their food were 3.6 times (AOR = 3.641, 95%CI [1.167, 12.831], P = 0.041) at increased risk of hypertension as compared to those who practiced in adding not frequently. Study participants with body mass index of greater than or equal to 25 Kg/m^2 were about 3 times (AOR =2.881, 95%CI [1.237,6.714], P = 0.014) more at risk of hypertension as compared to those with body mass index of less than 25 Kg/m^2 (Table 6).

Chapter Six: Discussion

The overall prevalence of hypertension among diabetes mellitus clients in this study was 53.5%.This result is almost consistent with a study conducted on the prevalence of hypertension among T2DM clients in Hosanna, Nigist Ellen Mohamed memorial Hospital, Southern Ethiopia which was 55%, 54.2% in Benin City, Nigeria, 55.35% and in Thailand (55.35%) (6,30,45). But it was lower than studies conducted in Iraq diabetic patients for the prevalence and control of hypertension, a prospective cohort study with a definition of hypertension in diabetic patients was confirmed if systolic BP was equal or more than 130 mmHg and or diastolic BP equal or more than 80 mmHg was 89.6%, in Amritsar 86.6% (88.2 % and 84.7% in diabetic males and females, respectively), in Benghazi, Libya 85.6%, 70.4% in Morocco and 61.2% in Gaborone City Council clinics, Botswana, Akaba Southern Jordan(76%) and Jordan(72.4%) (31,33–35,41,46,47) and slightly higher (46.5%) than a study conducted in Jimma University Specialized Hospital(48).This difference may be due to the life style and socio-demographic differences of the study participants among different regions of the world. The variety use of hypertension definition in diabetic patients may also another reason for the difference.

Of the total 122 hypertensive diabetic patients in this study 60(49.2%) of them were newly diagnosed during the study period, this result is consistent with studies conducted in Nigist Ellen Mohamed memorial Hospital, Hosanna, Southern Ethiopia and Iraq showed that half and 45.3% of the patients who were hypertensive were diagnosed during the study period respectively, where as in Morocco, of 371 hypertensive patients 38.8% of them were not aware of having hypertension at the time of the study(30,31,35).This may be due to infrequent screening of hypertension among DM patients and/ or the increase incidence of HTN from time to time.

In this study factors independently associated with hypertension were being urban in place of residence, having family history of hypertension, suffering from overt DM for more than five years, not controlled FBS(>130mg/dl), not frequently consuming fruits, not frequently consuming vegetables, frequently adding salt to food and BMI of more than 25Kg/m^2.Urban residents were about 3.2 times more likely to be hypertensive as compared to rural residents which is consistent with a study conducted in Nigist Ellen Mohamed Memorial Hospital, Hosanna, southern Ethiopia that revealed rural residents were less likely to have hypertension as compared to urban residents (30).This may be due to the fact that most of the time urban residents practiced sedentary way of life and their habit of diet might not be diversified. Family history of hypertension was among the independently associated factors of hypertension in this study, showed that Study subjects who were having family history of hypertension were 4.3 times at increased risk of hypertension as compared to their counterparts**.** This result is consistent with studies conducted in Kuwait, China, Botswana and Jigjiga, Ethiopia(8,34,36,37). This implies that genetics is an important risk factor of hypertension. Study subjects who experienced diabetes mellitus for more than five years were 5.8 times at increased risk of hypertension as compared to those experienced for less than five years. Therefore DM duration of the client was among independently associated factors of hypertension in this study which was similar with studies conducted in Iraq, Morocco and Libya. Years of DM duration were associated with the prevalence of hypertension among diabetic patients, Hypertension was less prevalent among subjects who had the least duration of DM(31,33,35).The possible explanation for this may be as the duration of diabetes increases, complications become more worsen which leads to hypertension. Study participants who were not controlled (FBS>130mg/dl) their FBS were 4.2 times at increased risk of hypertension as compared to patients with under control of FBS ($\leq$ 130mg/dl).Study participants with body mass index of greater than or equal to 25 Kg/m2 were about 3 times more at risk of hypertension as compared to those with body mass index of less than 25 in this study which was similar with a study conducted in Iraq that identified BMI was among the factors independently associated with hypertension; BMI $\geq$25Kg/m^2 were 5 time more at risk for hypertension than those with BMI less than 25 Kg/m^2. Similarly, in a cross-sectional population based study in Jigjiga Town, Somali, Ethiopia those who had BMI $\geq$ 25 were two times more likely to be hypertensive when compared to those who had BMI less than 25as well as in a hospital based study in Bahir Dar Felege-Hiwot Referral hospital, Peoples of BMI >=25 were 4.79-folds more likely to develop hypertension than underweight individuals(8,23,31,35).The possible explanation for this is when an individual becomes obese he/she will have excess bad cholesterol in blood vessels and it makes narrow blood vessels and progressively the person develop hypertension due to hormonal effects. Sodium retention, plasma rennin activity, angiotensinogen, angiotensin II and aldosterone values display significant increase during obesity and additionally insulin resistance and inflammation may promote an altered profile of vascular function and consequently leads to hypertension.

The limitation of this study may be the design can't identify which comes first hypertension or exposure factors and unable to show temporal relationship. Since the study was hospital based, it may not be representative of the community and some questions were exposed for recall bias like for example food frequency questions.

Chapter Seven: Conclusion and Recommendation

7.1 Conclusion

The prevalence of hypertension among diabetes patients in this study was high. More than half (53.5%) of diabetes patients in this study were hypertensive. Individuals with both hypertension and diabetes are at high risk for both micro vascular and macro vascular complications of DM. Both are recognized as important risk factors for atherosclerosis, cardiovascular diseases including myocardial infarction and stroke. The two diseases often multiply the risk for complications if they coexist. Diabetic patients with hypertension should be treated with appropriate antihypertensive drugs and carefully monitored to ensure satisfactory blood pressure control and prevention of the end-organ complications of hypertension. The results in this study concluded that there was a significant association between residence, family history of hypertension, fasting blood sugar, duration of DM, eat saturated oil, adding salt to food, fruits and vegetables consumption and body mass index.

7.2 Recommendation

For Debre Tabor General Hospital: It is better to design strategies for diabetes patients to practice eating fruits and vegetables frequently ,to reduce saturated oil consumption, how to reduce obesity and control their FBS and BP in addition to pharmacologic medications.

For South Gondar Zone Health Department: The health department had better to work with health institutions (i.e. Hospitals and health centers) in the prevention and control of hypertension among diabetes patients by helping them to design and apply strategies in each health institution and home to home blood pressure screening program for DM patients should be considered in the health extension packages.

For Amhara Regional Bauru and FMOH: These institutions had better to promote the importance of life style modifications in preventing hypertension through mass media and different mechanisms. In addition to government concern, prevention of hypertension need societal and community as well as NGOs support. Therefore, health system policy makers should prioritize to prevent/control coexistence of non-communicable chronic diseases in this case HTN among DM patients.

For researchers: I would like to recommend conducting prospective cohort and community based studies to overcome the limitations of this study on the prevalence of hypertension and associated factors among DM patients considering serum cholesterol level and lipid profiles, institutional and professional factors, psychological factors and factors related to diabetes complications.

References

1. Hauser JFK. Harrison's Principles of Internal Medicine. 20th ed. MC GrawHill Education; 2018.
2. WHO. A global brief on Hyper - tension World Health Day. 2013;
3. Anto et al . Determinants of isolated systolic hypertension among diabetic patients visiting the diabetic clinic at the Tamale Teaching Hospital , Northern Ghana . 2016;16(4):1151–6.
4. Demitri N, Member S, Zoubir AM. Measuring Blood Glucose Concentrations in Photometric Glucometers Requiring Very Small Sample Volumes. 2016;1–12.
5. Muleta et al. Blood pressure control and its determinants among diabetes mellitus co- morbid hypertensive patients at Jimma University medical center , South West Ethiopia. 2017;1–9.
6. Hurst C, Thinkhamrop B, Tran HT. The Association between Hypertension Comorbidity and Microvascular Complications in Type 2 Diabetes Patients : A Nationwide Cross-Sectional Study in Thailand. 2015;395–404.
7. WHO. Facts about hypertension. 2013;
8. Asresahegn H. et al. Prevalence and associated factors of hypertension among adults in Ethiopia. a community based cross-sectional study. BMC Res Notes [Internet]. 2017;1–8. Available from: https://doi.org/10.1186/s13104-017-2966-1
9. WHO. Non communicable diseases report country profiles. 2018;
10. Awoke A. et al. Prevalence and associated factors of hypertension among adults in Gondar , Northwest Ethiopia : a community based cross-sectional study. 2012;2–7.
11. CambellRK. Type 2 diabetes: where we are today: an overview of disease burden, current treatments, and treatment strategies. J Am Pharm Assoc; 2009. p. 49 Suppl 1:S3-9.
12. Mohan et al. The Rising Burden of Diabetes and Hypertension in Southeast Asian and African Regions : 2013;2013.
13. Tesfaye et al. prevalence of high blood pressure among adults in Addis Ababa : 2009;10.
14. Molla M. Systematic Reviews of Prevalence and Associated Factors of Hypertension in Ethiopia : Finding the Evidence. 2015;3(4):514–9.
15. Kibret KT, Mesfin YM. Prevalence of hypertension in Ethiopia : a systematic meta-analysis. Public Health Rev [Internet]. 2015; Available from: http://dx.doi.org/10.1186/s40985-015-0014-z
16. Gladness G. Comorbidity of Diabetes And Hypertension And Available Management Strategies In Eastern African Region. 2017;6(6):1–9.
17. Federal Democratic Republic of Ethiopia. National Strategic Plan of NCDs. 2016;
18. Masolo N et al. What Are the Determinants of Insulin Resistance (IR) and How Effective Is the Sub-Saharan Africa-Specific Threshold of Abdominal Obesity (AO-SSA) Identifying IR in Congolese Black Hypertensive Patients ? 2014;(December):642–54.
19. Kalofoutis et al. Clinical cardiology: Review Type II diabetes mellitus and cardiovascular risk factors. current therapeutic approaches. 2007;12(1):17–28.
20. WHO. The top ten cuases of death. 2007;(February).
21. CDC. National Diabetes Fact Sheet, General information. 2007;
22. Teshome et al. Determinants of blood pressure control amongst hypertensive patients in Northwest Ethiopia. 2018;1–11.
23. Belachew et al. Prevalence and associated factors of hypertension among adult patients in Felege - Hiwot Comprehensive Referral Hospitals , northwest , Ethiopia : a cross - sectional study. BMC Res Notes [Internet]. 2018;1–6. Available from: https://doi.org/10.1186/s13104-018-3986-1
24. Helelo et al. Prevalence and Associated Factors of Hypertension among Adults in Durame. 2014;1–9.

25. Gudina K et' al. Prevalence of Hypertension and associated factors in Bedele Town , Southwest Ethiopia. 24. No.1(6).
26. Abebe et al. Prevalence and Associated Factors of Hypertension : A Crossectional Community Based Study in Northwest Ethiopia. 2015;241:1–11.
27. WHO. Non communicable diseases country profiles. In Geneva, Switzerland; 2011. Available from: ISBN 978 92 4 150228 3
28. WHO. Non communicable diseaes Country Profiles 2014. 2014;
29. Palencia R. Prevalence of hypertension and obesity in patients with type 2 diabetes mellitus in observational studies : a systematic literature review. 2013;327–38.
30. Tadesse et al. Prevalence of Hypertension among Patients with Type 2 Diabetes Mellitus and Its Socio Demographic Factors in Nigist Ellen Mohamed Memorial. 2018;9(4):4–10.
31. Mansour AA. Prevalence and Control of Hypertension in Iraqi Diabetic Patients : A Prospective Cohort Study. 2012;68–71.
32. Mehata et al. Prevalence and Determinants of Comorbid Diabetes and Hypertension in Nepal : Evidence from NCD Risk Factors STEPS Survey Nepal. 2015;13(1):20–5.
33. Nouh F, Omar M, Younis M. Prevalence of Hypertension among Diabetic Patients in Benghazi : A Study of Prevalence of Hypertension among Dieabetic Patients in Benghazi : A Study of Associated Factors. 2017;(September).
34. Addisu Y. Mengesha. Hypertension and related risk factors in type 2 diabetes mellitus (DM) patients in Gaborone City Council (GCC) clinics , Gaborone ,. 2007;7(4):244–5.
35. Mohamed Berraho et al. Hypertension and type 2 diabetes: in Morocco. 2012;8688:1–9.
36. Thangavel Alphonse Thanaraj. State of Diabetes, Hypertension, and Comorbidity in Kuwait: Showcasing the Trends as Seen in Native Versus Expatriate Populations. 2013;36:2827.
37. Jiang et al. Association Between Family History and Hypertension Among Chinese Elderly. 2015;94(48):1–6.
38. Website of Wikepedia. Profile of South Gondar Zone. 2018.
39. WHO. The WHO STEPwise approach to noncommunicable disease risk factor surveillance, Geneva, Switzerland. 2014;
40. Ogunsina MA, Anumah FO. Prevalence and correlates of hypertension and diabetes mellitus in an urban community in North-Western Nigeria. 2018;8688:1–7.
41. Kaur, N. and Sidhu S. Prevalence of Obesity and Hypertension in Newly Diagnosed Type 2 Diabetes Mellitus (T2dm) Patients Of Amritsar. 2010;(1996):113–8.
42. Joint National Committee. JNC 8 Hypertension Guideline Algorithm. 2014;311(5).
43. WHO_anthropometry interpretation. 1995.
44. WHO: WHO Stepwise Approach for non communicable diseaeses risk factor surveillance. 2017;(September):2016–7.
45. Unadike BC, Eregie A, Ohwovoriole AE. Prevalence of hypertension amongst persons with diabetes mellitus in Benin City , Nigeria. 2011;14(3):300–2.
46. Alhusamia et al. prevalence of Hypertension among Diabetic type 2 patients Attending Medical clinic at Prince Hashem Bin Abdullaii Hospital in Aqaba: I ndian J ournal of M edical R esearch and P harmaceutical S ciences. 2017;4(June):47–54.
47. Mubarak FM, Froelicher ES, Jaddou HY, Ajlouni M. Hypertension among 1000 patients with type 2 diabetes attending a national diabetes center in Jordan. 2008;28(October):346–51.
48. Solomon T. et al. Risk factors for cardiovascular diseases among diabetic patients in Southwest Ethiopia: 2010;

Annex One: English version Information and consent sheet

Jimma University

Institute of health

Faculty of public health

Department of Epidemiology

Information sheet

Good morning/Afternoon!!?

I am____________________, I am data collector of a research on the prevalence of hypertension and associated factors among adult DM patients/clients in DTGH**.** The aim of the study is to assess the prevalence of hypertension and associated factors among adult DM patients/clients. Therefore, this study will have a great contribution in the control and prevention of hypertension among DM patients. Besides, I believe that this study will help in attracting governmental and non-governmental organizations and contribute their part on this problem.

During the study period, you will be interviewed about your socio demographic characteristics, smoking status, physical activity and health habits. In addition your height, weight and blood pressure will be measured using standardized instruments and some important variables will be taken from your folder. Only light clothes will be wearing during measurement of body weight and Height will be measured using measuring board with bare foot. This study does not bring any harm to your health and it does not have benefit in terms of fee. If you feel discomfort with the questions, please feel free to drop at any time you want. This process will take about 15 minutes. Finally, what I want to assure you is that your name and address will not be mentioned and handed over to others. However, the result will be organized and documented and might be submitted to the concerned Health Organizations or other bodies.

Are you voluntary? A. Yes B. No Continue if and only if the option is yes, otherwise go to next respondent.

Investigator's Address:

Wondimnew Desalegn Addis Phone No.: +251918454337

Email: wondimnewd@gmail.com

Annex Two: English Version Questionnaire for data collection

Questionnaire for data collection of prevalence of hypertension and associated factors among adult DM patients/clients in DTGH North West Ethiopia, 2019

Name of the data collector: ____Sign. ______
Name of the supervisor: ____Sign. _____
Date of data collection ________________ E.C MRN _________ Questionnaire No.____________

Question No.	Question	Response category	Skip
Part I Socio-demographic and economic variables			
101	Age of the respondent in completed years	_________________	
102	Sex	1. Male 2. Female	
103	Educational status	________________	
104	Marital Status	1. Single 2. Married 3. Separated 4. Divorced 5. Widowed	
105	Occupation	1. Government employed 2. Private 3. Farmer 4. Merchant 5. Student 6. Other/specify______________	
106	Average Monthly income of the household in ETB	_________________	

107	Place of residence	1. Urban 2. Rural	
109	Religion	1. Orthodox Christian 2. Muslim 3. Protestant 4. Other/specify ___________	
110.	Family History of DM	1. Yes 2. No	
111	Family History of HTN	1. Yes 2. No	

Part II Clinical factors

201	Type of DM	1. Type I 2. Type II	
202	Duration of DM in months	_____________	
203	Presence of other diagnosed chronic Diseases	1. Yes 2. No	Q--301
204	If your answer is yes for Q-203, what is the disease?	_____________________	

Part III Behavioral factors

301	What is your Smoking habit	1. Current smoker 2. Non smoker-------------------------→ 3. Pervious smoker--------------------→	 Q-303 Q-303
302	If your smoking habit is current smoker, How many cigarettes do you smoke in your life time?	1. More than 100 2. Less than 100	
303	Have you ever consumed any alcohol such as beer, wine, spirits, 'Tela' or 'Arekie'?	1. Yes 2. No-------------------------------→	 Q-310

304	Have you consumed any alcohol within the past 12 months?	1. Yes 2. No------------------------------→	Q-306
305	During the past 12 months, how frequently have you had at least one standard alcoholic drink?	1. Daily 2. 5-6 days per week 3. 3-4 days per week 4. 1-2 days per week 5. 1-3 days per month 6. Less than once a month 7. Never	
306	Have you consumed any alcohol within the past 30 days?	1. Yes 2. No-------------------------→	Q-309
307	During the past 30 days, on how many occasions did you have at least one standard alcoholic drink?	1. Number 2. Do not know/remember	
308	During the past 30 days, when you drank alcohol, how many standard drinks on average did you have during one drinking occasion?	1. Number____________ 2. Do not know/remember	
309	During each of the past 7 days, how many standard drinks did you have each day?	1. Monday _________________ 2. Tuesday_________________ 3. Wednesday_________________ 4. Thursday_________________ 5. Friday_________________ 6. Saturday_________________ 7. Sunday_________________	
310	Do you chew chat?	1. Yes 2. No------------------------------→	Q-312
311	If yes for Q-310, how often do you chew?	1. Less than once a month 2. Once to three times per month 3. Once a week 4. Two to four times per week 5. Daily	
312	How often do you eat saturated oil?	1. Always 2. Often 3. Sometimes 4. Rarely 5. Never	

313	How often do you eat fatty foods like meat?	1. Always 2. Often 3. Sometimes 4. Rarely 5. Never	
314	How often do you eat sugar and sweets?	1. Always 2. Often 3. Sometimes 4. Rarely 5. Never	
315	How often do you eat fruits	1. Always 2. Often 3. Sometimes 4. Rarely 5. Never	
316	How often do you eat vegetables	1. Always 2. Often 3. Sometimes 4. Rarely 5. Never	
317	How often do you add salt or a salty sauce such as soy sauce to your food right before you eat it or as you are eating it?	1. Always 2. Often 3. Sometimes 4. Rarely 5. Never 6. Don't know	
318	How much salt or salty sauce do you think you consume?	1. Far too much 2. Too much 3. Just the right amount 4. Too little 5. Far too little	

Physical activity Questionnaire

Below are questions about individual's physical activity levels. Please read the descriptions and answer the questions even if you do not consider yourself to be an active person. Consider all activities, those you do at school, as part of your house and yard work, to get from place to place, and in your spare time for recreation, exercise or sport.

Hard physical activity:

Think about all the vigorous activities which take hard physical effort that you did in the last 7 days. Vigorous activities make your breath harder than normal and may include heavylifting, aerobic, or fast bicycling. Think only about those physical activities that you did for atleast 10 minutes at a time.

319	During the *last 7 days*, on how many days did you do vigorous physical activities?	1. ________days/week 2. Don't know/not sure	
320	How much *total time* did you usually spend doing *vigorous physical activities* on one of those days?	1. ________hours/day 2. ________minutes/day 3. ________don't know/not sure	
Moderate physical activity: *Think about the activities which take moderate physical effort that you did in the last 7 days. Moderate physical activities make your breath somewhat harder than normal andmay include carrying light loads, bicycling at a regular pace, or doubles tennis. Do not include walking. Again, think about only those physical activities that you did for at least 10 minutes.*			
321	During the last 7 days, on how many days did you do moderate physical activities?	1. ________days 2. ________don't know/not sure	
322	How much *total time* did you usually spend doing *moderate physical activities* on one of those days?	1. ________hours/day 2. ________minutes/day 3. ________don't know/not sure	
323	If your pattern of activity varies from day to day or includes multiple tasks, how much *total time* did you spend over the last 7 days doing *moderate physical activity?*	1. ________hours/day 2. ________minutes/day 3. ________don't know/not sure	
	Walking: *Now think about the time you spend walking in the last 7 days. This includes at work and at home, walking to travel from place to place, and any other walking that you might do solely for recreation, sport, exercise or leisure*		

324	During the *last 7 days*, on how many days did you *walk* for at least 10 minutes at a time?	1. __________days/week 2. _________do not know/not sure	
325	If your pattern of activity varies from day to day or includes multiple tasks, how much *total time* did you spend *walking* over the last 7 days?	1. ________hours/day 2. ________minutes/day 3. ________don't know/not sure	
	Sitting: *Finally, think about the time you spent sitting on weekdays during the last 7 days. Include time spent at class, at home, while doing course work, and during leisure time. This may include time spent sitting at a desk, visiting friends, reading, and sitting or lying down to watch television.*		
326	During the *last 7 days* how much *total time* did you usually spend sitting on a week day?	1. ________hours/weekday 2. ________minutes/weekday 3. ________don't know	
	Part IV Anthropometric measurements (Observational checklist)		
401	Does the patient take anti hypertensive drug 1. Yes 2. No		
402	Patient's/client's recent FBS in mg/dl _______________		

403	Does the patient have other chronic diseases in addition to DM? 1.Yes 2.No --------------------------------------→			405
404	If yes to Q-403 What is/are the disease/s? ___________________________________			
	Anthropometry	Reading 1	Reading 2	Average
405	Height in meters			
406	Weight in kg			
407	BP(SBP/DBP) in mmHg			

Thank you!

Annex Three: Amharic Version information sheet and consent form

የመረጃና የስምምነት ቅጽ

ጅማ ዩኒቨርሲቲ

ጤና ኢንስቲትዩት

የሕብረተሰብ ጤና ፋካሊቲ

ኢፒዲሞሎጂ ት/ት ክፍል

<u>በደብረ ታቦር ጠቅላላ ሆስፒታል የረዥም ጊዜ ሕክምና ክትትል ክፍል የስኳር ታካሚዎች</u>

<u>/ደንበኞች ላይ የደም ግፊት መጠንና ተያያዥ መንስኤዎች ቃለ መጠይቅ 2011ዓ.ም</u>

እንደምን አደሩ/ዋሉ? እኔ____________________እባላለሁ፤ ከጅማ ዩኒቨርሲቲ ኢፒዲሞሎጂ

ት/ት ክፍል የደም ግፊት መጠንና ተዛማጅ መንስኤዎች በደብረ ታቦር ጠቅላላ ሆስፒታል የረዥም ጊዜ ሕክምና ክትትል ክፍል_የስኳር ህመም ታካሚዎች ላይ ለሚደረገው ጥናት መረጃ ሰብሳቢ ነኝ፡፡ የጥናቱ ዓላማ የደም ገፊት ህመም መጠንና ተዛማጅ መንስኤዎች በስኳር ህመም ታካሚዎች ላይ መለየት ነው፡፡ ስለዚህ ይህ ጥናት በደም ግፊት በሽታ መከላከልና ቁጥጥር ላይ ከፍተኛ አስተዋጽዖ ያበረክታል፡፡ በተጓዳኝም ጥናቱ የግልና የመንግስት ተቋማት በችግሩ ላይ የበኩላቸውን ተሳትፎ እንዲያደርጉ ይረዳል፡፡ በጥናቱ ጊዜ የማህበረሰብ፤ ስነ ህዝብ፤ የሕክምና ታሪክዎንና የአኗኗር ዘይቤ እንዲሁም ተዛማጅ ነገሮችን የሚመለከቱ ጥያቄዎችን እጠይቆታለሁ፤ በተጨማሪም ክብደትዎን ፤ ቁመትዎንና የደም ግፊት መጠንዎን ይለካሉ፡፡ ክብደት በሚመዘኑበት ጊዜ ቀላል ልብሶችን ለብሰውና በባዶ እግርዎት መሆን እንዳለበት ላሳስብዎት እፈልጋለሁ፡፡ ይህ ጥናት በጤናዎት ላይ የሚያመጣብዎት ጉዳት የለም፡፡ ከተሳቀቁ ፡ ካልተመቸዎት ወይም ጥሩ ስሜት ካልተሰማዎት በማንኛውም ሰዓት ማቋረጥ ይችላሉ፡፡ ጠቅላላ ሒደቱ **15 ደቂቃ** አካባቢ ይወስዳል፡፡ በመጨረሻ ላረጋግጥልዎ የምፈልገው በዚህ ጥናት ስምዎ ወይም አድራሻዎ አይጠቀስም ነገር ግን የጥናቱ ውጤት ተደራጅቶና ተመዝግቦ ወደሚመለከታቸው የጤና ተቋማት እና ባለድርሻ አካላት ሊገባ ይችላል፡፡

ፈቃደኛ ነዎት? 1. አዎ 2. አይደለሁም

ፈቃደኛ ከሆኑ ይቀጥሉ ካልሆኑ ግን አቋርጠው ወደ ቀጣዩ ታካሚ ይሂዱ!!!

የጥናት አድራጊው

ስም፡ ወንድምነው ደሳለኝ አዲስ

አድራሻ፡ ስልክ ቁጥር +251918454337

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Annex Four: Amharic Version Questionnaire

የአማርኛ መጠይቅ

የመረጃ ሰብሳቢው ስም-- ፊርማ-----------------

የተቆጣጣሪው ስም -- ፊርማ----------------

መረጃው የተሰበሰበበት ቀን------------------የህክምና ካርድ ቁጥር--------------------የመጠይቅ ቁጥር-------

ተ.ቁ	ጥያቄ	የምላሽ ዝርዝር	እለፍ ወደ	ምርመራ
	ክፍል አንድ፡ የማኅበራዊ ስነ ህዘብ ና ምጣኔ ሀብት መጠይቆች			
101	እድሜዎት ምን ያክል ነው?	______________________		
102	ጾታ	1. ወንድ 2. ሴት		
103	የትምህርት ደረጃ/ እስከ ስንት ተምረዋል?	______________________		
104	የትዳር ሁኔታ	1. ያላገባ/ች 2. ያገባ/ች 3. የተለያየ/ች 4. የተፋታ/ች 5. የሞተችበት/ባት		
105	ሥራዎት ምንድነው?	1. የመንግስት ሰራተኛ 2. የግል 3. ነጋዴ 4. አርሶ አደር 5. ተማሪ 6. ሌላ ከሆነ ይጥቀሱ		
106	የቤታችሁ አማካይ የወር ገቢ ምን ያክል ነው?	______________________		
107	የሚኖሩት የት ነው?	1. ከተማ 2. ገጠር		
108	ሐይማኖትዎ?	1. ኦርቶዶክስ ተዋህዶ 2. ሙስሊም 3. ፕሮቴስታንት 4. ሌላ ከሆነ ይጥቀሱ ---------------		
109	ከቤተሰብ ወይም ከዘመድ የስኳር ህመም ያለበት/የነበረበት አለ?	1. አዎ 2. የለም		
110	ከቤተሰብ ወይም ከዘመድ የደም ግፊት ህመም ያለበት/የነበረበት አለ?	1. አዎ 2. የለም		

	ክፍል ሁለት፡ ህክምና ነክ ጥያቄዎች			
201	እየታከሙት ያለው የስኳር ህመም ዓይነት የትኛውነው?	1. አንደኛው 2. ሁለተኛው		
202	የስኳር ህመሙ የታወቀሎት ከመቼ ጀምሮ ነው / ምን ያክል ዓመት /ወር ሆነው?	____________________		
	ክፍል ሦስት፡ የአኗኗር ዘይቤ መጠይቆች			
301	ሲጋራ ያጨሳሉ?	1. አዎ 2. አላጨስም----------› 3. አጨስ ነበር---------›	ጥ.ቁ-303 ጥ.ቁ-303	
302	ሲጋራ የሚያጨሱ ከሆነ፤ በሕይወት ዘመንዎ ምን ያክል ሲጋራ አጭሰዋል?	1. 100ና ከዚያ በላይ 2. ከ100 በታች 3. አላስታውስም		
303	አልኮል /ቢራ፤ ወይን፤ጠላ፤ አረቂ/ ጠጥተው ያውቃሉ?	1. አዎ 2. የለም----------------›	ጥ.ቁ-310	
304	ባለፉት 12 ወራት አልኮል ጠጥተዋል?	1. አዎ 2. የለም----------------›	ጥ.ቁ-306	
305	ባለፉት 12 ወራት አንድ ብርጭቆ ና ከዚያ በላይ አልኮል ምን ያክል ጊዜ ጠጥተዋል?	1. በየቀኑ 2. ከ5-6 ቀናት በሳምንት 3. 3-4 ቀናት በሳምንት 4. ከ1-2 ቀናት በሳምንት 5. ከ1-3 ቀናት በ ወር 6. በወር ከ1 ቀን ያነሰ		ለጠላ ብርጭቆ ለአረቂ ስኒ ለቢራ በጠርሙስ ይጠይቁ
306	ባለፈው አንድ ወር አልኮል ጠጥተዋል?	1. አዎ 2. የለም-------------›	ጥ.ቁ-309	
307	ባለፈው አንድ ወር አንድ ብርጭቆና ከዚያ በላይ አልኮል ለምን ያክል ጊዜ ጠጥተዋል?	1. __________ጊዜ 2. አላስታውስም		
308	ባለፈው ወር አልኮል ሲጠጡ በአንድ ጊዜ የመጠጥ አጋጣሚ ስንት ብርጭቆ ጠላ / ስኒ አረቂ /ጠርሙስ ቢራ ጠጡ?	1. ቁጥር 2. አላስታውስም		
309	ባለፈው ሳምንት በእያንዳንዱ ቀናት ስንት ብርጭቆ ጠላ ጠጥተዋል?	1. ሰኞ ____________ 2. ማክሰኞ __________ 3. ረቡዕ ____________ 4. ሐሙስ ___________ 5. ዓርብ ____________ 6. ቅዳሜ ___________ 7. እሁድ ____________		
310	ጫት ይቅማሉ?	1. አዎ 2. የለም		

311	ለጥ.ቁ 310 መልስዎ አዎ ከሆነ ምንያክል ጊዜ ይቅማሉ?	1. በወር ከአንድ ጊዜ ያነሰ 2. በወር ከ1-3 ጊዜ 3. በሳምንት አንድ ጊዜ 4. በሳምንት ከ2-4 ጊዜ 5. በየቀኑ		
312	የረጋ ዘይት ምን ያክል ጊዜ ይመገባሉ?	1. ሁልጊዜ 2. አብዛኛውን ጊዜ 3. አልፎ አልፎ 4. አብዛኛውን ጊዜ አልጠቀምም 5. ምንም አልጠቀምም		
313	ስብ እና ስብ ነክ ምግቦችን ምን ያክል ጊዜ ይመገባሉ?	1. ሁልጊዜ 2. አብዛኛውን ጊዜ 3. አልፎ አልፎ 4. አብዛኛውን ጊዜ አልጠቀምም 5. ምንም አልጠቀምም		
314	ስኳር እና ጣፋጭ ምግቦችን ምን ያክል ጊዜ ይመገባሉ?	1. ሁልጊዜ 2. አብዛኛውን ጊዜ 3. አልፎ አልፎ 4. አብዛኛውን ጊዜ አልጠቀምም 5. ምንም አልጠቀምም		
315	ፍራፍሬ ምን ያክል ጊዜ ይመገባሉ?	1. ሁልጊዜ 2. አብዛኛውን ጊዜ 3. አልፎ አልፎ 4. አብዛኛውን ጊዜ አልጠቀምም 5. ምንም አልጠቀምም		
316	አትክልት ምን ያክል ጊዜ ይመገባሉ?	1. ሁልጊዜ 2. አብዛኛውን ጊዜ 3. አልፎ አልፎ 4. አብዛኛውን ጊዜ አልጠቀምም 5. ምንም አልጠቀምም		
317	ጨው እና ጨው ያለባቸው ነገሮች ከምግብዎ ከመመገብ በፊት ወይም ሲመገቡ ምን ያክል ጊዜ ይጨምራሉ?	1. ሁልጊዜ 2. አብዛኛውን ጊዜ 3. አልፎ አልፎ 4. አብዛኛውን ጊዜ አልጨምርም 5. ምንም አልጨምርም		
318	ምን ያክል ጨው ጨው ያለባቸው እጠቀማለሁ ብለው ያስባሉ?	1. እጅግ በጣም ብዙ 2. በጣም ብዙ 3. ልከኛ መጠን		

		4. በጣም ትንሽ 5. እጅግ በጣም ትንሽ 6. አላውቅም		
	የአካል እንቅስቃሴ መጠይቅ ከዚህ በታች የተጠያቂውን የአካል እንቅስቃሴ ደረጃ የሚያመለክቱ መጠይቆች አሉ። ምንም እነኳን እራስዎን የእንቅስቃሴ ሰው አድርገው ባይቆጥሩ እንኳን እባክዎን መግለጫውን ተረድተው ምላሽ ይስጡ። በትምህረት ቤት፤ በቤትና በሥራ ቦታ፤ ከቦታ ቦታ ለመንቀሳቀስ፤ በመዝናኛ ቦታ ወይም በስ ቦታ ያደረጓቸውን ተግባራት ሁሉ ታሳቢ አድርገው ይመልሱ።			
	ጠንካራ የአካል እንቅስቃሴ ባለፉት 7 ቀናት ያደረጓቸውን ከፍተኛ ኃይል የሚጠይቁ ጠንካራ ተግባራትን ሁሉ ያስቡ፤ ጠንካራ ተግባራት ትንፈሳን ጠንካራ የሚያደርጉ እንደ ከባድ እቃ/ሸክም ማንሳት፤ ፈጣን ሩጫ፤ ሳይክል በፍጥነት መጋለብ ወዘተ ቢያንስ በአንድ ጊዜ ለ10 ደቂቃ የሰሯቸውን ያስታውሱ።			
319	ባለፉት 7 ቀናት ስንቶቹ ላይ ጠንካራ ተግባራት/እንቅስቃሴ አደረጉ?	1. ----------ቀናት 2. አላውቅም/እርግጠኛ አይደለ		
320	ከእነዚህ ቀናት ባንዱ በአብዛኛው ምን ያክል ድምር ጊዜ ጠንካራ ተግባራትን እየሠሩ አሳለፉ?	1. ----------ሰዓት/በቀን 2. ----------ደቂቃ/በቀን 3. አላስታውስም/እርግጠኛ አይደለሁም		
	መካከለኛ የአካል እንቅስቃሴ ባለፉት 7 ቀናት መካከለኛ የአካል እንቅስቃሴ የሚጠይቁ የሠሯቸውን ተግባራት ያስቡ፤ እነዚህ ተግባራት ትንፈሳን ከትክክለኛው በተወሰነ መልኩ የሚጨምሩ እንደ፡- ቀለል ያሉ ሸክሞችን ማንሳት/መሸከም፤ በተረጋጋ ፍጥነት ሳይክል/በቅሎ፤ፈረስ መጋለብ፤ የሰምሶማ ሩጫ ወዘተ ናቸው። እርምጃን አይጨምሩ በተጨማሪም ቢያንስ ለ 10 ደቂቃ የሠሯቸውን ብቻ ያሥቡ።			
321	ባለፉት 7 ቀናት ስንቶቹ ላይ መካከለኛ ተግባራት/እንቅስቃሴ አደረጉ?	1. ----------ቀናት 2. አላውቅም/እርግጠኛ አይደለሁም		
322	ከእነዚህ ቀናት ባንዱ በአብዛኛው ምን ያክል ድምር ጊዜ መካከለኛ ተግባራትን እየሠሩ አሳለፉ?	1. ----------ሰዓት/በቀን 2. ----------ደቂቃ/በቀን 3. አላስታውስም/እርግጠኛ አይደለሁም		
323	የተግባርዎት ይዘት ከቀን ቀን የሚለያይ ከሆነ ወይም ብዙ ተግባራትን ያጠቃለለ ከሆነ ባለፉት 7 ቀናት መካከለኛ እንቅስቃሴ/ተግባር በማድረግ በድምሩ ለምን ያክል ጊዜ አሳለፉ?	1. ----------ሰዓት/በቀን 2. ----------ደቂቃ/በቀን 3. አላስታውስም/እርግጠኛ አይደለሁም		
	የእርምጃ እንቅስቃሴ *አሁን ባለፉት 7 ቀናት በእርምጃ እንቅስቃሴ ያሳለፏቸውን ጊዜያት ያስቡ፤ እነዚህም በሥራ ቦታ፤ በቤት ፤ ከቦታ ቦታ ሲንቀሳቀሱና ማንኛውም በእርምጃ ፍጥነት ለመዝነኛ ወይም ለስፖርት ብቻዎትን ወይም ከጓደኛ ጋር ያደረጓቸውን ያጠቃልላል።*			

324	ባለፉት 7 ቀናት ስንቶቹ ቀናት ላይ በአንድ ጊዜ ቢያንስ ለ10ደቂቃ የእርምጃ ተግባራት/እንቅስቃሴ አደረጉ?	1. ----------ቀናት 2. አላውቅም/እርግጠኛ አይደለሁም	
325	የተግባርዎት ይዘት ከቀን ቀን የሚለያይ ከሆነ ወይም ብዙ ተግባራትን ያጠቃለለ ከሆነ ባለፉት 7 ቀናት የእርምጃ እንቅስቃሴ/ተግባር በማድረግ በድምሩ ለምን ያክል ጊዜ አሳለፉ?	1. ----------ሰዓት/በቀን 2. ----------ደቂቃ/በቀን 3. አላስታውስም/እርግጠኛ አይደለሁም	
	በመጨረሻም ባለፉት የሳምንቱ 7 ዕለታት ተቀምጠው ያሳለፏቸውን ጊዜያት የስቡ፤ እነዚህም በት/ቤት ክፍል ውስጥ፤ በቤት፤ በመዝናኛ፤ በንባብ፤ ቴሌቪዥን ጋደም ብለው ወይም ተቀምጠው ሲመለከቱ፤ጓደኛ ወይም ዘመድ ሲጠይቁ ወዘተ		
326	ባለፉት 7 ቀናት በአብዛኛው ተቀምጠው ያሳለፉት ድምር ጊዜ ምን ያክል ነው?	1. ----------ሰዓት/በቀን 2. ----------ደቂቃ/በቀን 3. አላስታውስም/እርግጠኛ አይደለሁም	

ማጠቃለያ፡- የአካል ብቃት እንቅስቃሴ

1. ከፍተኛ
2. መካከለኛ
3. ዝቅተኛ

ስለ ትብብርዎ አመሰግናለሁ!!!