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Determinants of Hypertension Among Adult Diabetes Mellitus Patients in Amhara Region Comprehensive Specialized Hospitals, Ethiopia, 2020/21. Unmatched Case Control Study

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BAHIR DAR UNIVERSITY
SCHOOL OF HEALTH SCIENCE,
COLLEGE OF MEDICINE AND HEALTH SCIENCES,
DEPARTMENT OF ADULT HEALTH NURSING

DETERMINANTS OF HYPERTENSION AMONG ADULT
DIABETES MELLITUS PATIENTS IN AMHARA REGION
COMPREHENSIVE SPECIALIZED HOSPITALS, ETHIOPIA,
2020/21. UNMATCHED CASE CONTROL STUDY

BY
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JULY, 2021

BAHIR DAR, ETHIOPIA

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A THESIS SUBMITTED TO DEPARTMENT OF ADULT HEALTH NURSING,
COLLEGE OF MEDICINE AND HEALTH SCIENCE, SCHOOL OF HEALTH
SCIENCE, BAHIRDAR UNIVERSITY IN PARTIAL FULFILLMENT OF THE
REQUIREMENTS FOR THE DEGREE OF MASTERS OF SCIENCE IN ADULT
HEALTH NURSING

JULY, 2021

BAHIR DAR, ETHIOPIA

DECLARATION SHEET

This is to certify that the thesis entitled “Determinants of Hypertension Among Adult Diabetes Mellitus Patients in Amhara region comprehensive specialized hospitals, Ethiopia, 2020/21” submitted in partial fulfillment of the requirements for the degree of masters of science in adult health nursing, department of adult health nursing, Bahir Dar University, is prepared solely by myself and it has not been submitted, in whole or in part, in any previous application for a master’s degree. Except where states (BDU) otherwise by reference or acknowledgment, the work presented is entirely my own.

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Approval of Thesis Report

I hereby certify that I have examined this thesis report entitled ““Determinants of Hypertension Among Adult Diabetes Mellitus Patients in Amhara region comprehensive specialized hospitals, Ethiopia, 2020/21” by Makda Abate. We recommend and approve the thesis report for a degree of “Masters of science in Adult Health Nursing”.

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Abstract

Background: Comorbid hypertension among people with diabetes is now becoming a worldwide public health problem. Even though hypertension is the most common comorbidity among diabetes populations, studies on determinants of hypertension among diabetes populations are scarce in Ethiopia, especially in Amhara region. So, this research was aimed to fill this gap.

Objective: This study was aimed to identify determinants of hypertension among people with diabetes attending chronic follow-up clinics in Amhara region comprehensive specialized hospitals, Ethiopia, 2021.

Method: an institutional-based unmatched case-control study was conducted among 476 participants from March 17 to April 18, 2021, in Amhara region comprehensive specialized hospitals. Multistage sampling technique was used to select participants of this study. Data were collected by using interviewer-administered questionnaires, physical measurements, and a checklist. Data was entered into Epi-Data version 3.1 and exported to Statistical Package for Social Science version 21 for analysis. Logistic regression was used to identify variables having significant association at p-value < 0.05 with a 95% confidence interval.

Results: A total of 235 cases and 235 controls were participated in this study. The mean age \pm Standard deviation for the controls were 60.12 ± 10.387 and median age for case were 60 with interquartile range of (12- 66). Age > 50 years, a lower level of physical activity [AOR = 1.82, 95 % CI (1.00, 3.31)], having depression [AOR = 2.00, 95 % CI (1.24, 3.21)], family history of hypertension [AOR = 2.13, 95 % CI (1.34, 3.37)], not attending a diabetic education session [AOR= 1.87, 95% CI (1.18, 2.96)], longer duration of diabetes [AOR= 1.99, 95% CI (1.05, 3.79)] and poor glyceic control [AOR=1.57, 95% CI (1.01, 2.45)] were the significant determinants of hypertension among individuals with diabetes mellitus.

Conclusion: In this study, physically inactivity, having depression, family history of hypertension, not participating in diabetes education, duration of DM, and poor glyceic control were determinants of hypertension in diabetes clients. Therefore, as an integral part of diabetes care, health care providers should screen, assess and treat depression, create participants awareness to attend diabetes education, and advise diabetes individuals to engage in physical activity.

Key Words: Hypertension, Diabetes Mellitus, Determinants, Ethiopia

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Abbreviation and Acronyms

8-MMS	8 Item Morisky Medication Adherence Scale
AOR	Adjusted Odd Ratio
AUDIT	Alcohol Use Disorders Identification Test
BMI	Body Mass Index
CI	Confidence Interval
COR	Crude Odd Ratio
CVDs	Cardio Vascular Diseases
DM	Diabetes Mellitus
IPAQ	International Physical Activity Questionnaire
HC	Hip Circumference
HTN	Hypertension
MET	Metabolic Equivalent Task
NCDs	Non-Communicable Diseases
OSLO	Oslo social support questionnaire
PDAQ	Perceived Dietary Adherence Questionnaire
PHQ 9	Patient health Questionnaire
WC	Waist Circumference
WHO	World Health Organization
WHR	Waist to Hip Ratio

1. Introduction

1.1. Background

Hypertension (HTN) among people with diabetes mellitus is a serious medical condition characterized by the persistent elevation of systemic arterial blood. For clinical purposes, it is defined as systolic blood pressure (SBP) of >130 mmHg and/or diastolic Blood pressure (DBP) of >80 mmHg on two consecutive days or any prior diagnosis of HTN made by health personnel and taking antihypertensive drugs (1, 2). If Blood pressure is $\geq 180/110$ mmHg with evidence of cardiovascular disease, hypertension diagnosis among diabetic clients might also be made with a single visit (2).

Over the past decades the global prevalence, mortality, and disability-adjusted life-years caused by comorbid hypertension among people with diabetes mellitus (DM) is increasing worldwide as a result of unplanned urbanization, lifestyle change, and increased life expectancy (3). High blood pressure is found to be the most common contributing factor for the increment of populations with DM since their number was 451 million in 2017 and estimated to grow up 693 million in 2045 (4).

The prevalence of hypertension among people with diabetes is higher than patients without Diabetes. The additive effect of hypertension among diabetes mellitus (DM) population is the primary reason for cardiovascular mortality and morbidity through its effects on target organs like the heart, brain, eye, and kidney due to different structural alterations in the microcirculation secondary to endothelial dysfunction, inflammation, oxidative stress, insulin resistance in the nitric-oxide pathway, dyslipidemia, smooth muscle growth, sodium fluid retention, the stimulatory effect of hyperinsulinemia on the sympathetic nervous activity, and the excitatory effect of hyperglycemia on renin-angiotensin-aldosterone system (4-6).

General predictors of hypertension among DM patients are being overweight/obese, advanced age, unhealthy diet, lack of physical exercise, family history of hypertension, poor glycemic control, smoking, poor medication adherence, harmful alcohol consumption, and extensive atherosclerosis (5, 7, 8).

Hypertension among DM population causes organ damage which manifested by increased excretion of albumin (Proteinuria), left ventricular hypertrophy, and Presence of left ventricular strain patterns on echocardiography, detection of cotton wool spots, papilledema, hard exudates,

retinal hemorrhages, and microaneurysms in fundoscopy and Presence of either ischemic or hemorrhagic injury to the brain on the brain imaging procedures (5, 8).

The coexistence of hypertension with DM fastens the development and progression of microvascular (retinopathy, nephropathy, and neuropathy) and macrovascular (atherosclerotic) complications. If the level of blood pressure isn't controlled, it leads to heart attack, stroke, kidney disease, vision loss, sexual dysfunction, and peripheral arterial disease (6). Moreover, the development of HTN in diabetic individuals complicates the treatment strategy and increases healthcare costs (5, 7).

Management consists of lifestyle modification, including weight loss if overweight or obese, physical activity, avoidance of tobacco and excessive alcohol intake, Dietary Approaches to Stop Hypertension style (DASH) based nutrition counseling, and reduced sodium intake (2). Timely initiation of antihypertensive drugs and subsequent titration is recommended to achieve individualized blood pressure goals. An angiotensin-converting enzyme inhibitor or an angiotensin receptor blocker should generally be included in the pharmacologic therapy for hypertension in people with diabetes mellitus. A combination of drugs, particularly including a thiazide diuretic, is necessary and should be started soon in the course of management (9).

1.2. Statement of the problem

Comorbid hypertension among people with diabetes is now becoming a worldwide public health problem. The frequency of HTN among the diabetes population is almost twice that of non-diabetic populations and it is reported in over two-thirds of people with type 2 diabetes (6). Since it is present in 20% to 60% of people with type 2 diabetes, HTN is the most common co-morbid disease in people with diabetes (10, 11).

The coexistence of hypertension with DM increases the risk of cardiovascular events by six-fold, double the risk of all-cause mortality and stroke, triple the risk of coronary heart diseases, hasten the progression of vascular complications, reduces the event-free survival, and influences the ability to achieve the recommended therapeutic targets, both in terms of fasting glucose and blood pressure (BP) levels (11). One study done on DM patients showed that the coexistence of hypertension in diabetes mellitus is attributed to the risk of death and cardiovascular events by 44% and 41%, respectively, in comparison with 7% and 9% of risks in people with diabetes alone (12).

Behavioral risk reduction (cessation of tobacco smoking, following a healthy diet plan, doing physical activity, and minimizing alcohol consumption) and lifestyle modification (weight loss if overweight or obese, a DASH style based nutrition counseling, and reduced-sodium/salt intake) were some of the strategies which have been implemented in the past to control the progress of hypertension among people with DM (13). Despite the implementation of this strategy, different studies indicate that the burden of hypertension among people with diabetes is still high as they indicate its prevalence is 76% in Jordan (14), 92.7% in Malaysia (15), 56.3% in Nigeria(16), 85.6% in Benghazi(17), 56.3% in Adama (18) and 59.5% in Debre Tabor general hospital (5).

Hypertension and diabetes cause a huge economic impact as a result of direct costs of treatment and human power lost due to the devastating effect of the diseases on the individual, family & society as a whole (19). Currently, the presence of complications (including hypertension) among people with diabetes resulted in about \$125 (1.65 times) higher cost of illness than that without complications.

Even though Ethiopia is among the top five leading African countries with the prevalence of DM, there is still a paucity of studies conducted on the determinants of hypertension among people with

DM in Ethiopia. The only case-control study conducted in Tigray Ethiopia on determinants of hypertension among people with DM (20) recommended conducting further research that investigates the determinants of hypertension among people with diabetes in a broader social context and larger sample size. This research tried fill this gap by broadening the study area, relatively increasing the sample size, and adding some variables.

Additionally, in view of findings of different institutional-based cross-sectional studies (5, 7, 18, 20, 21), the present study aims at filling the existing research gap by examining multiple risk factors such as impaired physical activity, unhealthy diet, kchat chewing, depression, poor social support, harmful alcohol consumption, overweight, obesity, raised waist to hip ratio and raised waist circumference which may contribute to the progress of hypertension among people with DM.

1.3. Significance of the study

Identifying determinants of hypertension among people with diabetes would be important for many stakeholders. Primarily, for people with diabetes, this study would provide fruitful information to create awareness in controlling their lifestyle and delaying or preventing the onset of comorbid hypertension among people with diabetes.

Findings from this study could also benefit health care providers (especially physicians and nurses) to develop effective strategies for improving quality of care, for building a trusting relationship, minimizing treatment-related errors & to provide quality care services which are often triangulated with evidence to prevent comorbid hypertension in people with DM.

For future researchers who are interested in conducting a cohort or metanalysis study on the area, the finding of this study would be used as an input and framework by giving pertinent information on determinants of hypertension among diabetic clients.

Finally, this study would provide valuable information for health policy-makers, which are used in designing or redesigning appropriate and cost-effective strategies to halt or reduce factors contributing to the development of comorbid HTN among people with diabetes mellitus.

2. Literature review

Hypertension is a growing public health problem with a remarkable contribution to morbidity and mortality and it is a common condition that usually coexists with diabetes and aggravates its complications (7). Different cross-sectional studies investigating hypertension prevalence among people with diabetes reported that the prevalence of hypertension among people with diabetes is 25.9% in Bellary (22), 76% in Jordan (14) and 92.7% in Malaysia (15).

In sub-Saharan Africa the burden of non-communicable diseases like DM and hypertension is on the rise, as a result, the epidemiological transition causes the domination of non-communicable diseases over communicable diseases (23). A systematic literature review conducted to identify the prevalence of hypertension among people with type 2 DM across different regions of the world has shown that the prevalence of hypertension among people with diabetes in the continent of Africa varies from country to country in which it ranges from 38.5% - 64.9% in Nigeria, 70.1% in Cameroon and 80% in Zimbabwe (24). Hospital-based prevalence studies in African countries also reported that the prevalence of hypertension among people with Diabetes ranges from 57.4 % to 85.9% (16, 17, 25). In Ethiopia, the prevalence of co-morbid HTN among people with type 2 DM was ranged from 37.4 to 69.1 % (7, 18, 21, 26, 27).

2.1. Determinants of hypertension among DM patients

Previous studies documented that socio-demographic, clinical, and psychosocial factors are some of the determinants contributing to the development of co-morbid HTN among people with diabetes (5, 7, 15-17, 21, 22, 25, 27-42).

2.1.1. Socio-Demographic Determinants

Many pieces of literature conducted previously across the world identified that socio-demographic variables significantly determine the development of hypertension among peoples with diabetes. Different pieces of evidence revealed a positive association with the development of hypertension, as the age of the diabetic patients increased the risk of having hypertension also increased (5, 7, 15, 28-34).

Studies in Egypt and Botswana stated that female subjects with diabetes have higher odds of having hypertension than their counterparts (27, 29, 31). But these finding is inconsistent with cross-sectional studies conducted in Cameron (35) and different parts of Ethiopia (7, 27) as they

stated that male subjects with diabetes were significantly associated with risk of having hypertension.

Research findings from low-income countries have shown that the likelihood of having hypertension is decreased when the level of education increased (15, 21, 36). However, an institutional-based cross-sectional study done in Morocco revealed that the level of education doesn't pose a significant risk of hypertension among people with diabetes (30).

According to a study in Kenya, widowed respondents have a higher risk of having hypertension as compared to married respondents (32). Contrary to this, a finding from a similar study in Ethiopia showed that married diabetic subjects followed by divorced subjects were found to have a higher risk of HTN as compared to unmarried subjects (21).

A study in Uganda stated that participants considered the richest had increased odds of hypertension compared to their counterparts belonging to the middle wealth index (25). In a study conducted in Ethiopia, merchants were 2.6 times and retired were 3.43 times more likely to have HTN as compared to a government employee (21).

A cross sectional study conducted in southern Ethiopia and Debretabor, Ethiopia stated that urban residence is a significant predictor of hypertension among diabetic clients (5, 21). However, a study in Wachemo University Nigest Elleni Mohammed Memorial Referral Hospital states that rural type 2 diabetics are 1.75 times increased risk of developing hypertension than their counterparts (37).

2.1.2. Clinical Determinants

As addressed by different studies clinical determinants like duration of DM, poor glycemic control, comorbidities, diabetes-related complication, waist to hip ratio, body mass index, treatment modality, and family history of hypertension are known to cause hypertension among diabetic patients (5, 7, 15-17, 21, 22, 25, 27-42).

Global pieces of evidence have shown that $BMI \geq 25 \text{ Kg/m}^2$ is the commonest determinant of hypertension in people with diabetes (15, 28). In Malaysia, overweight and obese people with diabetes have 1.43 times higher odds of acquiring hypertension than those who have a healthy weight (15). Different studies in Africa have also shown that the prevalence of hypertension is

higher among people with diabetes who are overweight and obese than those who have a normal weight (16, 17, 25, 29). Correspondingly, findings in Ethiopia identified a positive association between increased BMI status and a higher risk of developing hypertension (5, 7, 18, 20).

According to the findings of cross sectional studies done in Pakistan (38), Benin (34) and Cameroon (35), diabetic individuals with abnormal waist-to-hip ratio and waist circumference were more likely to develop hypertension than those diabetics with a normal waist-to-hip ratio and waist circumference. Whereas, a study conducted in Uganda didn't show any significant association with waist to hip ratio and risk of having hypertension (25).

Another cross sectional study conducted in Jordan (14) has shown that DM patients with dyslipidemia & cardiovascular disease were more prone to hypertension.

A study conducted in Duhok reported that poor glycemic control is a significant predictor of hypertension among diabetic clients (22). Similarly, a cross-sectional study done in Debretabor and a case-control study from Tigray, Ethiopia revealed that diabetic individuals who had poor glycemic control were 3 times and 23 times more likely to develop hypertension than their counterparts respectively (5, 20).

Research finding from Jordan (39) and Southern Ethiopia (37) showed that diabetic individuals with a positive family history of hypertension had higher risk of acquiring hypertension when compared with those who had no positive family history of hypertension. Likewise, a study from Benghazi (29) reported that diabetic clients with positive family history of diabetes mellitus were more prone to hypertension than their counter parts.

According to cross sectional studies conducted in Ghana (40) and south west Ethiopia (41), individuals with type two diabetes mellitus were more likely to have hypertension than those with type one diabetic mellitus. On the other hand, findings from Uganda (25) and Harar, Ethiopia (27) didn't show significant association with type of DM and risk of having hypertension.

A facility-based prevalence study conducted in Jordan has reported that people with long-standing diabetes lasting for >10 years were found to be at higher risk of hypertension (14). In Benghazi, peoples who spent more years with DM have a higher risk of hypertension than those who had the

least duration of DM (17). Evidence in Ethiopia also shows an increased duration of diabetes predicts an increased risk of having hypertension (5, 18, 20).

2.1.3. Psychosocial and Behavioral Determinants

Many pieces of literature have identified that not adhering to a diabetic diet, not attending diabetes mellitus education sessions, not adhering to physical exercise, smoking, harmful alcohol consumption, non-adherence to diabetes medication, unable to monitor blood glucose level by self, khat chewing, depression, and poor social support are some of the behavioral factors which often shows significant association with the development of comorbid hypertension among people with DM (5, 7, 20, 22, 35).

Studies from Duhok (22), Benghazi, Libya (17), Uganda (25) and Tigray, Ethiopia (20) have shown that diabetic clients experiencing lower level of physical activity and who leads more sedentary life style were more likely to be hypertensive as compared to their counterparts.

A facility-based cross-sectional study conducted in Jimma university specialized hospital shows that diabetic patients who chew khat were 19.3 times more likely to develop hypertension as compared with non-chewers (7). Another similar study in Debre tabor also showed that Type 2 DM patients who were current cigarette smokers were 3.9 times more likely to develop HTN than those who were not (5). But a cross-sectional study carried out in Morocco showed no significant association between hypertension and smoking (30).

An unmatched case control study conducted in Tigray, Ethiopia (20) also reported that diabetic clients who didn't attend diabetic education session and who didn't adhere to medication, healthy diet and self-blood glucose monitoring were more likely to develop hypertension than their counterparts.

A study conducted in Hong Kong, China (42) revealed that diabetic clients with depression were less likely to achieve individual treatment target blood pressure <130/80 mmHg and higher odds for having a prior history of diabetes-related complications.

2.2. Conceptual framework

The conceptual framework stated below shows the interaction of outcome variables with different independent determinant factors containing Sociodemographic factors, anthropometric determinants, clinical, behavioral, and psychosocial determinants which are adapted after reviewing different literature (5, 7, 15-17, 21, 22, 25, 27-42) (Figure 1).

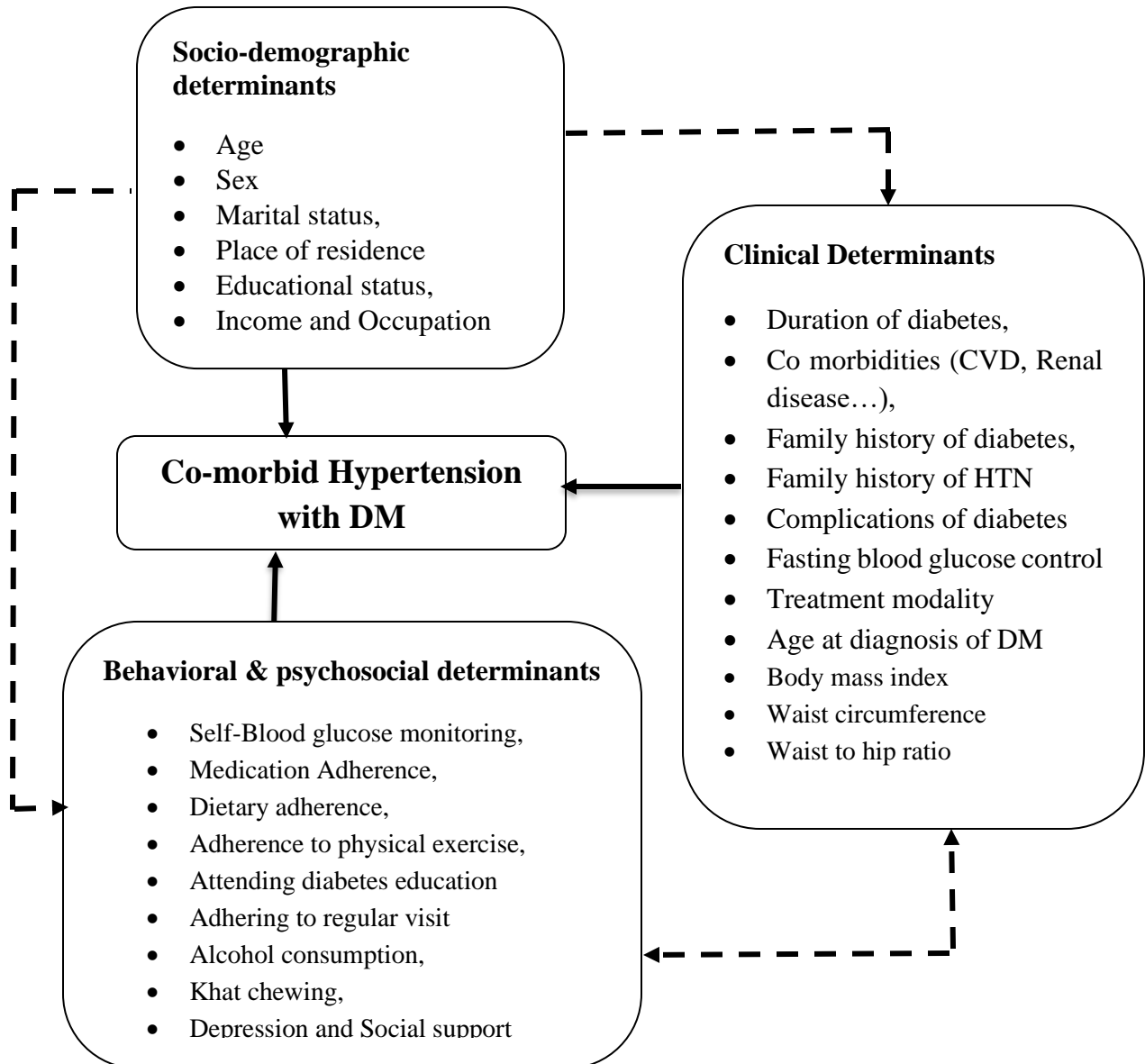


Figure 1: Conceptual framework adapted after reviewing different literature for determinants of hypertension among DM patient in Amhara region comprehensive specialized hospitals, 2020/2021

3. Objective of the Study

This study aimed to identify the determinants of hypertension among people with diabetes mellitus attending diabetic follow up in Amhara region comprehensive specialized hospitals, Amhara region, Ethiopia, 2021.

4. Method and materials

4.1. Study Area and Period

The study was conducted from March 17, 2021 to April 18, 2021 among people with diabetes mellitus in Amhara region comprehensive specialized hospitals. There are eight comprehensive specialized hospitals in the region. The estimated total number of DM clients attending their follow-up in those eight hospitals is 18,573. Debre-Berhan, Felege-Hiwot, and Dessie comprehensive specialized hospitals were included out of the eight comprehensive specialized hospitals.

Debre Berhan comprehensive specialized hospital is found in Debre Berhan which is the capital city of North Shoa Zone and is located 130 kilometers north of Addis Ababa, Ethiopia. It has an outpatient department for chronic illness follow-up, and diabetes treatment is provided five days a week. Approximately, twenty-five to thirty patients have received diabetes follow-up services per day.

Felege-Hiwot comprehensive specialized hospital is found in the capital city of Amhara Regional State, Bahir Dar, which is 565 kilometers far away from the capital city of Ethiopia, Addis Ababa. The chronic disease follows up clinics of the hospital give service for DM populations particularly two days a week and approximately it is visited by one hundred fifty-six DM patients per week.

Dessie Comprehensive Specialized Hospital is found in north-eastern Ethiopia which is 481km far from Bahir Dar, and 401 kilometers from Addis Ababa, the capital city of Ethiopia. The chronic disease follows up clinics of the hospital give services on all working days (Monday to Friday), and on average it is visited by twenty-seven DM patients per day.

4.2. Study Design

An institutional-based unmatched case-control study design was used to conduct this study.

4.3. Population

4.3.1. Source population

All adult people with diabetes mellitus attending chronic follow-up clinics in Amhara region comprehensive specialized hospitals were the source population.

4.3.2. Study population

Cases - Adult people with diabetes mellitus who have hypertension and attending the chronic disease follow-up clinic in the selected hospitals during the study period.

Controls - Adult people with diabetes mellitus who have no hypertension and attending the chronic disease follow-up clinic in the selected hospitals during the study period.

4.4. Eligibility criteria

4.4.1. Inclusion criteria

Cases - Adult people with diabetes mellitus who have hypertension and attending the chronic disease follow-up clinic in selected hospitals during the study period.

Controls - Adult people with diabetes mellitus without hypertension and attending the chronic disease follow-up clinic in selected hospitals during the study period.

4.4.2. Exclusion criteria

Critically ill DM patients or those who have a severe medical illness that made it impossible to complete the study questionnaire in one setting, newly diagnosed diabetic patients who didn't take diabetes medication in the last 6 months in a regular follow up, recently transferred in diabetes mellitus patients who have incomplete medical records, those who have a history of hypertension at the time of diagnosis of DM and before the diagnosis of DM were excluded from this study.

4.5. Sample size determination

Epi info version 7.2.3.1 was used to calculate sample size by two population proportions with assumptions of 95% Confidence interval (CI), 80% power, and 1:1 case to controls ratio. Odds ratio (OR) and proportion of potential predictor variable of hypertension among control were taken from a study in Tigray, Ethiopia (20). By considering adjustment for expected non-response rate (10 %) and design effect (1.5), the largest total sample size became 476. Since the ratio of a case to control is 1:1, the final calculated sample size was 238 for cases and 238 for controls (Table 1).

Table 1: Sample size calculation to assess determinants of hypertension among people with diabetes mellitus in Amhara Region comprehensive specialized hospitals, 2020/2021.

Variables	Percent of controls exposed (%)	AOR	Assumptions			Final sample size after multiplying by design effect and adding 10% non-response
			Power (%)	Confidence Interval (%)	Case to control ratio	
Attending diabetic education session	76.2	2.61	80	95	1:1	$288 * 1.5 + 44 = 476$
BMI status	39.6	4.84	80	95	1:1	$66 * 1.5 + 10 = 109$
Adherence to medication	33.7	4.66	80	95	1:1	$68 * 1.5 + 11 = 113$
Adherence to diabetic exercise	21.8	5.47	80	95	1:1	$60 * 1.5 + 9 = 99$

4.6. Sampling techniques and procedures

Multistage sampling technique was used to select participants of this study. Initially, a list of all comprehensive specialized hospitals was obtained from Amhara health bureau. There are eight comprehensive specialized hospitals in Amhara region. Of all eight comprehensive specialized hospitals, three comprehensive specialized hospitals (Debre Berhan, Dessie, and Felegehiwot) were selected by using simple random sampling method. After that, the number of diabetic patients with hypertension and without hypertension who took service from chronic follow-up clinics was taken from chronic disease follow-up clinic registry book. Finally, eligible cases were selected every two patients by using systematic random sampling. For each case, one control that fulfills the inclusion criteria was selected every seven patients by using systematic random sampling technique from chronic follow-up clinics of the same hospitals from which cases were drawn (Figure 2).

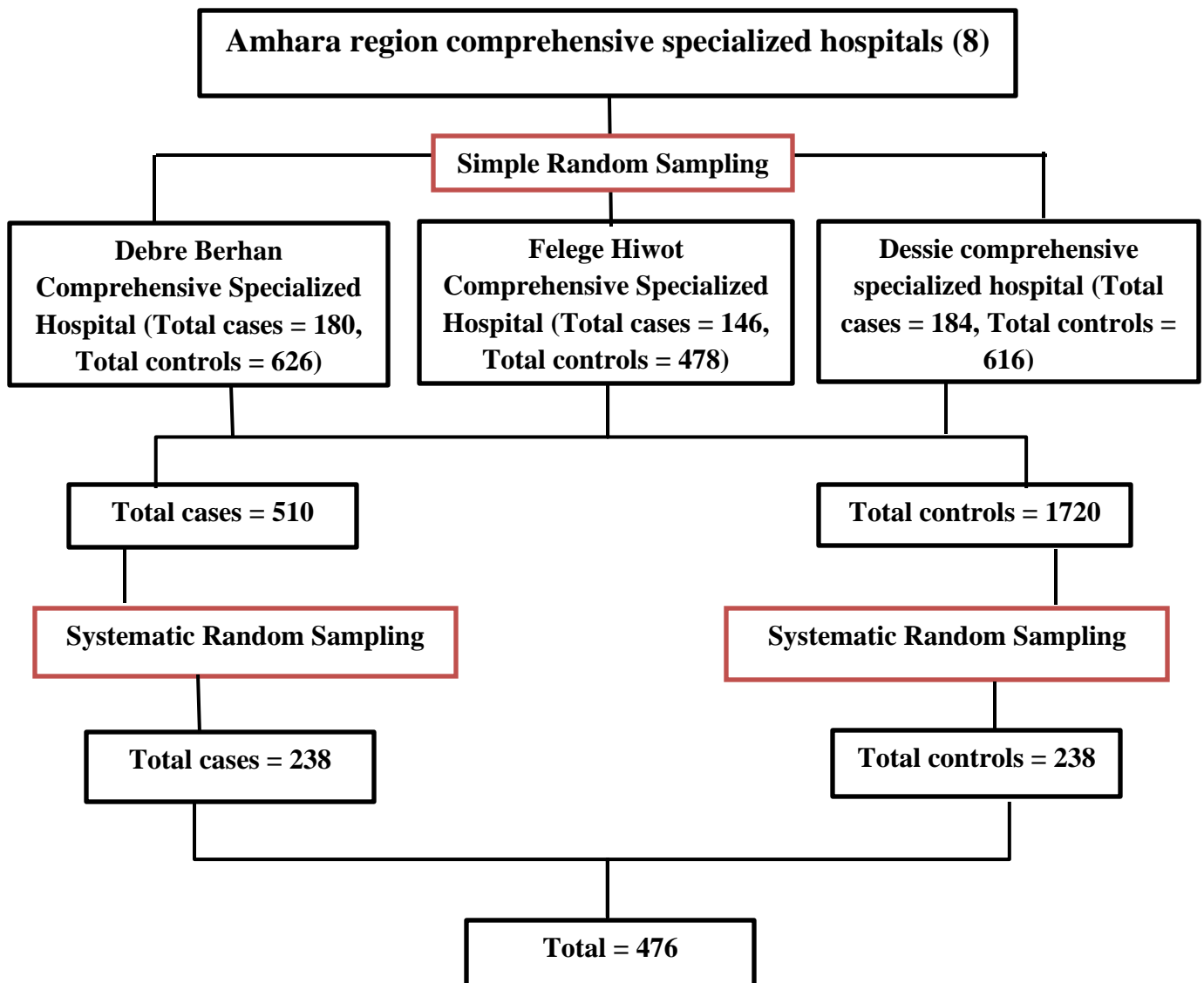


Figure 2: Schematic presentation of sampling procedure on determinants of hypertension among DM patients in Amhara region comprehensive specialized hospitals, 2020/2021.

4.7. Study variables

4.7.1. Dependent variable

Hypertension among peoples with DM

4.7.2. Independent variables

Socio-demographic variables

Age, sex, marital status, place of residence, educational status, income, and occupation

Psychosocial and Behavioral variables

Self-Blood Glucose Monitoring (SMBG), anti-diabetic medication Adherence, attending diabetic education program, adhering to a regular visit, adherence to a healthy diet plan, harmful alcohol consumption, khat chewing, adherence to physical exercise, depression, and social support.

Clinically related variables

Duration of diabetes, comorbidities (stroke, myocardial infarction, renal diseases), diabetic complications, family history of hypertension, family history of diabetes, treatment modality, fasting blood glucose control, age at diagnosis of DM, weight, height, body mass index, waist circumference, and waist to hip ratio.

4.8. Operational definition

HTN Comorbid with DM: diabetic individuals diagnosed by a physician and on antihypertensive medications or those who had systolic blood pressure 140 mmHg and/or diastolic blood pressure 90 mmHg (2).

Physical activity; Adherence to higher level of physical activity: -

- Diabetic individuals were considered as having higher level of physical activity if they have done vigorous type physical activity at least 3 days and achieving a minimum total physical activity of at least 1500 metabolic equivalent of task (MET) minutes per week. OR

- Having seven or more days of any combination of walking, moderate intensity or vigorous intensity activities achieving a minimum total physical activity of at least 3000MET minutes in a week (43).

Adherence to Moderate level of physical activity: - diabetic clients were considered as having moderate adherence to physical activity if they;

- Engaging in 3 or more days of vigorous-intensity activity and/or walking of at least 30 minutes per day OR
- Engage in five or more days of moderate-intensity activity and/or walking of at least 30 minutes per day OR
- Having five or more days of any combination of walking, moderate-intensity or vigorous-intensity activities achieving a minimum total physical activity of at least 600MET minutes a week (43).

Low adherence to physical activity : patients were considered as having lower adherence to physical activity if they are not meeting any of the criteria for either moderate or high levels of physical activity (43).

Alcohol consumption: - on alcohol use disorder identification screening tool (AUDIT) subscales those who score 0 -7 was considered as having low-risk drinking, 8- 15 as medium risk/hazardous use, 16 – 19 as having high risk/harmful use, and 20 - 40 as addiction likely (44, 45). Total scores of 8 or more were considered as indicators of hazardous and harmful alcohol use, as well as possible alcohol dependence (44).

Adherence to dietary regimen: on perceived dietary adherence questionnaire (PDAQ), patients were classified as having good dietary adherence if they eat a healthy diet for at least four days in the week (46).

Medication adherence: on Morisky Medication Adherence scale – 8 (MMAS-8) related questions a patient were considered as having good adherence when he/she scores 8, medium adherence if he/she scores 6 to less than 8, and low adherence if he/she scores < 6 (47).

Glycemic control: the patient was considered as having good glycemic control if the average of the last three fasting blood glucose level is between 70mg/dL and 130mg/dL and Poor glycemic control if the average of the last three fasting blood glucose level >130 mg/dL (48).

Adherence to self-blood glucose monitoring: the patient was considered adhere to blood glucose monitoring when he/she score at least 50% self-blood glucose monitoring-related questions (49).

Body Mass Index: patients were considered as Underweight if BMI is less than 18.5 Kg/m², healthy weight if BMI is 18.5 to 24.9 Kg/m², overweight if BMI is from 25 to 29.9 Kg/m², and obese if BMI is 30Kg/m² or higher (45).

Social support: on Oslo Social Support questionnaires 3 (OSS-3) a patient with a score of 3 - 8 was considered as having “poor social support”, 9–11 as “moderate social support” and 12–14 as “strong social support” (50).

Depression: patients with a score of 5 and above in the Patient Health Questionnaire (PHQ) were considered as having depression. On PHQ-9 depression subscales patients were classified as having no depression if the PHQ-9 score is 0–4, mild depression if the PHQ-9 score is 5–9, moderate depression if the PHQ-9 score is 10–14, moderately severe depression if the PHQ-9 score is 15 –19, and severe depression if the PHQ-9 score is 20–27 (48).

Waist circumference: >94 cm for male and >80 cm for female was considered as abnormal(raised/above normal) (51).

Waist to hip ratio: ≥ 0.90 for males and ≥ 0.85 cm females was considered as abnormal (raised/above normal) (51).

4.9. Data collection tools and procedures

Data was collected by using semi-structured interviewer-administered questionnaires, physical measurement, and data extraction checklists were developed after reviewing different literatures (5, 7, 17, 18, 20, 21, 34, 39). Data was collected by six BSC nurses and supervised by three MSc students. The questionnaire contains different parts which are socio-demographic data, clinical characteristics of the study subjects, behavioral and psychosocial characteristics, physical measurements, and a data extraction checklist.

The short-form international physical activity questionnaire (IPAQ) was used for assessing the level of physical activity of participants of this study. This tool is designed to assess specific types of activity such as walking, moderate and vigorous-intensity activities done at work, as part of house and yard work, to get place to place, and in spare time for recreation, exercise or sport. Study participants were asked to recall their activities of the last seven days preceding the interview. Data is reported as metabolic equivalent of tasks minutes (MET-minutes per week) using the IPAQ screening protocol to considered as high, moderate, and low level of physical activity categories (52). This tool has been used in previous studies conducted in Ethiopia (53, 54).

MMAS - 8 (47, 55) was used to measure patients Self-reported adherence to diabetic medication. It consists of 8 items, with binary scoring (yes/no) for the first seven items and a 5-point Likert score for the last item. The last item contributes a score between zero and one in 0.25-point increments on a 5-point scale assessing the frequency patients forget take medications (never = 1, once in a while = 0.75, sometimes = 0.5, usually = 0.25, and all the time = 0). Each "no" response was rated as "1" and each "yes" was rated as "0" except for item 5 (reversed score), in which the response "yes" was rated as "1" and "no" was rated as "0".The total score is a summation of all MMAS-8 items and ranges between 0 and 8, with scores of 8 reflecting high adherence, 7 or 6 reflecting medium adherence, and <6 reflecting low adherence (56). This tool is a validated tool and has been used in a previous study conducted in Ethiopia (57, 58).

PDAQ, a nine-item tool is also used for assessing dietary adherence. The response is based on a seven-point Likert scale to answer the question phrased as “On how many of the last 7 days did you?” Higher scores reflect higher adherence except for items 4 and 9, which reflect unhealthy choices (foods high in sugar or fat). For these items, higher scores reflect lower adherence, therefore, for computing a total PDAQ score, the scores for these items were inverted. Patients

were classified as having good dietary adherence if they eat a healthy diet for at least four days in a week and as having poor dietary adherence if they eat healthy diet for less than 4 days in a week (46). This tool has been used in previous studies conducted in Ethiopia (59, 60).

PHQ-9, a nine-item self-report instrument (scoring ranges from 0 to 27) and a standardized validated tool in East Africa including Ethiopia was used for assessing depression (61). The response item choices of the PHQ-9 range from 0- (not at all), 1- (several days), 2- (more than half the days), to 3- (nearly every day).

The level of social support was assessed by using the Oslo 3 social support scale by asking the patients to rate the level of support they received from family and friends. This tool is validated in different African countries (62) and has been used in studies conducted in Ethiopia (50). The scale ranges from 3 to 14. Participants who scored 3–8, 9–11, and 12–14 out of 14 were considered as having poor, moderate, and strong social support respectively.

The 10-item AUDIT tool was used to assesses alcohol consumption level (3 items), symptoms of alcohol dependence (3 items), and problems associated with alcohol use (4 items)(44, 45). The total score ranges from 0 to 40. Those who score 0-7 were considered as having low risk, 8- 15 as having medium risk, 16 – 19 as having high risk, and 20 - 40 as addiction likely. This tool is validated in Dessie referral hospital, Ethiopia among medical outpatients (63). Patients were considered hazardous alcohol consumers if they scored above 8.

Recent clinical related and biochemical data like fasting blood glucose level, presence of co-morbidity, diabetes-related complications, duration of diabetes, and treatment modality were collected from the patients' records by using checklists.

Physical Measurements

After the participants stood with arms at the sides, feet positioned close together, and weight evenly distributed across the feet, waist circumference was measured to the nearest cm at the end of normal exhalation at the level of iliac crest. The hip circumference of the patients was measured to the nearest centimeter at the largest maximum circumference of the buttocks. Both hip and waist circumference were measured with stretch-resistant tape wrapping snugly around the participants. WHR was calculated as WC (cm) divided by HC (cm) (51).

Heights of subjects were measured to the nearest centimeter, using a standard meter with subjects standing in the upright position. Weight (in kilograms) was measured in light clothing using a calibrated Weighing Scale. BMI was calculated as the weight divided by height squared (kg/m^2) (51). The scale was calibrated regularly and the indicator was checked against zero reading before every measurement.

4.10. Data quality assurance

The questionnaire first developed in English was translated to Amharic language and back-translated to English to ensure its consistency by independent language experts. Before data collection, the instrument was pretested by taking 5% (24) of study subjects in Tibebe Ghion comprehensive specialized hospital to check whether the questionnaires are simple, clear, and easily understandable. One-day training on the interview techniques and measurement procedures was given to six data collectors and three supervisors by the principal investigator. Data recording quality was checked at the end of data collection through random evaluation of the collected tool for consistency, completeness, clarity, and accuracy. Also, during data processing, the information was checked for completeness.

4.11. Data processing and analysis

Data were first checked for completeness and then each completed questionnaire was assigned a unique code. Subsequently, the data were entered using Epi Data version 3.1. The generated data was exported to a Statistical Package for Social Sciences (SPSS) version 21. The data was checked by visualizing, calculating frequencies, and sorting. Based on the nature of variables frequency distribution, summary statistics such as mean, median, standard deviation, and interquartile range were computed for case and control groups after doing a normality test (for continuous variables). The bivariable logistic regression model was fitted for each explanatory variable. Accordingly, those variables having a p-value less than or equal to 0.2 in the bivariable analysis were taken as candidates for the multivariable logistic regression model. In a multivariable regression P-value, less than 0.05 with a 95% confidence interval was considered as statistically significant. In this study extent of multicollinearity between independent variables was checked using variance inflation factor and the maximum reported variance inflation factor was 3.394 with a minimum tolerance of 0.294 and maximum standard error of Beta coefficients of the model was 0.564.

The fitness of the model was checked using Hosmer and Lemeshow goodness-of-fit test statistics giving a p-value of 0.463 and Omnibus tests of model coefficient tests < 0.001 . Besides, the Receiver Operator Characteristic (ROC) curve was plotted to check if the model can be used as a good classifier. The area under the curve was 0.796 (Annex VII), indicating the accuracy of the model in predicting the probabilities of risk factors of HTN among DM patients.

4.12. Ethical clearance

Ethical clearance was obtained from the institutional review board of Bahir Dar University, college of medicine, and health sciences with a protocol number 079/2021. A formal letter was submitted to the selected hospitals. At the initial stage of data collection and interview, informed consent was obtained from respondents and assured for them that their participation is recorded anonymously, and confidentiality of response was maintained throughout the study. Patients found to have severe depression were linked to psychiatry clinics for further assessment and treatment.

5. Results

5.1. Sociodemographic characteristics of the study participants

A total of 470 diabetic individuals (235 cases and 235 controls) were included in this study yielding a response rate of 98.74%. Of the total respondents, 121(51.5%) of controls and 118(50.2%) of cases were male participants. The mean age (\pm Standard deviation) for the controls were 60.12 (SD: \pm 10.387) and the median age for the cases were 60 with an interquartile range of (66 -12 = 14). Occupation-wise, 57 (24.3%) of controls were governmental employees and 59 (25.1%) of cases were retired. Of all participants enrolled in this study, 105 (44.7%) of cases and 97 (41.3%) of controls had an average monthly income of >3000ETB (Table 2).

Table 2: Sociodemographic characteristics of study participants for determinants of hypertension among diabetes mellitus patients having follow up in chronic disease follow up clinics of Amhara region comprehensive specialized hospitals, Ethiopia, 2021.

Variables	Controls (n=235)		Cases (n=235)	
	Frequency	%	Frequency	%
Sex				
Male	121	51.5	118	50.2
Female	114	41.5	117	49.8
Age				
≤ 50	123	52.3	45	19.2
51-60	59	25.1	76	32.3
61-70	37	15.7	76	32.3
>70	16	6.9	38	16.2
Marital status				
Single	34	14.4	12	5.1
Married	160	68.1	176	74.9
Divorced	23	9.8	17	7.2
Widowed	18	7.7	30	12.8
Educational status of the respondents				
Unable to Read and Write	54	23.0	47	20.0
Read and write	31	13.2	35	14.9
Primary school	45	19.1	39	16.6
Secondary school	22	9.4	28	11.9
Preparatory school	29	12.3	39	16.6
College or university completed	54	23.0	47	20.0
Occupational status				
Government Employee	57	24.3	49	20.9
Retired	34	14.4	59	25.1
Housewife	43	18.3	45	19.1
Daily laborer	16	6.8	9	3.8

	Merchant	32	13.6	44	18.7
	Farmer	53	22.6	29	12.4
Residence					
	Urban	170	72.3	196	83.4
	Rural	65	27.7	39	16.6
Average family income of the family					
	500-1000 ETB	38	16.2	22	9.4
	1001-2000 ETB	55	23.4	67	28.5
	2001-3000 ETB	45	19.1	41	17.4
	>3000 ETB	97	41.3	105	44.7

ETB means that Ethiopian Birr

5.2. Behavioral and psychosocial Characteristics of the study participants

As the finding of this study shows majority 190(80.9%) of cases and 187(79.6%) of controls were not kchat chewers. According to this study, one-quarter of the cases (25.1%) and nearly one-third of controls (28.5%) were hazardous alcohol consumers. Slightly lower than half of the cases (47.2%) and two-fifths of controls (40%) were found to have lower medication adherence. Concerning adherence to diet more than half of the cases (54.9%) and more than three-fifths of the controls (64.5%) had good adherence to a diet. The majority of cases (79.6%) and controls (84.7%) did not adhere to SBGM. Additionally, more than one-quarter of controls (28.9%) and nearly half of cases (49.8%) reported a lower level of physical activity in the last seven days. Among the total participants enrolled in this study 166 (70.6%) cases and 122 (51.9%) of controls were found to have depression. Regarding social support from the total participants, 102 (43.4%) of cases and 106 (45.1%) of controls have received a moderate level of social support from their family, friends, and neighbors (Table 3).

Table 3: Psychosocial and behavioral characteristics of study participants for determinants of hypertension among diabetes mellitus patients having follow up in chronic disease follow up clinics of Amhara region comprehensive specialized hospitals, Ethiopia, 2021.

Variables	Cases (n=235)		Controls (n=235)	
	Frequency	%	Frequency	%
Have you ever chewed kchat				
Yes	45	19.1	48	20.4
No	190	80.9	187	79.62
How often do you chew kchat				
Less than once a month	2	4.4	3	6.3
Once to three times per month	1	2.2	8	16.7
Once a week	12	26.7	16	33.3
Two to four times per week	16	35.6	13	27.1
Daily	14	31.1	8	16.6
Hazardous alcohol consumption				
Yes	59	25.1	67	28.5
No	176	74.9	168	71.5
Alcohol dependency				
Low Risk	176	74.9	168	71.5
Medium Risk	32	13.6	43	18.3
High Risk	9	3.8	10	4.3
Addiction Likely	18	7.7	14	6.0
Medication adherence				
Low	111	47.2	94	40.0
Medium	75	31.9	79	33.6
Good	49	20.9	62	26.4
Dietary adherence				
Good	151	64.3	129	54.9
Poor	84	35.7	106	45.

Adherence to self-blood glucose monitoring				
Adhere	36	15.3	48	20.4
Not adhere	199	84.7	187	79.6
Level of physical activity				
Low	118	50.2	68	28.9
Moderate	75	31.9	100	42.6
High	42	17.9	67	28.5
Depression				
Yes	166	70.6	122	51.9
No	69	29.4	113	48.1
Severity of depression				
No	69	29.4	113	48.1
Mild	78	33.2	64	27.2
Moderate	56	23.8	31	13.2
Moderately sever	25	10.6	20	8.5
Sever	7	3.0	7	3.0
Depression related level of difficulty in doing work				
Not difficult at all	155	66.0	133	56.6
Somewhat difficult	51	21.7	74	31.5
Very difficult	22	9.3	25	10.6
Extremely difficult	7	3.0	3	1.3
Social Support				
Poor	79	33.6	67	28.5
Moderate	102	43.4	106	45.1
Strong	54	23.0	62	26.4

5.3. Clinical characteristics of the study participants

Regarding the type of DM in this study, 96.6% of cases and 81.7% of controls were found to have type two diabetes. The median age of cases at diagnosis of DM was 52 with an interquartile range of (59 – 44 = 15) and the mean age of controls at diagnosis of DM were $44.49 \pm$ (SD: 11.0). Concerning the type of treatment taken for DM, the largest percentage of cases (83%) and nearly three fourth of controls (71.9%) were on oral hypoglycemic agents. The median duration of diabetes mellitus since diagnosis were 8 with an interquartile of (12-5 =7) for both controls and cases. More than half of the cases 120 (51.1%) and more than one-quarter of the controls 66 (28.1%) reported that they had a family history of hypertension.

Concerning education about diabetes more than half of the cases 134(57%) and nearly three fourth of controls 170(72.3%) have received diabetes education. Regarding glycemc control, unlike the cases 126 (53.6%) most of the controls 153 (65.1%) had good glycemc control. According to this study out of 470 participants more than half of the controls (56.2%) and two-fifths of the cases (40%) have a healthy weight. Concerning waist circumference higher than half of the controls (51.5%) and more than three-fifths of cases (68.5%) had above normal waist circumference. Nearly half of the controls (47.7%) and less than three fourth of cases (68.1%) had above normal waist to hip ratio (Table 4).

Table 4: Clinical characteristics of study participants for determinants of hypertension among diabetes mellitus patients having follow up in chronic disease follow up clinics of Amhara region comprehensive specialized hospital, Amhara region, Ethiopia, 2021.

Variables	Cases (n=235)		Controls (n=235)	
	Frequency	%	Frequency	%
Type of DM				
Type 1	8	3.4	43	18.3
Type 2	227	96.6	192	81.7
Kind of treatment of DM				
Oral hypoglycemic agent	195	83.0	169	71.9
Insulin therapy only	25	10.6	58	24.7
Both oral and insulin	15	6.4	8	3.4
Duration of diabetes				
<5year	46	19.5	85	36.2
5-10year	108	46.0	102	43.4
>10year	81	34.5	48	20.4
Family history of HTN				
Yes	120	51.1	66	28.1
No	115	48.9	169	71.9
Family history of DM				
Yes	105	44.7	111	47.2
No	130	55.3	124	52.8
Regularly visit a physician				
Yes	206	87.7	195	83.0
No	29	12.3	40	17.0
Diabetic health education				
Yes	134	57.0	170	72.3
No	101	43.0	65	27.7
Comorbidity other than HTN				
Yes	110	46.8	55	23.4

No	125	53.2	180	76.6
Specific types of comorbidities *				
Cardio vascular disease	79	71.8	42	76.4
Respiratory disease	17	15.5	4	7.3
Renal disease	19	17.3	11	20
Neurological disease	5	7.3	8	9.1
Diabetes-related complication				
Yes	57	24.3	35	14.9
No	178	75.7	200	85.1
Type of diabetes-related complication *				
Diabetic retinopathy	5	14.3	9	15.8
Diabetic nephropathy	12	34.3	26	45.6
Diabetic neuropathy	13	37.1	19	33.3
Sexual dysfunction	7	20.0	3	5.3
Average fasting blood Glucose				
Good	126	53.6	153	65.1
Poor	109	46.4	82	34.9
Body mass index				
Underweight	1	0.4	6	2.5
Healthy weight	94	40.0	132	56.2
Overweight	105	44.7	70	29.8
Obese	35	14.9	27	11.5
Waist Circumference				
Normal	74	31.5	114	48.5
Above normal	161	68.5	121	51.5
Waist to Hip Ratio				
Normal	75	31.9	123	52.3
Above Normal	160	68.1	112	47.7

***Indicates that total will not add up to 235 (100%) for cases and 235 (100%) for control, as multiple responses were possible in these categories**

5.4. Determinants of hypertension among DM patients

On the bivariable logistic regression analysis respondents age, marital status, educational status, average family income, non-adherence to medication, lower level of physical activity, non-adherence to diet, depression, body mass index, waist circumference, waist to hip ratio, family history of hypertension, not having diabetic health education, longer duration of diabetes, comorbidity other than hypertension., diabetes-related complication and average fasting blood glucose shows a statistically significant association at $p\text{-value} < 0.2$.

After controlling the potential confounders age, physical inactivity, depression, family history of hypertension, not attending a diabetic health education, duration of diabetes, and poor glycemic control were significant factors that made association at $p\text{-value} < 0.05$.

In this study diabetic patients who belongs within the age group of 51- 60 years were 3.33 times [AOR=3.331, 95 % CI (1.92 – 5.78)], 61-70 years were 3.99 times [AOR= 3.99, 95 % CI (2.14 – 7.46)] and >70 years were 2.95 times [AOR = 2.95, 95 % CI (1.25, 5.98)] more likely to have hypertension as compared to those diabetic individuals who aged below 50 years.

The odds of having hypertension were also 1.82 times [AOR = 1.82, 95 % CI (1.00 – 3.31)] higher among diabetic individuals who had a lower level of physical activity as compared to those who have higher levels of physical activity. Additionally, diabetic individuals who had depression were also 2 times [AOR = 2.00, 95 % CI (1.24 - 3.21)] more likely to be hypertensive than those diabetic individuals who have no depression.

Regarding family history, diabetic individuals who have a positive family history of hypertension were 2.13 times higher odds of [AOR = 2.13, 95 % CI (1.34 - 3.37)] having hypertension compared to those who had no family history of hypertension. Diabetic clients who didn't attend diabetic education were 1.87 times [AOR= 1.87, 95% CI (1.18 – 2.96)] more likely to have hypertension than their counterparts.

The odds of having hypertension were also 1.99 times higher among those individuals who spent >10years of their life with DM as compared to those individuals spending their time with DM for less than 5 years [AOR= 1.99, 95% CI (1.05 – 3.79)].

Concerning glycemic control, diabetic individuals who have poor glycemic control were 1.57 times more likely to develop hypertension than those diabetic clients with good glycemic control [AOR=1.57, 95% CI (1.01 – 2.45)] (Table 5).

Table 5: Bivariable and Multivariable logistic regression analysis results for determinants of hypertension among DM patients having follow up in chronic follow up clinics of Amhara region comprehensive specialized hospital, Amhara region, Ethiopia, 2021.

Variables	Cases (n = 235)	Controls (n = 235)	COR (95%CI)	AOR (95%CI)	P Value
Age					
>70	38 (16.2)	16 (6.8)	6.492(3.30, 12.77)	2.95 (1.25, 6.92)	0.013**
61-70	76 (32.3)	37 (15.7)	5.61 (3.34, 9.45)	3.99 (2.14, 7.46)	< 0.001**
51-60	76 (32.3)	59 (25.1)	3.52 (2.17,5.70)	3.33 (1.92, 5.78)	< 0.001**
≤ 50	45 (19.2)	123 (52.3)	1	1	
Marital status					
Married	176 (74.9)	160 (68.1)	3.11 (1.56, 6.23)	1.56 (0.67, 3.64)	0.305
Divorced	17 (7.2)	23 (9.8)	2.09 (0.84, 5.19)	1.15 (0.39, 3.39)	0.797
Widowed	30 (12.8)	18 (7.7)	4.72 (1.96, 11.39)	1.10 (0.37, 3.32)	0.865
Single	12 (5.1)	34 (14.4)	1	1	
Educational status					
Unable to Read and Write	47 (20.0)	54 (23.0)	1.00 (0.58, 1.74)	0.89 (0.41, 1.96)	0.779
Read and write	35 (14.9)	31 (13.2)	1.29 (0.69, 2.4)	1.05 (0.46, 2.36)	0.915
Primary school	39 (16.6)	45 (19.1)	0.99 (0.55, 1.77)	0.96 (0.45, 2.05)	0.910
secondary school	28 (11.9)	22 (9.4)	1.46 (0.74, 2.89)	1.16 (0.49, 2.74)	0.744
preparatory school	39 (16.6)	29 (12.3)	1.54 (0.83, 2.87)	1.13 (0.51, 2.48)	0.767
College or university completed	47 (20.0)	54 (23.0)	1	1	
Average family income					
>3000	105 (44.7)	97 (41.3)	1.86 (1.03, 3.38)	1.609 (0.72, 6.62)	0.251
2001-3000	41 (17.4)	45 (19.1)	1.57 (0.80, 3.08)	1.264 (0.54, 2.54)	0.592
1001-2000	67 (28.5)	55 (23.4)	2.10 (1.11, 3.96)	1.77 (0.81, 3.86)	0.151
500-1000	22 (9.4)	38 (16.2)	1	1	
Medication adherence					
Low	111 (47.2)	94 (40)	1.49 (0.93, 2.37)	1.15 (0.64, 2.04)	0.646
Medium	75 (31.9)	79 (33.6)	1.20 (0.73, 1.961)	0.93 (0.51, 1.69)	0.802
Good	49 (20.9)	62 (26.4)	1	1	

Physical activity						
Low	117 (49.8)	68 (28.9)	2.74 (1.69, 4.47)	1.82 (1.00, 3.31)	0.049**	
Moderate	76 (32.3)	100 (42.6)	1.21 (0.75,1.97)	1.02 (0.57, 1.84)	0.947	
High	42 (17.9)	67 (28.5)	1	1		
Dietary Adherence						
Poor	84 (35.7)	106 (45.1)	0.67 (0.47, 0.98)	0.75 (0.47, 1.19)	0.219	
Good	151 (64.3)	129 (54.9)	1	1		
Depression						
Yes	166 (70.6)	122 (51.9)	2.22 (1.52, 3.26)	2.00 (1.24, 3.21)	0.004**	
No	69 (29.4)	113 (48.1)	1	1		
Waist Circumference						
Above normal	161 (68.5)	121 (51.5)	2.04 (1.40, 2.98)	0.85 (0.37, 1.97)	0.704	
Normal	74 (31.5)	114 (48.5)	1	1		
Waist to Hip Ratio						
Above Normal	160 (68.1)	112 (47.7)	2.34 (1.61, 3.41)	1.84 (0.80, 4.23)	0.150	
Normal	75 (31.9)	123 (52.3)	1	1		
Family history of hypertension						
Yes	120 (51.1)	66 (28.1)	2.67 (1.82, 3.19)	2.13 (1.34, 3.37)	≤ 0.001**	
No	115 (48.9)	169 (71.9)	1	1		
Diabetic health education						
No	101 (43.0)	65 (27.7)	1.97 (1.34, 2.89)	1.87 (1.18, 2.96)	0.008**	
Yes	134 (57.0)	170 (72.3)	1	1		
Duration of DM						
>10year	81 (34.5)	48 (20.4)	3.11 (1.88, 5.17)	1.99 (1.05, 3.79)	0.036**	
5-10year	108 (46.0)	102 (43.4)	1.95 (1.24, 3.06)	1.51 (0.88, 2.61)	0.137	
<5year	46 (19.6)	85 (36.2)	1	1		
Comorbidity other than hypertension						
Yes	110 (46.8)	55 (23.4)	2.880 (1.94, 4.28)	1.38 (0.84, 2.27)	0.206	
No	125 (53.2)	180 (76.6)	1	1		
Diabetes-related complication						
Yes	57 (24.3)	35 (14.9)	1.82 (1.15, 2.92)	0.79 (0.45, 1.42)	0.444	
No	178 (75.7)	200 (85.1)	1	1		

Glycemic control					
Poor	109 (46.4)	82 (34.9)	1.61 (1.11, 2.34)	1.57 (1.01, 2.45)	0.046**
Good	126 (53.6)	153 (65.1)	1	1	

**** Indicates that variables are statistically significant at P value < 0.05**

6. Discussion

The main purpose of this study was to assess determinants of hypertension among diabetic patients attending chronic follow-up clinics in Amhara region comprehensive specialized hospital. The identified determinants in multivariable analysis were age of the respondents, physical inactivity, depression, family history of hypertension, not having a diabetic health education, longer duration of diabetes, and poor glycemic control.

In this study diabetic patients who belong within the age group of 51-60 years were 3.33 times, 61-70 years were 3.99 times and >70 years were 2.95 times more likely to have hypertension as compared to those diabetic individuals who aged below 50 years. This finding is in line with studies conducted in Malaysia (15), Emirates (33), Benin (34), Jimma (7), Hossana (21), Debretabor (5), and as they stated that older age (age ≥ 50 years) is associated with an increased risk of having hypertension. This finding may be attributed to age-related modifications of the vascular system that results in stiffening and thickening of the layers of the artery, decreased baroreceptor sensitivity, increased responsiveness to sympathetic nervous system stimuli, alteration of renal and sodium metabolism, modification of the renin-angiotensin-aldosterone system. Those changes will finally predispose to high blood pressure (64, 65). Moreover, the possible explanation for this might also be due to easily susceptibility to pathological conditions and other DM-related complication, non-adherence with the treatments and diabetes mellitus care. As per the finding of this study risk of having hypertension among diabetic clients aged > 70 were lower compared to diabetic clients aged 51-60 years and 61-70 years. This might be occurred due to the inclusion of the lowest proportion of cases and controls aging > 70 years compared to other age group.

In this study, the odds of having hypertension were 1.99 times higher among those individuals who live with DM for above 10 years as compared to those individuals who live with DM for less than 5 years. This finding is supported by a study conducted in Benin (34) and Adama (18). The reason might be when the duration of diabetes increases, different changes may be occurred due to chronic hyperglycemia (those changes could be damage to the vasculature, an enhanced renin-angiotensin system, increased resistance of insulin, progressive impairment of insulin secretion and sensitivity, blood vessel stiffening). Those changes finally cause endothelial suffering leading to thickening of the arterial wall and a rise in blood pressure (66, 67).

Concerning glycemic control, diabetic individuals who have poor glycemic control were 1.57 times more likely to develop hypertension than those diabetic clients with good glycemic control. This finding is in agreement with studies conducted in Debreabor (5) and Tigray, Ethiopia (20). This association is might be due to persistent hyperglycemia. Excessive level of glucose chemically binds to collagen, free amino groups of proteins, and other long-lived proteins in blood vessel walls which cause trapping of circulating low-density lipoprotein (LDL) that promotes the deposition of cholesterol in the intima, which further accelerates the formation of atheroma on the walls of arteries and subsequent hypertension. Also, hyperglycemia increases the osmolality of the extracellular fluid, causing water to shifts from the intracellular to extracellular space and cause volume expansion and high BP (67-69).

The odds of having hypertension were also 1.82 times higher among diabetic individuals who had lower levels of physical activity as compared to those who have higher levels of physical activity. This finding is supported by a study conducted in Benghazi (17) and Tigray, Ethiopia (20). This association might be occurred due to the reason that exercise can normalize body mass index, improve glucose tolerance and insulin sensitivity, systemic vascular resistance, waist circumference, and able to improve insulin sensitivity. Additionally. exercise can improve lipid metabolism (e.g., increase the level of high-density lipoprotein, helps in reducing level of triglycerides, low-density lipoprotein level, and total cholesterol) which results in good glycemic control and optimal level of blood pressure (70). But if diabetic clients didn't adhere to exercise, they might lose the advantage they have got through this physical activity,

Regarding family history, diabetic individuals who have a positive family history of hypertension were 2.13 times higher odds of having hypertension compared to those who had no family history of hypertension. This finding is in line with a study conducted in Southern Ethiopia (37) and Jordan (39). The possible reason for this might be related to different mechanisms that expose a person to high blood pressure among diabetic clients (increased renal proximal sodium reabsorption, having genetic traits related to high blood pressure such as high sodium-lithium counter-transport, elevated level of uric acid, high fasting plasma insulin concentrations and oxidative stress).

Additionally, in this study diabetic individuals who had depression were also 2 times more likely to be hypertensive than those diabetic individuals who have no depression. This finding might have occurred as a result of physiological mechanisms that may cause prolonged activation of the

sympathetic nervous system and the release of inflammatory markers, catecholamines, and cortisol, which could trigger the problems of insulin resistance, which finally causes high blood pressure (71). Additionally, having depression is negatively associated with adherence to DM treatment regimen, self-care aspects (diet, medication, exercise, self-monitoring of blood glucose), medical appointments attendance, disease, and quality of life.

And also in this study, diabetic clients who didn't attend diabetic education were 1.87 times more likely to have hypertension than their counterparts. This finding is consistent with a case-control study conducted in Tigray (20) Ethiopia. The possible reason for this might be due to diabetic education is a key factor for good blood pressure and glucose management and affects patient health positively (45). Diabetic health education in diabetic individuals can optimize metabolic control (including self-blood glucose monitoring, adherence to dietary practice, adherence to physical activity, and medication adherence), prevent and manage complications like hypertension, improve patient and health professional's relation and plan of care, help in adopting a more positive attitude towards the disease and relieve the symptoms of the disease or handle with emergencies and disease-related exacerbation (72). Unlike this, failure of attending diabetic education sessions is responsible for frequent re-hospitalizations, not following lifestyle modifications suggested by health care professionals, not actively engaging in self-management of diabetes, disease complications, and poor life quality.

7. Strength and Limitation of the study

7.1. Strength of the study

Using information from patients' medical cards and using physical measurement to gather information rather than relying only on self-reported information and being a multicenter study were major strengths of this study.

7.2. Limitation of the study

Since the study was hospital-based the finding may not be generalized to the general populations and using fasting blood glucose level instead of HgA1C were limitations of this study.

8. Conclusion

The burden of risk factors of hypertension among DM population is a significant public health challenge. In this study, determinants that increase the risk of hypertension among peoples with diabetes mellitus were increased age of respondents, physical inactivity, depression, family history of hypertension, not having a diabetic health education, longer duration of diabetes, and poor glycemic control.

9. Recommendation

Based on the findings of this study, the following recommendations are forwarded:

To Amhara regional health bureau

Simple client-friendly intervention programs aimed at preventing and modifying the identified risk factors of hypertension in diabetic population (low level of physical activity, depression, poor glycemic control, and diabetic health education) should be incorporated in the health care systems of the Amhara region for effective control and management of hypertension among diabetic clients.

To Amhara region comprehensive specialized hospital

Amhara region comprehensive specialized hospital administrative shall design a strategy to give comprehensive diabetic care and internal referral linkage to psychiatric department for diabetic clients for early screening and treatment of depression.

Health care providers are also recommended to give diabetic health education, create awareness of the participants to attend diabetes education, and advise diabetes individuals to actively engage in physical activity to have good control of the disease.

To diabetic clients

People with diabetes are recommended to be physically active or adhere to physical exercise (they have to do at least 75 minutes of vigorous-intensity physical activity or 150 minutes of moderate-intensity physical activity throughout the week) and attend diabetic health education programs to have good control and prevention of the disease.

To Researchers

A prospective cohort study triangulated with qualitative study design is recommended to be carried out on the incidence of hypertension and related risk factors of hypertension among diabetic clients by considering different variables like lipid profile (LDL, HDL, Triglycerides, and Total cholesterol), knowledge on diabetes, and fear of complications.

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11. Annex

Respondent 's code number _____

Annex I: Information sheet (English version)

My name is _____. I am here representing Makda Abate, Adult Health Nursing Student at Bahir Dar University, College of Health Sciences, department of adult health nursing, Graduate Study Program, and she is conducting a research on a topic entitled as Determinants of hypertension among adult diabetes mellitus patients attending the diabetic clinic in Amhara Region Comprehensive Specialized Hospitals.

I am inviting you to participate in this research. You may choose to take part or not and if you choose to, you are free to withdraw from the study at any time during the study. If you do not want to take part, your care in the hospital will not be affected by your decision.

The necessary information regarding the study is mentioned below.

Purpose of the study: the purpose of this study is to assess the determinants of hypertension among adult diabetes mellitus patients attending the diabetic clinic in Amhara Region Comprehensive Specialized Hospitals.

Benefits and risks of the study:

Benefits: For your participation in the study no payment will be granted. Your responses to the following questions are beneficial to you and other diabetic patients as an input in identifying risk factors for hypertension and will contribute a role in preventing those risk factors in accordance with the study findings.

Risks: Your participation will not cause any harm on you. The study will be conducted through interviews and you will assist me in completing the questionnaire. I will ask you some questions and your answer will help me to fill the forms. The questions are easy and will take about 25 – 30 minutes to complete the forms

Confidentiality: to establish confidentiality of research data, the principal investigator (PI) will use codes during data collection period instead of using names. so the information you provided for us is kept strictly confidential.

Right of the participant: Participating and not participating is the full right and participants can stop from participation in the study at any time. This would have no effect at all on your health and nobody will enforce you to explain the reason of withdrawal. Data collectors can skip question which the participant does not want to respond.

Person to contact: This research work is approved by the institutional review board of college of medicine, and health sciences of Bahir Dar University. If you have any question, you can contact any of the following individuals (Investigator and Advisors) and you may ask at any time you want.

1. Makda Abate: Bahir Dar University, College of Medicine and Health Science, School of Health Science, Department of Adult Health Nursing: **principal investigator**

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2. Mr. Teshager Woldegiorgis (MSc. Asst professor): Bahir Dar University, College of Medicine and Health Science, School of Health Science, Department of Adult Health Nursing: Advisor

Cell phone: +251-9 12 88 61 62, E-mail: teshagerhylemarriam@gmail.com

3. Mr Alemshet Yirga (Msc in Surgical Nursing): Bahir Dar University, College of Medicine and Health Science, School of Health Science, Department of Adult Health Nursing: Advisor

Cell phone: + 251 -9-18 06 56 64, E-mail- alemyirga25@gmail.com

Interview: _____ date _____ month _____ year.

Annex II: Informed Consent form (English version)

In undersigning this document, I am giving my consent to participate in the study. I have been informed that the purpose of this study is to assess the determinants of hypertension among diabetes mellitus patients in Amhara region comprehensive specialized hospitals. I have understood that participation in this study is entirely voluntary and my identity will not be disclosed to the third party. I have also been informed that my participation or my refusal to take part will not affect the care I receive from the hospital. I understood that participation in this study imposes no risk to me. I understood that Makda Abate is the contact person if I have questions about the study or about my rights as a study participant. Now I am giving my consent to participate in the study voluntarily.

Signature of the participant _____ Date____/_____/____

Data collector Name _____ Signature _____ Date____/_____/____

Annex III: Questionnaires in English Version

Part 1: Socio-demographic and socioeconomic factors

S.No	Question	Response	Remark
101	Sex	1. Male 2. Female	
102	How old are you?	-----Years	
103	What is your marital status?	1. Single 2. Married 3. Divorced 4. Widowed 5. Separated	
104	What is the highest level of education you have completed?	1. Unable to read and write 2. Read and write 3. Primary school (1-8) 4. Secondary school (9-12) 5. High school/preparatory school 6. College/University completed	
105	Occupational status?	1. Government employee 2. Retired 3. Housewife 4. Daily laborer 5. Merchant 6. Farmer 7. Others, specify _____	
106	Residence?	1. Urban 2. Rural	
107	Average Family monthly income?	_____ ETB	

Part 2: Behavioral characteristics

Kchat Chewing			
201	Have you ever chewed Kchat?	1. Yes 2. No	If no skip to Q. 203
202	If yes for Q-201, how often do you chew?	1. More than one year ago 2. Four to twelve months ago 3. One to three months ago 4. Within the last month 5. Today	

Harmful Alcohol Consumption			
Now I am going to ask you some questions about your use of alcoholic beverages (Beer, Tellá, Tejj, Areké) during this past year''			
203	How often do you consume a drink containing alcohol?	0. Never 1. Monthly or less 2. 2 to 4 times a month 3. 2 to 3 times a week 4. 4 or more times a week	If the answer is Never Skip to Q. 212
204	How many drinks containing alcohol do you consume on a typical day when you are drinking?	0. 1 or 2 1. 3 or 4 2. 5 or 6 3. 7, 8, or 9 4. 10 or more	
205	How often do you have six or more drinks on one occasion?	0. Never 1. Less than monthly 2. Monthly 3. Weekly 4. Daily or almost daily	Skip to Questions 211 and 212 if Total Score for Questions 204 and 205 = 0
(Complete full questionnaire if score is 3 or more)			
206	Once after you had started drinking, how often have you recognized that you were not able to stop/cut down your drinking during the last year?	0. Never 1. Less than monthly 2. Monthly 3. Weekly 4. Daily or almost daily	
207	How often during the last year have you failed to do what was normally expected from you because of drinking?	0. Never 1. Less than monthly 2. Monthly 3. Weekly 4. Daily or almost daily	

208	How often during the last year have you needed a first drink in the morning to get yourself going after a heavy drinking session?	0. Never 1. Less than monthly 2. Monthly 3. Weekly 4. Daily or almost daily	
209	How often during the last year have you had a feeling of guilt or remorse after drinking?	0. Never 1. Less than monthly 2. Monthly 3. Weekly 4. Daily or almost daily	
210	How often during the last year have you been unable to remember what happened the night before because you had been drinking?	0. Never 1. Less than monthly 2. Monthly 3. Weekly 4. Daily or almost daily	
211	Have you or someone else been injured as a result of your drinking?	0. No 2. Yes, but not in the last year 4. Yes, during the last year	
212	Has a relative or friend or a doctor or another health worker been concerned about your drinking or suggested you cut down?	0. No 2. Yes, but not in the last year 4. Yes, during the last year	

Medication adherence Questionnaire			
Now I am going to ask you some questions about your use of medication for diabetes.			
217	Do you sometimes forget to take your diabetes medication?	1.Yes 2.No	
218	People sometimes miss taking their medications for reasons other than forgetting. Thinking over the past two weeks, is there any days when you did not take your diabetes medicine?	1.Yes 2.No	
219	Have you ever cut back or stopped taking your medication without telling your doctor, because you felt worse when you took it?	1.Yes 2.No	
220	When you travel or leave home, do you sometimes forget to bring along your diabetes medication?	1.Yes 2.No	
221	Did you take your diabetes medicine yesterday?	1.Yes 2.No	
222	When you feel like your diabetes is under control, do you sometimes stop taking your medicine?	1.Yes 2.No	
223	Taking medication every day is a real inconvenience for some people. Do you ever feel hassled about stick to your diabetes treatment plan?	1.Yes 2.No	

224	How often do you have difficulty remembering to take all your medications?	1.Never/Rarely 2.Once in a while 3.Sometimes 4.Usually 5.All the time	
-----	--	---	--

Perceived dietary adherence questionnaires									
Now I am going to ask you some questions about your eating plan in the last seven days.									
S.NO	Question	Response							
		0	1	2	3	4	5	6	7
225	On how many of the last SEVEN DAYS have you followed a healthful eating plan?								
226	On how many of the last SEVEN DAYS did you eat five or more servings of fruits and vegetables?								
227	On how many of the last SEVEN DAYS did you eat carbohydrate-containing foods with a low Glycemic Index? (Example: dried beans, lentils, barley, pasta, low-fat dairy products)								
228	On how many of the last SEVEN DAYS did you eat foods high in sugar, such as rice, potatoes, etc.?								
229	On how many of the last SEVEN DAYS did you eat foods high in fiber such as oatmeal, high fiber cereals, and whole-grain bread?								
230	On how many of the last SEVEN DAYS did you space carbohydrates evenly throughout the day?								
231	On how many of the last SEVEN DAYS did you eat fish or other foods high in omega-3 fats?								
231	On how many of the last SEVEN DAYS did you eat foods that contained or were prepared with Vegetable oil, Butter and Sesame /nug oil?								
232	On how many of the last SEVEN DAYS did you eat foods high in fat (such as high-fat dairy products, fatty meat, fried foods or deep-fried foods)?								
Self-Blood Glucose Monitoring									
234	On how many of the last SEVEN DAYS did you test your blood sugar?								
235	On how many of the last SEVEN DAYS did you test your blood sugar according to the number of times recommended by your health care provider?								

Physical activity assessment by using international physical activity questionnaire

I am going to ask you about the time you spent being physically active in the last 7 days. Please answer each question even if you do not consider yourself to be an active person. Think about the activities you do at work, as part of your house and yard work, to get from place to place, and in your spare time for recreation, exercise or sport.

S.NO	Questions	Response	Skip
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Now, think about all the vigorous activities which take hard physical effort that you did in the last 7 days. Vigorous activities make you breathe much harder than normal and may include heavy lifting, digging, aerobics, or fast bicycling. Think only about those physical activities that you did for at least 10 minutes at a time.

236	During the last 7 days, on how many days did you do vigorous physical activities for at least 10 minutes at a time?	1. ____ Days per week 2. No vigorous physical activities	If respondent answers No vigorous physical activities skip to Question 238
237	How much time did you usually spend doing vigorous physical activities on one of those days for at least 10 minutes at a time?	1. _____ Hours per day 2. _____ Minutes per day	

Now think about activities which take moderate physical effort that you did in the last 7 days. Moderate physical activities make you breathe somewhat harder than normal and may 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 at a time.

238	During the last 7 days, on how many days did you do moderate physical activities at least 10 minutes at a time?	1. ____ Days per week 2. No moderate physical activities	If respondent answers No moderate physical activities skip to Question 240
239	How much time did you usually spend doing moderate physical activities on one of those days?	1. _____ Hours per day 2. _____ Minutes per day	

Now think about the time you spent 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.

240	During the last 7 days, on how many days did you walk for at least 10 minutes at a time?	1. ____ Days per week 2. No walking	If respondent answers NO skip to Question 242
241	How much time did you usually spend walking on one of those days?	1. _____ Hours per day 2. _____ Minutes per day	

Now think about the time you spent sitting on week days during the last 7 days. Include time spent at work, at home, while doing course work, and during leisure time. This may include time spent sitting at a desk, visiting friends, reading or sitting or lying down to watch television.

242	During the last 7 days, how much time did you usually spend sitting on a week day?	1. _____ hours per day 2. _____ minutes per day	
-----	--	--	--

Instructions: this interview consists of nine items. Please listen carefully what I am going to read each item of statement for you, and then tell me the **one number** in each item that best describes the way you have been feeling during the **past two weeks including today.**

Over the last 2 weeks, how Often have you been bothered by any of the following problems?					
S.No	Questions	Respondents possible answer			
		Not at all	Several days	More than half the days	Nearly every day
244	Little interest or pleasure in doing things	0	1	2	3
244	Feeling down, depressed, or hopeless	0	1	2	3
245	Trouble falling or staying asleep, or sleeping too much	0	1	2	3
246	Feeling tired or having little energy	0	1	2	3
247	Poor appetite or overeating	0	1	2	3
248	Feeling bad about yourself- or that you are a failure or have let yourself or your family down	0	1	2	3
249	Trouble concentrating on things, such as reading the newspaper or watching television	0	1	2	3
250	Moving or speaking so slowly that other people could have noticed? Or the opposite-being so fidgety or restless that you have been moving around a lot more than usual	0	1	2	3
250	Thoughts that you would be better off dead or of hurting yourself in some way	0	1	2	3
<p>If you checked off any problems, how difficult have these problems made it for you to do your work, take care of things at home, or get along with other people?</p> <ol style="list-style-type: none"> 1. Not difficult at all 2. Somewhat Difficult 3. Very difficult 4. Extremely difficult 					

Oslo social support scale 3 (OSS3)

The following questionnaire consists of 3 items. Please read each item carefully and then pick out the one choice in each group that best describes your social support. Be sure that you do not choose more than one statement for any item.

S.NO	Questions	Response
252	How many people are you so close to that you can count on them you have great personal problems?	1. None 2. 1-2 3. 3-5 4. >5
253	How much interest and concern do people show in what you do?	1. None 2. Little 3. Uncertain 4. Some 5. A lot
254	How easy it is to get practical help from a neighbor if you should need it?	1. Very difficult 2. Difficult 3. Possible 4. Easy 5. Very easy

Part 3: Clinical Determinants

S.No	Questions	Response	Skip
301	At what age you have been told by a doctor you had a diabetes?	_____ year	
302	Do you have a family history of hypertension?	1. Yes 2. No	
303	Do you have a family history of DM?	1. Yes 2. No	
304	Do you visit your physician regularly for evaluation and treatment of your diabetes?	1. Yes 2. No	If yes skip to Q.307
306	During any of your visits to a doctor or other health worker/ health institution in the past 12 months, were you advised or attend any diabetic health education?	1. Yes 2. No	If no skip to Q.401

Part Four: Physical Measurements

No	Anthropometry	Reading
401	Height (in centimeter)	
402	Weight (in kilogram)	
403	Body mass index (BMI)	
404	Waist circumference (in centimeter)	
405	Hip circumference (in centimeter)	
406	Waist to hip ratio (WHR)	

Part Five: Data Extraction Checklists (taken from patient cards)

S. No	Questions	Response	Skip
501	Type of dm	1. Type 1 2. Type 2	
502	Duration of DM	_____	
503	Kind of treatment of DM taking	1. Oral hypoglycemic agent only 2. Insulin therapy only 3. Both oral and insulin 4. Dietary	
504	Is there any comorbidity other than hypertension?	1. Yes 2. No	If no go to Question 506
505	Which one best describe the type of comorbid illness?	1. Cardiovascular disease (CHF, STROKE ...) 2. Respiratory disease 3. Renal disease 4. Neurological disease 5. Other specify.....	
506	Are there any diabetes related complications?	1. Yes 2. No	If no go to question 508
507	Which one best describe the type of diabetes related complication?	1. Diabetic retinopathy 2. Diabetic nephropathy 3. Diabetic neuropathy 4. Sexual dysfunction 5. Other specify	
Blood glucose level (In addition to current take previous last two Recent results)			
508	Fasting blood glucose	____ mg/dl ____ mg/dl ____ mg/dl	

Annex IV: Information Sheet (Amharic Version)

ጤና ይስጥልኝ!! ስሜ _____ እባላለሁኝ። እዚህ የተገኘሁት በባህር ዳር ዩኒቨርሲቲ ጤና ሳይንስ ኮላጅ የድህረ ምረቃ መርሃ ግብር ተማሪ የሆኑት ማክዳ አባተን ወክሎ ነው። እሳቸውም በአማራ ክልል ስፔላይዝድ ሆስፒታሎች የስኳር ህመም ማእከል በሚከታተሉ ታካሚዎች ዙርያ ለደም ግፊት በሚያጋልጡ ነገሮች ላይ ጥናት እያካሄዱት ነው። በዚህ ጥናት እንዲሳተፉ እጋብዛችኋለሁኝ። ተሳታፊ ለመሆንም ላለመሆንም መምረጥ ይችላሉ። ከፈለጉ በጥናቱ ወቅት በማንኛውም ጊዜ ጥናቱን ማቋረጥ ይችላሉ። እርስዎ የጥናቱ አካል ለመሆን ካልፈለጉ፣ በውሳኔዎ ምክንያት በሆስፒታሉ ውስጥ በሚያገኙት እንክብካቤ ላይ ለውጥ አያመጣም። ስለ ጥናቱ አስፈላጊ የሆኑ መረጃዎች ከዚህ በታች ተዘርዝረዋል።

የጥናቱ ዓላማ፣ የዚህ ጥናት ዓላማ በአማራ ክልል ስፔላይዝድ ሆስፒታሎች የስኳር ህመም ማእከል በሚከታተሉ ታካሚዎች ዙርያ ለደም ግፊት በሚያጋልጡ ነገሮችን መገምገም ነው።

ጥቅሞች፣ በጥናቱ ሲሳተፉ ክፍያ አይሰጥዎትም ። ይሁን እንጂ መልስዎ ለእርስዎ እና ለሌሎች የስኳር ታካሚዎች ለደም ግፊት የሚያጋልጡ ነገሮችን ለማወቅ ያግዛል። እንደሁም በግኝቶቹ መሰረት ከስኳር ህመም ጋር ተያይዞ የሚመጣ የደም ግፊትን ለመከላከል እና እንክብካቤዎቹን ለማሻሻል ከፍተኛ አስተዋጽኦ ይኖረዋል።

ጉዳዮች፣ ተሳትፎዎ ምንም ጉዳት አያስከትልም። ጥናቱ የሚካሄደው በቃለ-መጠይቆች ሲሆን መጠይቁን በመመለስ ቅጾቹን ለመሙላት ያግዘኛል። ጥያቄዎቹ ቀላል እና ለማጠናቀቅ ከ 25 – 30 ደቂቃዎችን ይወስዳል።

የጥናቱ ሚስጥራዊነት፡- የተሳታፊውን ማንነት እና የሚሰጠው መረጃ በሚስጥር ይያዛል። ስለሆነም ከተሳታፊ ስም ይልቅ የሚስጥር ኮድ መረጃ በሚሰበሰቡበት ጊዜ እንጠቀማለን።

የቃለ መጠይቅ ተሳታፊ ሙባቶች

- ተሳታፊው በዚህ ጥናት ላይ የመሳተፍ ወይም ያለመሳተፍ ሙባቱ የተጠበቀ ነው።
- በመሳተፍ ላይ እያሉ በማንኛውም ሰዓት ማቋረጥ ወይም ለመመለስ የማይፈልጉትን ጥያቄ አለመመለስ ይቻላል።
- በቃለ መጠይቅ ወቅት ግልፅ ያልሆነ ነገር መጠየቅ ይቻላል።

ስለ ጥናቱ ማንኛውም ጥያቄ ካለዎት የሚከተሉትን ግለሰቦች ማነጋገር ይችላሉ እና በፈለጉት ጊዜ መጠየቅ ይችላሉ ፡

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Annex V: Informed Consent form (Amharic version)

ይህንን ቅጽ በመፈረም ጥናቱ ላይ ለመሳተፍ ፈቃዴን እሰጣለሁ ። የዚህ ጥናት ዓላማ በአማራ ክልል ስፔላይዝድ ሆስፒታሎች የስኳር ህመም ማእከል በሚከታተሉ ታካሚዎች ዙርያ ለደም ግፊት የሚያጋልጡ ነገሮችን መገምገም ነው። በዚህ ጥናት መሳተፊ ሙሉ በሙሉ በፈቃዴ ውስጥ የተካተተ እንደሆነና የእኔን ማንነት ለሶስተኛ ወገን እንደማይሰጥ ተረድቻለሁ። በተጨማሪም የእኔ መሳተፍ ወይም ለመሳተፍ ፈቃደኛ አለመሆኔ ከሆስፒታሉ ከማገኘው እንክብካቤ ላይ ተጽዕኖ እንደማይኖረው ተነግሮኛል። በዚህ ጥናት ውስጥ መሳተፍ ለእኔ ላይ ምንም አደጋ እንደማያስከትል ተረድቻለሁ። ስለ ጥናቱ ወይም እንደ ጥናት ተሳታፊ ስለ መብቶቼ አስልመክቶ ጥያቄዎች ካሉኝ ማክዳ አባተን እና የጥናቱን አማካሪዎች መጠየቅ እንደምችል ተረድቻለሁ። በዚህም መሰረት በፈቃደኝነት በጥናቱ ለመሳተፍ ፈቃዴን እስማማለሁ።

የተሳታፊው ፊርማ _____ መጠይቁ የተደረገበት ቀን _____

የጠያቂው ስም _____ ፊርማ _____ ቀን _____

Annex VI: Questionnaires in Amharic Version

ክፍል አንድ፡ - ማህበራዊ፣ ኢኮኖሚያዊ እና ሥነ-ሕዝባዊ መረጃዎች

ተ. ቁ	ጥያቄዎች	ምላሽ	ምርመራ
101	ገታ	1. ወንድ 2. ሴት	
102	እድሜዎ ስንት ነው?	----- ዓመት	
103	የጋብቻ ሁኔታ?	1. ያላገባ/ች 2. ያገባ/ች 3. የፈታ/ች 4. የሞተችበት/ባት	
104	የትምህርት ደረጃ?	1. ማንበብና መጻፍ የማይችል/የማትችል 2. ማንበብና መጻፍ የሚችል/የምትችል 3. የመጀመሪያ ት/ት (1-8) 4. 2ኛ ደረጃ ትምህርት (9-10) 5. መሰናዶ ትምህርት (11-12) 6. ኮሌጅ/ዩኒቨርሲቲ ያጠናቀቀ	
105	የስራ ሁኔታ?	1. የመንግስት ሰራተኛ 2. ጡረተኛ 3. የቤት እመቤት 4. የቀን ሰራተኛ 5. ነጋዴ 6. ገበሬ 7. ስራ የሌለው	
106	የመኖሪያ አድራሻ?	1. ከተማ 2. ገጠር	
107	አማካይ ወርሃዊ የቤተሰብ ገቢ?	----- የኢትዮጵያ ብር	

ክፍል ሁለት፡- ከስነ ባህሪ ጋር የተያያዙ መጠይቆች

ጫት መቃምን የተመለከቱ መጠይቆች			
201	ጫት ቅመው ያዉቃሉ?	1. አዎ 2. የለም	መልስዎ የለም ከሆነ ወደ Q.203 ይለፉ
202	ለጥ.ቁ 205 መልስዎ አዎ ከሆነ ምን ያክል ጊዜ ይቅማሉ?	1. በወር ከአንድ ጊዜ ያነሰ 2. በወር ከ1-3 ጊዜ 3. በሳምንት አንድ ጊዜ 4. በሳምንት ከ2-4 ጊዜ 5. በየቀኑ	

አልኮል መጠጣትን የተመለከቱ መጠይቆች

203	አልኮልነት ያላቸውን መጠጦች በየስንት ጊዜ ይጠጣሉ?	0. በጭራሽ አልጠጣም 1. ወርሃዊ ወይም ከዚያ ያነሰ 2. በወር ከ 2 እስከ 4 ጊዜ 3. በሳምንት ከ 2 እስከ 3 ጊዜ 4. በሳምንት 4 ወይም ከዚያ በላይ ጊዜ	መልሱ በጭራሽ አልጠጣም ከሆነ ወደ ጥያቄ 212 ይለፉ
204	በአንድ መደበኛ ቀን በሚጠጡበት ጊዜ በአማካኝ ምን ያህል መለኪያ ይጠጣሉ?	0. 1 ወይም 2 1. 3 ወይም 4 2. 5 ወይም 6 3. 7 ፣ 8 ወይም 9 4. 10 ወይም ከዚያ በላይ	
205	በአንድ አጋጣሚ ስድስት ወይም ከዚያ በላይ መለኪያ መጠጦችን በየስንት ጊዜ ይጠጣሉ?	0. በጭራሽ 1. ከወር በታች 2. ወርሃዊ 3. ሳምንታዊ 4. በየቀኑ ወይም ከዚያ ባነሰ	ለጥያቄ 204 እና 205 ጠቅላላ ውጤት 0 ከሆነ ወደ 211 እና 212 ጥያቄዎች ይዝለሉ
206	ባለፈው ዓመት አንዴ መጠጣት ከጀመሩ በኋላ መጠጣትዎን ለማቆም / ለመቀነስ / ወስነው ሳይሳካልዎ ቀርቷል?	0. በጭራሽ 1. ከወር በታች 2. ወርሃዊ 3. ሳምንታዊ 4. በየቀኑ ወይም ከዚያ ባነሰ	
207	ባለፈው ዓመት ውስጥ በመጠጥዎ ምክንያት በመደበኛነት ከእርስዎ የሚጠበቁ ስራዎችን ማከናወን አለመቻል ምን ያህል ጊዜ አጋጥሞዎት ያዉቃል?	0. በጭራሽ 1. ከወር በታች 2. ወርሃዊ 3. ሳምንታዊ 4. በየቀኑ ወይም ከዚያ ባነሰ	
208	ባለፈው ዓመት ውስጥ በጣም በመጠጣትዎ ምክንያት በማግስቱ የዕለት ስራዎችን ለመጀመር ምን ያህል ጊዜ በጠዋት የአልኮል መጠጥ መጠጣት አስፈልጎዎት ያዉቃል?	0. በጭራሽ 1. ከወር በታች 2. ወርሃዊ 3. ሳምንታዊ 4. በየቀኑ ወይም ከዚያ ባነሰ	
209	ባለፈው ዓመት ውስጥ አልኮል በመጠጣትዎ ምክንያት የመፀፀት፣ ራስዎን የመዉቀስና የጥፋተኝነት ስሜት ምን ያህል ጊዜ ተሰምቶዎት ያዉቃል?	0. በጭራሽ 1. ከወር በታች 2. ወርሃዊ	

		3. ሳምንታዊ 4. በየቀኑ ወይም ከዚያ ባነሰ	
210	ባለፈው ዓመት ጠጥተው ስለነበረ ምሽት ላይ ምን እንደተፈጠረ ለማስታወስ ምን ያህል ጊዜ አልቻሉም?	0. በጭራሽ 1. ከወር በታች 2. ወርሃዊ 3. ሳምንታዊ 4. በየቀኑ ወይም ከዚያ ባነሰ	
211	በመጠጥዎ ምክንያት እርስዎ ወይም ሌላ ሰው ላይ ጉዳት ደርሶብዎት ያውቃል?	0. አያውቅም 2. አዎ ፣ ግን ባለፈው ዓመት ውስጥ አይደለም 4. አዎ ፣ ባለፈው ዓመት ውስጥ	
212	ዘመድ፣ ጓደኛ፣ ሐኪም ወይም ሌላ የጤና ባለሙያ ስለ መጠጥዎ ተጨንቆ መጠጣትዎን እንዲያቆሙ መከራከርዎት ያውቃል?	0. አያውቅም 2. አዎ ፣ ግን ባለፈው ዓመት ውስጥ አይደለም 4. አዎ ፣ ባለፈው ዓመት ውስጥ	

መድኃኒትን መውሰድን የተመለከቱ መጠይቆች		
ተ. ቁ	ጥያቄዎች	ምላሽ
217	አንዳንድ ጊዜ የስኳር በሽታ መድኃኒትዎን መውሰድዎን ይረሳሉ?	1. አዎን 2. የለም
218	ሰዎች አንዳንድ ጊዜ ከመርሳት ባለፈ ምክንያት መድኃኒቶቻቸውን ሳይወስዱ ይቀራሉ ። ባለፉት ሁለት ሳምንታት ውስጥ ፣ የስኳር በሽታ መድኃኒትዎን ያልወሰዱባቸው ቀኖች አሉ?	1. አዎን 2. የለም
219	መድኃኒት በሚወስዱበት ጊዜ የከፋ የህመም ስሜት ስለተሰማዎት ለሐኪምዎ ሳይናገሩ መድኃኒትዎን ቀንሰው ወይም አቁመው ያውቃሉ?	1. አዎን 2. የለም
220	ሲጓዙ ወይም ከቤት ሲወጡ አንዳንድ ጊዜ የስኳር በሽታ መድኃኒትዎን ይዘው መውጣትዎን ይረሳሉ?	1. አዎን 2. የለም
221	ትናንት የስኳር ህመም መድኃኒትዎን ወስደዋል?	1. አዎን 2. የለም
222	የስኳር ህመምዎ በቁጥጥር ስር እንደዋለ ሲሰማዎት አንዳንድ ጊዜ መድኃኒትዎን መውሰድ ያቆማሉ?	1. አዎን 2. የለም
223	በየቀኑ መድኃኒት መውሰድ ለአንዳንድ ሰዎች እውነተኛ ምቹት ነው ። በስኳር ህመምዎ የመድሀኒት አወሳሰድ እቅድ ምክንያት ያለመመቻት/የመረበሽ ስሜት ተሰምቶዎት ያውቃል?	1. አዎን 2. የለም
224	ሁሉንም መድኃኒቶችዎን ለመውሰድ ምን ያህል ጊዜ ለማስታወስ ይቸገራሉ?	1. በጭራሽ/አልፎ አልፎ 2. አንድ ጊዜ 3. አንዳንድ ጊዜ 4. ብዙ ጊዜ 5. ሁል ጊዜ

ምግብ አመጋገብን የተመለከቱ መጠይቆች

	ጥያቄዎች	መልሶች							
		0	1	2	3	4	5	6	7
225	ባለፉት 7 ቀናት ውስጥ ለምን ያህል ቀን/ናት ጤነኛ የአመጋገብ እቅድ ነበርዎት?								
226	ባለፉት 7 ቀናት ውስጥ ምን ያህል ቀን/ናት 5 እና ከዚያ በላይ ጊዜ አትክልትና ፍራፍሬ ተመገቡ?								
227	ባለፉት ሰባት ቀናት ውስጥ ምን ያህል ቀን/ናት ዝቅተኛ Glycemic Index ያላቸው ካርቦሃይድሬትን የያዙ ምግቦችን ተመገቡ? (ምሳሌ ደረቅ ባቄላ ፣ ምስር ፣ ጉብስ ፣ ፓስታ ፣ ዝቅተኛ ቅባት ያላቸው የወተት ተዋጽኦዎች)								
228	ባለፉት ሰባት ቀናት ውስጥ ምን ያህል ቀን/ናት እንደ ሩዝ ፣ ድንች ፣ ወዘተ ያሉ የስኳር መጠናቸው ከፍተኛ የሆኑ ምግቦች ይመገቡ ነበር?								
229	ባለፉት ሰባት ቀናት ውስጥ እንደ አጃ ፣ ጥራጥሬ ያሉ አህሎች፣ ዳቦ የመሳሰሉትን መጠኑ ከፍተኛ የሆነ ፋይበር ያላቸው ምግቦችን ምን ያህል ይመገቡ ነበር?								
230	ባለፉት 7 ቀናት ውስጥ ምን ያህል ቀን/ቀናት ሀይል ሰጪ ምግብ በአንድ ቀን ውስጥ በእኩል በማመጣጠን ወሰዱ?								
231	ባለፉት 7 ቀናት ውስጥ ምን ያህል ቀን/ቀናት ነው አሜጋ -3 ስብ ያላቸውን ዓሳ ወይም ሌሎች ምግቦችን ተመገቡ?								
232	ባለፉት 7 ቀናት ውስጥ ምን ያህል ቀን/ቀናት በአትክልት ዘይት፣ በቅቤ፣ በሰሊጥ /በነግ ዘይት የተዘጋጁ ምግቦችን በሉ?								
233	ባለፉት 7 ቀናት ውስጥ ምን ያህል ቀን/ናት ከፍተኛ የስብ መጠን ያላቸውን ምግቦች ተመገቡ? (ለምሳሌ ቀይ ሥጋ፣ የወተት ወይም በስብ የተሞላ የእንስሳት ተዋፅኦዎች፣ የተጠበሱ ምግቦች) (ይህም ከመጀመሩ በፊት ያለውን ጊዜ ይውሰዱ)								
የደም ውስጥ ስኳር መጠን ምርመራን የተመለከቱ መጠይቆች									
234	ባለፉት 7 ቀናት ውስጥ ምን ያህል ቀን/ናት የስኳር መጠን መርመራ አካሂደዋል (ቤትም ከቤት ውጭም)?								
235	ባለፉት 7 ቀናት ውስጥ ምን ያህል ቀን/ናት የጤና ባለሙያዎ/ሀኪም በነገርዎት ብዛት ልክ የስኳር መጠን ምርመራ አካሂደዋል?								

አካላዊ እንቅስቃሴን የተመለከቱ መጠይቆች (IPAQ)			
በመቀጠል ስለሚያደርጉባቸው የተለያዩ አካላዊ እንቅስቃሴዎች አጠይቆቻቸው:: እባክዎን ራስዎን አካላዊ እንቅስቃሴ የሚያደርግ ሰው አድርገው ባይቆጥሩም ሁሉንም ተግባራት በመመልከት ጥያቄዎቹን ይመልሱ:: እነዚህም በት/ቤት፣ በቤት ውስጥ ስራዎች ወይም ከቦታ ወደ ቦታ ለመሄድ የሚያደርጉላቸውን መደበኛ እንቅስቃሴዎች እና በዕረፍት ጊዜ ውስጥ ለመዝናኛ ወይም ለስፖርት የሚሰሩባቸውን እንቅስቃሴዎች ያጠቃልላሉ::			
ተ.ቁ	ጥያቄዎች	መልስ	ወደ ሚቀጥለው ጥያቄ ይለፉ
ባለፉት 7 ቀናት ያካናወኛቸውን ከባድ አካላዊ ጥረት ስለሚጠይቁ ጠንካራ እንቅስቃሴዎች ሁሉ ያስቡ :: ጠንከር ያሉ እንቅስቃሴዎች ከተለመደው በጣም በከባድ ሁኔታ እንዲተነፍሱ ያደርጉዎታል:: እንዲሁም ከባድ እቃ ማንሳትን እና መሰከም ፣ መቆፈርን ፣ ኤሮቢክስን ወይም በፍጥነት ብስክሌት መንዳት የመሳሰሉትን ያካትታሉ :: ታዲያ በአንድ ጊዜ ለ 10 ደቂቃ ስላከናወኛቸው አካላዊ እንቅስቃሴዎች ብቻ ያስቡ ::			
236	በአለፉት 7 ቀናት ውስጥ ለስንት ቀናት ቢያንስ ለ 10 ደቂቃ ያህል ጠንካራ አካላዊ እንቅስቃሴዎችን አደረጉ?	1. በሳምንት _____ ቀናት 2. ምንም ጠንካራ አካላዊ እንቅስቃሴዎችን አላደረጉም	መልሱ ምንም ጠንካራ አካላዊ እንቅስቃሴዎችን አላደረጉም ከሆነ ወደ ጥያቄ ቁጥር 238 ይሂዱ
237	በእነዚያ ቀናት በአንዱ ቢያንስ ለ 10 ደቂቃዎች ያህል በአንድ ጊዜ ጠንካራ አካላዊ እንቅስቃሴዎችን በማድረግ ምን ያህል ጊዜ አሳልፈዋል?	1. በቀን ----- ሰዓታት 2. በቀን ----- ደቂቃ	
ባለፉት 7 ቀናት በእግር መጓዝን ሳያካትቱ በአንድ ጊዜ ቢያንስ ለ 10 ደቂቃዎች ያካናወኛቸውን መጠነኛ አካላዊ ጥረት ስለሚወስዱ እንቅስቃሴዎች አሁን ያስቡ :: መጠነኛ አካላዊ እንቅስቃሴዎች ቀላል ሽክሞችን መሸከም ፣ በመደበኛ ፍጥነት ብስክሌት መንዳት ወይም ቴኒስ መጫዎት የመሳሰሉት ሲሆኑ ከተለመደው በተወሰነ ደረጃ በከባድ እንዲተነፍሱ ያደርጉዎታል ::			
238	በአለፉት 7 ቀናት ውስጥ ለስንት ቀናት ቢያንስ ለ 10 ደቂቃ ያህል መጠነኛ አካላዊ እንቅስቃሴዎች አደረጉ?	1. በሳምንት _____ ቀናት 2. ምንም መጠነኛ አካላዊ እንቅስቃሴዎች አላደረጉም	መልሱ ምንም መጠነኛ አካላዊ እንቅስቃሴዎች አላደረጉም ከሆነ ወደ ጥያቄ ቁጥር 240 ይሂዱ
239	በእነዚያ ቀናት በአንዱ ላይ መጠነኛ አካላዊ እንቅስቃሴዎችን በማድረግ ምን ያህል ሰአት አሳልፈዋል?	1. በቀን ----- ሰዓታት 2. በቀን ----- ደቂቃ	
አሁን ባለፉት 7 ቀናት ውስጥ በእግር በመራመድ ያሳለፉትን ጊዜ ያስቡ :: ይህ በሥራ ፣ በቤት ውስጥ ፣ ከቦታ ወደ ቦታ ለመጓጓዣ ፣ ለመዝናኛ ፣ ለስፖርት ፣ ለአካል ብቃት እንቅስቃሴ ወይም ለመዝናኛት ብቻ ሊያደርጉባቸው የሚችሉትን ማንኛውንም የእግር ጉዞዎች ያጠቃልላል ::			
240	በአለፉት 7 ቀናት ውስጥ ለስንት ቀናት ቢያንስ የ10 ደቂቃ የእግር ጉዞ አደረጉ?	1. በሳምንት _____ ቀናት 2. ምንም የእግር ጉዞ አላደረጉም	መልሱ ምንም የእግር ጉዞ አላደረጉም ከሆነ ወደ ጥያቄ ቁጥር 242 ይሂዱ
241	በእነዚያ ቀናት በአንዱ ላይ የእግር ጉዞ በማድረግ ምን ያህል ሰአት አሳልፈዋል?	1. በቀን ----- ሰዓታት 2. በቀን ----- ደቂቃ	
አሁን ባለፉት 7 የስራ ቀናት ውስጥ ቁጭ ብለው ያሳለፉትን ጊዜ ያስቡ :: በሥራ ፣ በቤት ውስጥ ፣ በትምህርት እና በእረፍት ያሳለፉትን ጊዜን ያጠቃልላል:: :: ይህ ጓደኞችን ለመጎብኘት ፣ በማንበብ ወይም በመቀመጥ ወይም ቴሌቪዥን ለመመልከት ፣ በመተኛት ያሳለፉትን ጊዜም ሊያካትት ይችላል ::			
242	በአለፉት 7 ቀናት ውስጥ ምን ያህል ሰአት ቁጭ በማለት አሳልፈዋል?	1. በቀን ----- ሰዓታት 2. በቀን ----- ደቂቃ	

ድብርት ስርጭት መኖሩን ለመለየት የተዘጋጀ ቃለ-መጠይቅ (ህመማን ጤና ቃለ-መጠይቅ-9) ማስታወሻ: አልፎ አልፎ ብቻ /2-6 ቀናት/= 1 በዛ ላለ ጊዜ /7-11 ቀናት/፤ ከሞላ ጎደል በየቀኑ /12-14 ቀናት/ መሆኑን ይግለጹ።					
ይህ ቃለ መጠይቅ ዘጠኝ ጥያቄዎችን የያዘ ነው። እባክዎን የማነበውን እያንዳንዱን በጥምር ያዳምጡና ላለፉት ሁለት ሳምንታት በይበልጥ እርስዎን የሚሰማዎትን ይመልሱ።	በፍጹም	ከሰባት ቀናት ያነሰ	ከሰባት ቀናት በላይ	ከሞላ ጎደል በየቀኑ	
243	ነገሮችን ሲሰሩ ፍላጎትዎ ወይም የሚያገኙት ደስታ በጣም ትንሽ (እምብዛም) ነበር ?	0	1	2	3
244	የትካዜ፣ የበታችነት፣ የጭንቀት፣ የመደበር ወይም ተስፋ የመቁረጥ ስሜት ነበረብዎት ?	0	1	2	3
245	እንቅልፍ የመተኛት፣ ተኝቶ የመቆየት ችግር ወይም ከመጠን በላይ የመተኛት ችግር ነበረብዎት ?	0	1	2	3
246	የድካም ስሜት ወይም አቅም የማነስ ሁኔታ ነበረብዎት ?	0	1	2	3
247	የምግብ ፍላጎት አለመኖር ወይም በጣም ብዙ የመብላት ችግር ነበረብዎት ?	0	1	2	3
248	የምግብ ፍላጎት አለመኖር ወይም በጣም ብዙ የመብላት ችግር ነበረብዎት ?	0	1	2	3
249	ስለራስዎ መጥፎ ስሜት ተሰምቶት ወይም አልተሳካልኝም ብለው አስበው፣ ወይም ቤተሰብን አሳፈርኩ ብለው አስበው ነበር ?	0	1	2	3
250	ነገሮች ላይ ሃሳብዎትን መሰብሰብ ወይም ልብ የማለት ችግር ነበረብዎት፣ ለምሳሌ ጋዜጣ ሲያነቡ ወይም ቴሌቪዥን ሲመለከቱ ?	0	1	2	3
251	ከተለመደው ውጭ እረፍት የማጣት፣ ወዲያ ወዲህ የማለት ወይም በተቃራኒው ሌሎች ሰዎች ሊገነዘቡት በሚችል ሁኔታ ቀስ ብለው የመናገር ወይም የመንቀሳቀስ ችግር ነበረብዎት ?	0	1	2	3
252	ብሞት ይሻላል ወይም እራሴን በሆነ መንገድ ብጎዳ ይሻላል ብለው ያሰቡበት ጊዜ ነበር ?	0	1	2	3
<p>ከላይ የጠቀስናቸው ችግሮች አጋጥሞዎት ከነበሩ፣ ችግሮቹ ስራዎትን እንዳይሰሩ፣ የቤተሰብዎትን ኃላፊነት እንዳይደምጡ፣ እራስዎን ለመጠበቅ ወይም ከሌሎች ሰዎች ጋር ባለዎት ግንኙነት ለእርስዎ ምን ያህል አስቸጋሪ (አዳጋች) ነበሩ?</p> <ol style="list-style-type: none"> 0. ምንም ችግር አልፈጠሩም 1. በመጠኑ ችግር ፈጥረዋል 2. በጣም ተቸግረዋል 3. እጅግ በጣም ተቸግረዋል 					

ማኅበራዊ ሁኔታን የተመለከቱ መጠይቆች (OSS3)

የሚከተለው መጠይቅ 3 ጥያቄዎችን ያቀፈ ነው :: እባክዎን እያንዳንዱን ጥያቄ በጥንቃቄ ያንብቡ እና ከዚያ ማህበራዊ ድጋፍዎን በተሻለ ሁኔታ የሚገልፅ በእያንዳንዱ ቡድን ውስጥ አንዱን ምርጫ ይምረጡ :: ለማንኛውም ጥያቄ ከአንድ በላይ መግለጫዎችን እንደማይመርጡ እርግጠኛ ይሁኑ::

ተቁ	ጥያቄዎች	የጥያቄዎች ምርጫ
253	በህይወትዎ ውስጥ በጣም የቅርብ የሆኑና ችግርዎትን የሚከፈሉ ስንት ሰዎች አሉ?	<ol style="list-style-type: none"> 1. ማንም 2. አንድ ወይም ሁለት 3. ከ 3-5 4. ከ 5 በላይ
254	ሌሎች ሰዎች እርስዎ በሚያደርጓቸው ነገሮች ላይ ምን ያህል ግድ ያላቸውና የሚያስቡልዎት ይመስልዎታል?	<ol style="list-style-type: none"> 1. ጨርሶ ግድ የላቸውም 2. ብዙም ግድ የላቸውም 3. እርግጠኛ መሆን አልቻልንም 4. በመጠኑ ግድ ይላቸዋል 5. በጣም ግድ ይላቸዋል
255	ከጎረቤትዎ እርዳታ ማግኘት ምን ያህል ቀላል ነው?	<ol style="list-style-type: none"> 1. በጣም ከባድ ነው 2. ከባድ ነው 3. ቀላል ባይሆንም እርዳታ ማግኘት ይቻላል 4. ቀላል ነው 5. በጣም ቀላል ነው

ክፍል ሶስት: ከክሊኒካል ምክንያቶች ጋር ተያያዥነት ያላቸው መጠይቆች

ተ.ቁ	ጥያቄ	መልስ	ምርመራ
301	በስንት ዓመትዎ ነው የስኳር ህመምተኛ መሆንዎ የተረጋገጠው?	_____	
302	በወላጆችዎ መካከል የደም ግፊት መጨመር ያለበት ሰው አለ?	<ol style="list-style-type: none"> 1. አዎ 2. የለም 	
303	በወላጆችዎ መካከል የስኳር በሽታ ያለበት ሰው አለ?	<ol style="list-style-type: none"> 1. አዎ 2. የለም 	
304	የስኳር ህመምዎን ለመታየት እና ህክምና ለማግኘት አዘውትረው ሐኪምዎን ይጎበኛሉ?	<ol style="list-style-type: none"> 1. አዎ 2. የለም 	
306	የስኳር ህመምዎን ለመታየት እና ህክምና ለማግኘት ሐኪምዎን በሚጎበኙ ጊዜ ስለ ስኳር ህመም የጤና ትምህርት ወይም ምክር ተሰጥቶታል?	<ol style="list-style-type: none"> 1. አዎ 2. የለም 	

ክፍል አራት: አካላዊ መለኪያዎች

ተ. ቁ	አካላዊ መለኪያዎች	የልኬት መጠን?
401	ቁመት (በሴንቲሜትር)	
402	ክብደት (በኪሎግራም)	
403	BMI	
404	የወገብ ዙሪያ (በሴንቲሜትር) (WC)	
405	ዳሌ (በሴንቲሜትር)	
406	WHR	

Part Five: Data Extraction Checklists (taken from patient cards)

S. No	Questions	Response	Skip
501	Type of dm	1. Type 1 2. Type 2	
502	Duration of DM	_____	
503	Kind of treatment of DM taking	1. Oral hypoglycemic agent only 2. Insulin therapy only 3. Both oral and insulin 4. Dietary	
504	Is there any comorbidity other than hypertension?	1. Yes 2. No	If no go to Question 506
505	Which one best describe the type of comorbid illness?	1. Cardiovascular disease (CHF, STROKE ...) 2. Respiratory disease 3. Renal disease 4. Neurological disease 5. Other specify.....	
506	Are there any diabetes related complications?	1. Yes 2. No	If no go to question 508
507	Which one best describe the type of diabetes related complication?	1. Diabetic retinopathy 2. Diabetic nephropathy 3. Diabetic neuropathy 4. Sexual dysfunction 5. Other specify	
Blood glucose level (In addition to current take previous last two Recent results)			
508	Fasting blood glucose	_____ mg/dl _____ mg/dl _____ mg/dl	

Annex VII: Receiver Operating (ROC) Curve

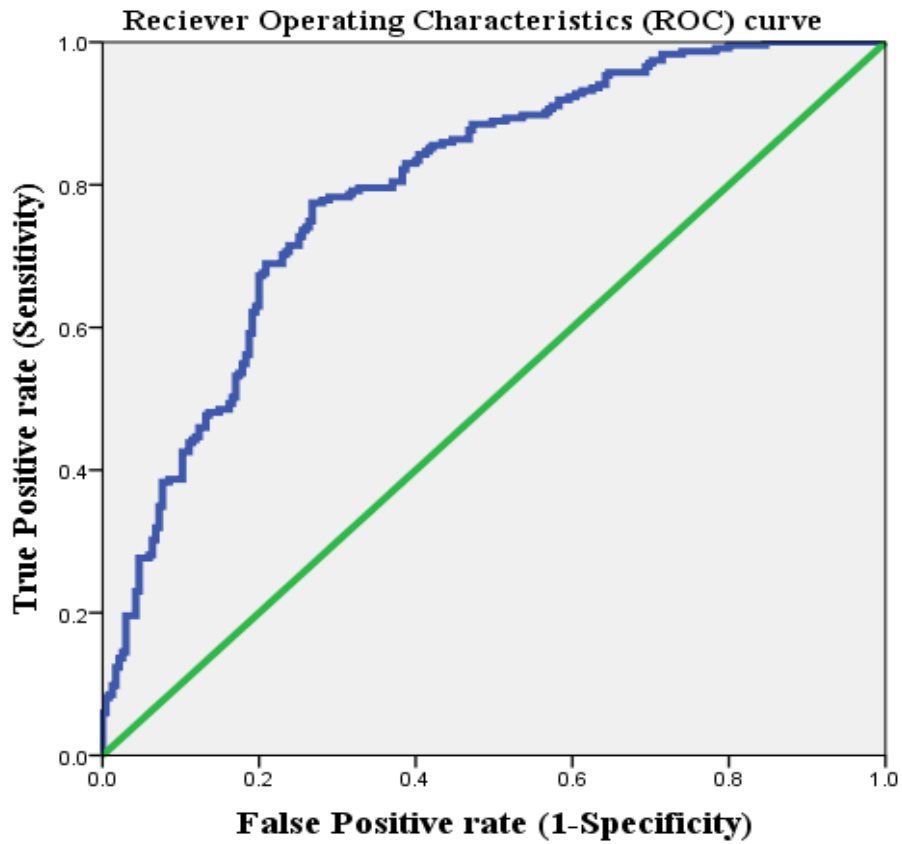


Figure 3: Receiver Operating Curve showing accuracy of the model in predicting probabilities of factors associated with hypertension among DM patients in Amhara region comprehensive specialized hospitals, 2020/2021