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Prevalence of Undiagnosed Diabetes Mellitus and Associated factors Among Adults in Bahir Dar City, North West Ethiopia

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PREVALENCE OF UNDIAGNOSED DIABETES MELLITUS AND ASSOCIATED FACTORS AMONG ADULTS IN BAHIR DAR CITY, NORTH WEST ETHIOPIA

A THESIS SUBMMITED TO SCHOOL OF PUBLIC HEALTH COLLEGE OF MEDICINE AND HEALTH SCIENCES, BAHIR DAR UNINIERSITY IN PARTIAL FULIFILMENT OF THE REQUIRMENTS FOR THE DEGREE OF MASTER OF PUBLIC HEALTH IN GENERAL PUBLIC HEALTH

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BAHIR DAR, ETHIOPIA

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Acronym

ADA	American Diabetic Association
ARHB	Amhara Regional Health Bureau.
BMI	Body-mass index
DM	Diabetes Mellitus
IDF	International Diabetes Federation
IDDM	Insulin-dependent Diabetes Mellitus
Mmol	Mill Mol
NIDDM	Non-Insulin-Dependent Diabetes Mellitus
NCD	Non-communicable disease
SPSS	Statistical Package for Social Sciences
WHO	World Health Organization
WHR	Waist-to-hip Ratio

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Abstract

Background: Diabetes mellitus is recognized as one of the emerging public health problems in developing countries. Evidence suggests that half of the Diabetic patients are undiagnosed. Undiagnosed Diabetes Mellitus impose substantial implications because subjects remain untreated and at risk for complications.

Objective: To assess the prevalence of undiagnosed Diabetes Mellitus and its associated factors among adults aged 18 years and above in Bahir Dar City, Northwest Ethiopia.

Methods: A community based cross-sectional study was conducted on 456 adults in Bahir Dar city from February 20 to March 20 /2017. Out of 9 sub-cities, three sub-cities were selected using a simple random sampling technique by lottery method, and systematic random sampling techniques was used to select household. Finally, from those households, a family member who meet all eligibility requirements was selected from adults who were present during the data collection. While the prevalence of Undiagnosed DM was evaluated by measuring the random blood sugar level, associated factors were determined through physical measurement and structured questionnaire, by adopting the WHO stepwise approach. Data analysis was done using SPSS version 20.0. Software. Bivariate and multivariable logistic regression analysis was used to infer casual relationships between the independent and dependent variables.

Results: The prevalence of undiagnosed diabetes mellitus was 5.9% (95%CI: 3.7%-8.3%). Overweight and obesity of the participants (AOR= 5.40, 95%CI: 2.22- 13.15), individuals with in the age group >35 years (AOR=4.24, 95%CI: 1.15- 15.55) and marital status (widowed, divorce and separate) (AOR= 0.27, 95%CI: 0.11- 0.64) were found to have statistically significant association with DM prevalence.

Conclusion: The current prevalence of undiagnosed diabetes mellitus in Bahir Dar city was high compared to estimated national prevalence of Ethiopia, 4.85% reported by the IDF in 2014 and it was found to have association with age, marital status (widowed, divorce and separate), overweight and obesity.

Recommendation: Urban health extension programs shall target households to implement dietary and physical activity practice that help reduce weight.

Introduction

1.1 Back ground

Diabetes mellitus is defined as a chronic metabolic disorder, characterized by deficiencies in the secretion and/or action of the insulin, a hormone secreted by the pancreatic beta cells [1]. Manifesting in high level of blood glucose, the disease is associated with increasing risk of premature death due to immediate complication such as hyperglycemic and/or hypoglycemic comas and overwhelming infection [2].

One of the earliest classification by WHO categorized the disease into two major classes namely, Insulin-dependent Diabetes Mellitus (IDDM) or Type 1 Diabetes, and non-Insulin-Dependent Diabetes Mellitus (NIDDM) or Type 2 Diabetes**.** Type 1 DM is the result of complete or near-total insulin deficiency. Type 2 DM is a heterogeneous group of disorders characterized by variable degrees of insulin resistance, impaired insulin secretion, and increased glucose production [1, 2].

A significant proportion of the world population is mostly affected by type 2 Diabetes, and as a result the disease has been labelled as epidemic. Rapid socio-economic development, urbanization and associated lifestyle changes including a shift in eating habits has increasingly contributed to the disease [2]. Both the number of cases and the prevalence of diabetes have been steadily increasing over the past few decades [3]. As a result, it has become one of four priority non communicable diseases (NCDs) targeted for action by world leaders.

Diabetes control, achieved through diabetes care and management and clinical preventive care practices, keeps people with diabetes healthy and can improve health outcomes [4]

1.2. Statement of the Problem

DM is one of the most common non-communicable diseases affecting the health of a significant number of the population and its prevalence is rapidly rising all over the globe at alarming rate [5]. It has been reported that nearly half of the individuals of people with DM remains undiagnosed [9]. Undiagnosed DM imposes significant implication as patients remain untreated and being at high risk for complication [11].

According to the global estimation of diabetes in 2014, 387 million people worldwide had diabetes and there were 5.1 million deaths associated with it [7]. This number is expected to rise to 592 million in 2035 unless some preventive measures are taken [6]. Diabetes imposes a large economic burden on the global health-care system and the wider global economy. This burden can be measured through direct medical costs, indirect costs associated with productivity loss, premature mortality and the negative impact of diabetes on nations' gross domestic product (GDP) [4].

Diabetes is the fourth leading cause of death in most developed countries, and 8th globally [7]. Over three-fourth (77%) of the diabetic people resides in low and middle income countries which are experiencing rapid increase in population growth, ageing, obesity , unhealthy diet and sedentary lifestyle [5, 6].

In Ethiopia, the number of diabetic's cases in the year 2000 was estimated at 800,000 and this number is expected to increase to 1.8 million by the year 2030 [25]. In the past few years Ethiopia has experienced rapid socio-economic development, along with increased urbanization and shifts in lifestyle and dietary structure. These changes are increasingly contributed to the prevalence of diabetes. The increasing prevalence of diabetes and associated health complications will threaten the economy of the country through, for example, direct medical costs and loss of work and wages. With limited infrastructure for diabetes care, Ethiopia is ill-equipped to handle this disease [22].

Although DM is recognized as one of the major non-communicable diseases in Ethiopia, its prevalence, challenges and threats are not well documented. In order to have

adequate data to be used for national planning and allocation of resources, it is important to determine the prevalence of DM. While many studies have documented worldwide increases in DM, this trend are not yet fully known in Ethiopia. It is therefore crucial to conduct research and understand the burden and trends of DM and its associated factors. Hence, this study was undertaken to determine the prevalence of undiagnosed DM and the associated factors of DM among undiagnosed adults in Bahir Dar City.

1.3. Literature Review

1.3.1. Global prevalence of diabetes: An overview

Diabetes mellitus (DM) is a major public health problem globally that is approaching epidemic proportion. Globally, an estimated 422 million adults were living with diabetes in 2014 [2], compared to 108 million in 1980 (rising from 4.7% to 8.5%) in the adult population. That means its prevalence has nearly quadrupled since the 1980 [2]. Among them, nearly half (46%) were undiagnosed for diabetes. The incidence tends to be higher among middle aged people (i.e., those between 40-59 years) and the majority (80%) of them reside in developing countries. Diabetes caused 1.5 million deaths in 2012. The high prevalence of the epidemic has a significant economic implication, having a burden on health care resources, quality of life, and life expectancy [12]. The global economic cost of diabetes in 2014 was estimated to be $612 billion USD [7]. The number of people with diabetes will hit 592 million in 2035 (i.e., one in 10 adults will have diabetes).

The prevalence of diabetes is considerably high in the United States where some 29.1 million people (9.3% of the total population) has diabetes in 2014 [16]. Interestingly, dynamics of the diabetic epidemic are changing rapidly. Once a disease of the West, type 2 diabetes has now covered all geographical areas, including the less rich parts of the world. The prevalence of the disease has grown more rapidly in low-and middle-income countries compared to the high-income counterparts [2]. Data obtained from IDF suggest that China, India, USA, Russia and Brazil are home to the largest number of diabetes patients [7]. Asia accounts for 60% of the world’s diabetic population

(ADA,).The prevalence of diabetes is also high in the Middle East and Gulf countries such as Saudi Arabia, UAE, and Qatar. For Instance, in 2011, UAE was among the top 10 countries with high prevalence of type 2 diabetes [21].

1.3.2. Diabetes in Africa

Studies show that a significant proportion of identified cases of diabetes are often undiagnosed, particularly in developing regions where there are high disease burden especially among the disadvantaged (poor) population [21].

In Africa, the prevalence of DM is increasing and the magnitude of the disease is progressing. The prevalence of diabetes among adults aged 18 years and above has more than doubled between 1980 (3.1%) and 2014 (7.1%) [2]. the number of people who live with diabetes has increased from 4 million in 1980, to 25 million in 2014 [2]. This may be due to increasing income, more sedentary lifestyle along with poor public spending. Indeed, compared to other regions, the rate of diabetes remains low in Africa.

In Africa, WHO estimated that more than 14 million people have diabetes, If appropriate measures are not taken, this figure will be more than doubled by 2040 [19]. In 2015 alone, diabetes caused 321,000 deaths, with the majority (79 percent) under the age of 60 [29]. Still diabetes received little attention in many African countries, as they are burdened with other illnesses whose immediate impact is more worrying than diabetes.

High prevalence is observed in Sub-Saharan Africa were the highest numbers of people with diabetes number including South Africa (2.3 million), Democratic Republic of Congo (1.8 million), Nigeria (1.6 million) and Ethiopia (1.3 million). Nearly half of all adults with diabetes in the region live in these four countries [40]. In South Africa, the colored population have been disproportionately affected by this epidemic [29]. In 2012, at least 58 people died of diabetes a day in South Africa. The crude prevalence of type 2 diabetes including the previously diagnosed type 2 diabetes was 28.2% (age-adjusted 26.3% (95% confidence interval (CI) 22.0 - 30.3)), and that of undiagnosed type 2 diabetes was 18.1% (age-adjusted 16.8% (13.3 - 20.4) among South Africans. Cardiovascular diseases might grow to epidemic level in the near future [23].

1.3.3. The state of diabetes in Ethiopia

The burden, prevalence and threats of diabetes and associated risk factors are not well understood in Ethiopia. This is mainly because the efforts to halt the spread of the disease is a recent phenomenon and the existing few studies are often based on small data which is generated from hospital admissions. Clearly, there is no comprehensive population based data on the prevalence of diabetes and key risk factors. However, all the studies conducted so far suggested the increasing prevalence of the disease – 3.32% to 5.2% [36, 37]. Some studies indicated that diabetes is the second principal ill-related reason for patients to visit health care services in most hospitals in Ethiopia [38, 40].

International Diabetes Federation (IDF) estimated that in 2014 close to 5 million Ethiopian adults in the age group 20-79 are living with diabetes and more than 2.9 million people of them live with impaired glucose tolerance [7]. According to the Ethiopian Diabetes Association, some 2%-3% of the population is estimated to live with diabetes. 1.4 million People were undiagnosed and the prevalence of the disease is higher in urban areas compared to rural areas [36]. A study conducted in North West Ethiopia, for example, indicated that the prevalence of diabetes was higher among the urban population (5.1%) than their rural counterparts (2.1%) [36]. In Ethiopia, awareness and knowledge about diabetes is lower even among urban residents and known diabetic patients [42].This higher prevalence of undiagnosed diabetes might be due to the priority to given communicable poor culture of visiting health facility for medical checkup, and lack of decentralized health services for chronic non communicable diseases [37]. Overall, lack of awareness and limited access to health facilities are widely mentioned reasons for the high prevalence of undiagnosed DM in developing countries [2].

A study conducted in North West Ethiopia, indicated that the prevalence of diabetes was higher among the urban population (5.1%) than their rural counterparts (2.1%) [36].

1.3.4. Complications and risk factors associated with diabetes

1.3.4.1. Complications

Diabetes and its complications increasingly associated with the risk of untimely death and bring substantial economic loss to people with diabetes and their families, and to health systems and national economies through direct medical costs and loss of work and wages [4]. When diabetes is not well managed, complications develop that threaten health and endanger life. Acute complications are a significant contributor to mortality, and poor quality of life. Abnormally high blood glucose can have a life-threatening impact if it triggers conditions such as diabetic ketoacidosis (DKA) in type 1 and 2, and hyperosmolar coma in type 2. Abnormally low blood glucose can occur in all types of diabetes and may result in seizures or loss of consciousness.

Chronic complications that cause serious health damage and life-threatening impact can damage the heart, blood vessels, eyes, kidneys, and nerves, which leads to disability and premature death [34]. During pregnancy, uncontrolled diabetes can increase the risks of death on both the mother and child [34]. Hyper glycaemia (even prior to diabetes) also exacerbates periodontal infection (gum disease) (IDF) [38].

1.3.4.2. Risk factors

Modifiable risk factors are associated with morbidity and mortality of the non-communicable diseases (NCDs) including diabetes. It is reported elsewhere that diabetes are aggravated by some risk factors such as unhealthy dietary habit, smoking, excessive alcohol consumption, hypertension, obesity, overweight, increased body mass index and sedentary life style [14, 16].

Overweight and obesity are a widely recognized risk factors for type 2 diabetes. Obesity is highly related to dietary practices and sedentary lifestyle. Under-nutrition is also associated with obesity in poor and less affluent areas of the world. Moreover, physical inactivity, family history of diabetes, ethnicity, unhealthy diet and smoking tend to increase the risk of type 2 diabetes [17].

The prevalence of diabetes in newly industrialized nations and those who are in economic transition is comparable to the most advanced societies. WHO data, for example, showed that obesity rate in Nigeria is increasing from time to time, which is more evident among women (35%), followed by men (8.3%) [23]. Indeed, obesity is

more prevalent in European countries, where more than half of adults are classified as obese. For example, one in four British adults is obese [33, 34]

1.3.5. Preventing diabetes

As indicated above, there is no known preventive measure for type 1 diabetes. Type 2 diabetes, however, can be prevented by promoting policies and practices that contribute to good health such as exercising regularly, eating healthily, avoiding smoking, and controlling blood pressure and lipids. This, indeed, will not only prevent type 2 diabetes but also the complications and premature deaths that can result from all types of diabetes [28].

A study conducted on several countries such as Finland, Sweden, the US, China, India, and Japan has proven that lifestyle interventions can halt, or at least delay, the onset of diabetes in people who are identified as having high risk [32, 33]. The study also reported that a shift in lifestyle such as losing weight for overweight people, increase physical exercise, making dietary modifications (reduce fat intake, increase dietary fiber, etc.) are key factors that prevent or reduce the risks of developing diabetes. The higher their achievement in these lifestyle changes, the more their chances to avoid the risks of becoming a diabetics [35].

Genetically, many people are not adapting well to the modern lifestyle and increase the risks of developing diabetes. Most importantly, a constant consumption of bulky food and beverages and inactive physical activity increase risks. There is sufficient evidence to suggest that dietary changes significantly prevent the risks of developing diabetes [21]. This include a diet rich in whole grains and fiber, and choosing good fats, such as polyunsaturated fats found in nuts, vegetable oils, and fish. Limiting sugary beverages and eating less red meat and other sources of saturated fat can also help prevent diabetes [25]. On the whole, much type 2 diabetes can be prevented as it results from modifiable risk factors that can be changed through promoting healthy lifestyle. This could be achieved through creating favorable policy, social and physical environment [26].

1.4. Conceptual framework of the study

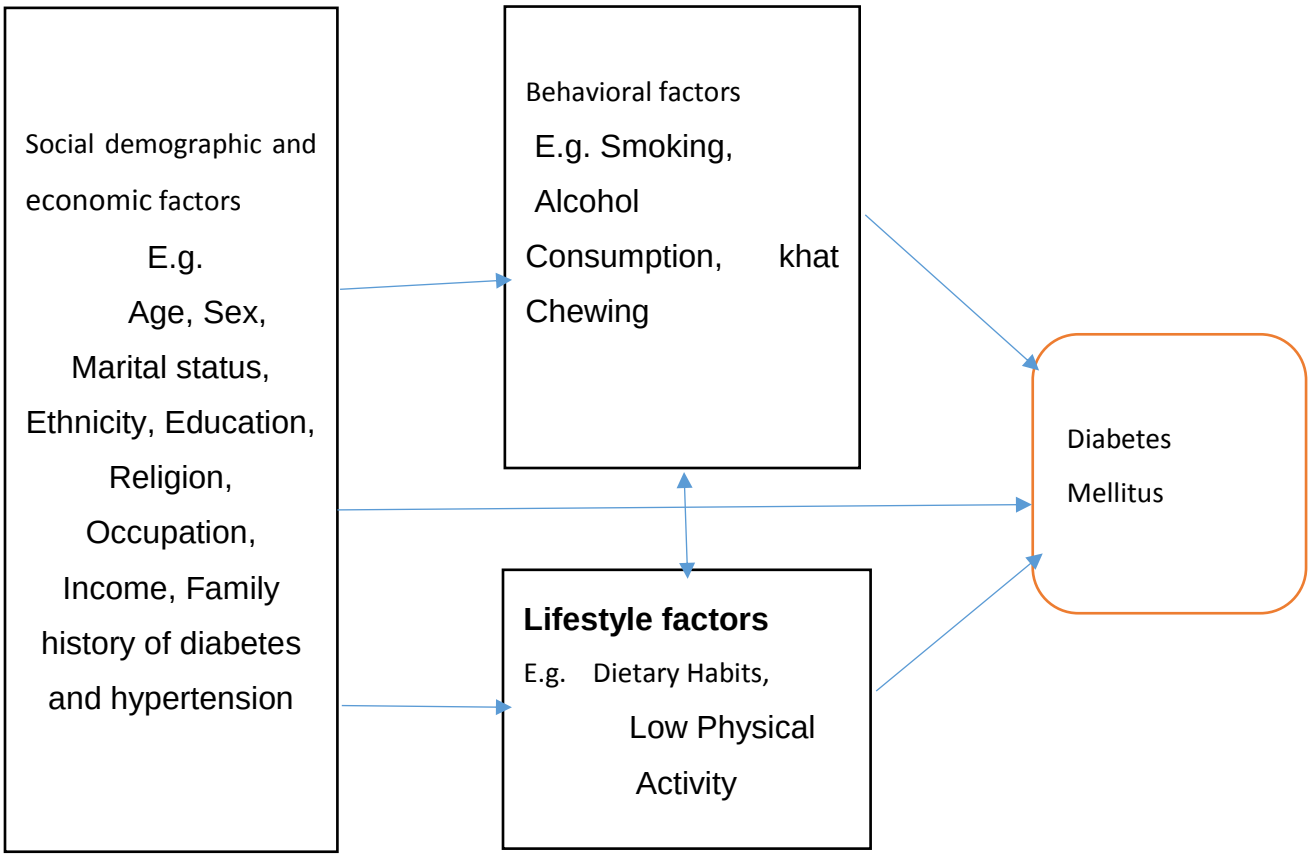

Figure 1: conceptual framework of the study

1.5. Justification

There is a significant lifestyle change in Ethiopia, as the country is experiencing fast socio-economic change in the past few decades. Undoubtedly, urbanization, globalization and economic growth changes the way people eat and spend time. The level at which this change occurs, indeed, varies according to place of residence and other socio-economic factors. Unhealthy lifestyle and risky behaviors such as - poor dietary habits, sedentary lifestyle, smoking and drinking habits - are more pronounced among the urban population. That is why the prevalence rate of diabetes inclines to be higher in urban areas compared to rural areas.

The government of Ethiopia is showing more concern on DM, as the prevalence of the disease is now more widespread. For example, the government is developing National plans and policies to prevent diabetes and other NCDs. A focal unit has recently been established at the Ministry of Health that deals with diabetes and NCDS. Reportedly, a policy framework, which guides and regulates the marketing of some food items and beverages, and frameworks which help to monitor the prevalence of diabetes and key risk factors are put in place.

National data on prevalence and incidence DM are lacking in Ethiopia in general and Bahir Dar in particular. However, patient attendance rates and medical admission in hospital are raising. Determining the prevalence of DM now and in future is important to allow for national planning and allocation resources. There is evidence for effective interventions to improve management of diabetes and to reduce its modifiable risk factors, but there are significant gaps in the knowledge base. Along with bridging the gap of knowledge on DM and associated factors. It will also be used as a base line for further studies. People in urban areas are more prone to developing diabetes.

2. Objective of the study

2.1. General Objective

- To assess the prevalence of undiagnosed Diabetes Mellitus and its risk factors among adults aged 18 years and above in Bahir Dar City North West, Ethiopia.

2.2. Specific Objective

- To determine the prevalence of undiagnosed Diabetes Mellitus among adults aged 18 years and above in Bahir Dar City.
- To identify factors associated with diabetes mellitus among adults aged 18 years and above in Bahir Dar City.

3. Methods

3.1. Study Design and period

Community based cross sectional study was conducted from February 20 to March 20/ 2017.

3.2. Study Area

The study was conducted in Bahir-Dar city, North Western part of Ethiopia. It is the capital city of the Amhara Regional State. The city is located 565 km from Addis Ababa, the capital city of Ethiopia. According to the Central Statistical Agency, in 2013 Bahir Dar has an estimated total population of 375,000. Of whom, women account for 51.1%, while the remaining 49.1% are men. The City is divided in to 9 sub-cities. The city of Bahir Dar hosts two government hospitals (one being a regional referral hospital, and the other just a district hospital) and six health centers that serves the population.

3.3. Population

3.3.1. Source population: All adults aged 18 years and above who are living in Bahir Dar city is the source population.

3.3.2. Study population: All adults aged 18 years and above who are living in the selected sub-city of Bahir Dar**.**

3.3.3. Sampling unit: households in the target Kebele's in Bahir Dar city with eligible adults.

3.3.4. Study unit: Adults selected to participate in the study.

3.3.5. Inclusion Exclusion Criteria

3.3.5.1. Inclusion Criteria.

All house hold with adult aged 18 years and above who are living in the targeted Keeble's of Bahir Dar city during the study period were included.

3.5.2. Exclusion criteria

- Individuals with diagnosed DM
- Pregnant women and
- Adults who are severely ill and not be able to communicate will be excluded from the Study

3.4. Sample Size Determination

Sample size was determined using single population proportion formula, by using the prevalence of undiagnosed diabetes mellitus that were reported in Gondar town study 5.1 % (p=0.051) [36]. Based on these assumption, the sample size was calculate as **$n= (Z\alpha/2)^2 P (1 - P) / w^2$.** Where; n= the minimum sample size required p= proportion of diabetes mellitus, w= margin of error/absolute precision = 3% (0.03) and Zα/2 =1.96 at the confidence interval=95%.Then $n= \frac{(1.96)^2(0.05)(0.95)}{(0.03)^2} =207$

By using the design effect (multiplying by 2), and adding 10% non-response rate, the final sample size for the study were 207x2=414+ (414x10%) =**456** participants.

3.5. Sampling procedures

A multistage sampling technique was used. All 9 sub-cities (kifle ketemas) of Bahir Dar City were listed and used as a sample frame. Out of 9 sub-cities, three sub-cities were selected using a simple random sampling technique by lottery method, the sample size was distributed to each selected sub-cities using proportional allocation using the formula: ni= n/N *Ni. Where; n=total sample size to be selected =456. N=total population =78219, Ni = total population of each strata G 20=30379, Tana= 27110 and Fasilo =20730.

ni= sample size from each strata G 20=177, T=158, F=121 and systematic random sampling techniques was used to select households. Finally, from those households, a family member who meet all eligibility requirements was selected from adults who were present during the data collection.

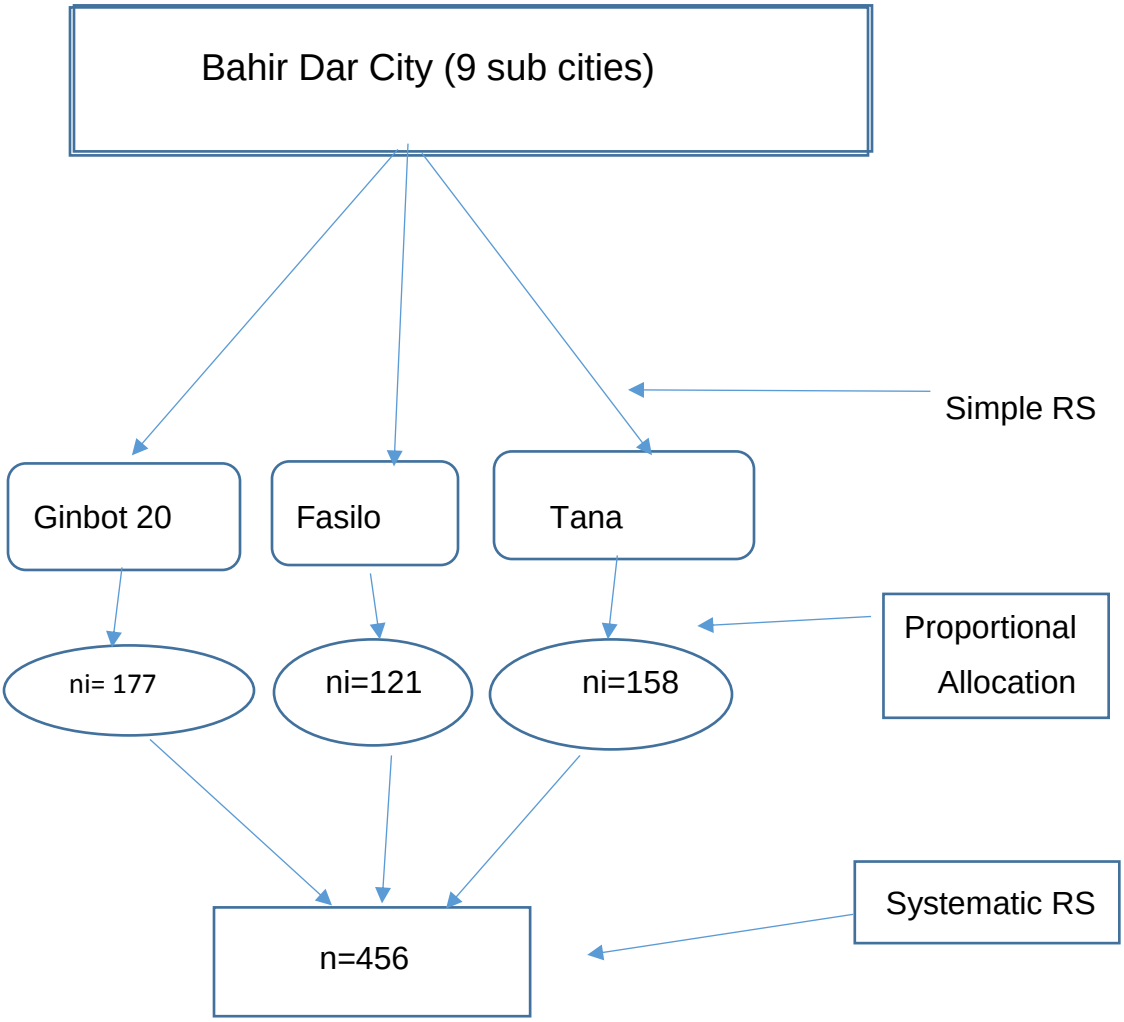

Figure 2: Schematic diagram of sampling technique and procedure

3.6. Study variables

3.6.1. Dependent variables

- Undiagnosed diabetes mellitus**.**

3.6.2. Independent variables

- Socio-demographic and economic variables*;*

Age, Gender, Marital status, Education, Religion, Occupation, Ethnicity, Income, family history of DM

- Lifestyle/behavioral factors

Obesity, Overweight, Hypertension (systolic and diastolic pressures), Smoking, Excessive Alcohol Consumption, Chewing Khat, Dietary Habits and Low Physical Activity.

- Anthropometric measurements; Height and weight (Body mass index (as an index of obesity and overweight), waist-to- hip ratio (as an index of central obesity).

3.7. Operational Definition

Undiagnosed diabetes mellitus are untreated.

Random blood glucose (RBG) level:

RBG measures ≥ 200 milligrams per deciliter or above (11.1 mmol/l).

Hypertension was defined according to WHO standardized criteria as SBP ≥ 140 mmHg or/and DBP ≥ 90 mmHg or using antihypertensive medication [32].

Body Mass Index (BMI) were defined as WHO criteria [33].

- Underweight BMI<18.5
- Normal BMI 18.5 to 24.9
- Overweight BMI≥25.0 and <29.9
- Obese BMI ≥30.0

Abdominal or central obesity: This is measured using waist to hip ratio (WHR). The cut off point for central obesity is WHR ≥ 102cm for male and WHR ≥ 88cm for female [30].

Low fruit and vegetables intake: An individual who didn't consume of fruits and vegetables daily [14].

Heavy Alcohol Consumption: WHO criteria high to excessive consumption (>21alcoholic beverages a week) or more than 3 standard alcoholic drinks per day for men (≈30gm of alcohol) or >2 alcoholic drinks (or 20gm alcohol) for women [38].

A standard alcoholic drink is the equivalent of one glass/can/bottle (330ml) of regular beer (with 3% ethanol), one glass (100ml) of wine (10% ethanol). Each of which adds up to about 10g of ethanol per drink

Sedentary lifestyle (Physical inactivity): In this study is measured as a response of being always or usually engaged in light/leisure activities for most days of the week, or a response of sometimes/never engagement in moderate to intense physical activity outside work for most days of the week, that would add up to at least three hours per week of moderate to intense (vigorous) physical activity [39].

3.8. Data collection instruments

The structured questionnaire were initially prepared in English and translated into Amharic in simple and precise ways to avoid ambiguity. Blood pressure was taken, using a standard zero mercury sphygmomanometer. Height was measured by using a stadiometer, standing upright on a flat surface. Body weight was measured while wearing light clothes by an adjusted scale. Body mass index (BMI) were calculated by the formula: Weight in kilograms divided by height in meter squared (wt. /ht2) [30]. The waist and hip-circumference was measured with the use of a flexible tape calibrated with centimeters.

3.9. Data Collection procedure

Four trained nurses collected data using structured questionnaire and physical measurements while one laboratory technician collected blood sample and Random blood sugar testing. Data collection was conducted after having signing a written consent of each participants. Blood pressure was measured with subjects in the seating position after waiting in a quiet place with leg uncrossed for at least five minutes. Blood pressure was taken from the subject's left arm while seating and his/her arm at heart level, using a standard zero mercury sphygmomanometer was used to take two

readings for blood pressure, a minimum of 30 minute each. Then the average of the two readings was obtained, following the WHO recommendation [20]. Waist circumferences was measured at the mid-way between the lower most rib margin and the iliac crest at the end of normal expiration while the hip circumferences was measured at the level of the widest circumference of hip over the greater trochanter. Both measurements were taken three times and the average of the three reading was used for the calculation of the body mass index.

3.10. Data quality assurance

Five research assistants, with a college degree in nursing and laboratory, were recruited and trained for one day on data collection approaches, questionnaire administration and physical measurement techniques a week before the actual survey. Data were collected after receiving a written consent from study participants and they were informed of their rights to withdraw from the study at any stage. Prior to actual data collection, the questionnaire were pre-tested so that it would help to improve the question wording, clarity, as well as to check the flow and consistency of questions. The clarity and completeness of each questionnaire was reviewed on a daily basis.

Using the manufacturer's recommended quality control instruments, the glucometer machine and test strips were periodically checked for accuracy. Anthropometric measurements were also taken using a standardized technique and calibrated equipment. In order to minimize the observer's error in measurements and recordings, the measurements were recorded twice and in some cases three times. The weight scale was regularly checked before starting any measurement. Study participants were weighed in light indoor clothing and without shoes or with footwear. Height were measured using a stadiometer; participants stood in erect posture without shoes and measures taken two times, and the average were considered in the analysis Waist girth was measured by placing a flexible plastic tape to the nearest 0.5 cm horizontally, midway between the 12^{th} rib and iliac crest on the mid-axillary line. Hip circumference was measured around the widest portion of the buttocks, with the tape parallel to the floor [33].

3.11. Data management and analysis

Data were entered into SPSS version 20.0 software. The entered data were cleaned before analysis. Descriptive statistics were computed to see the frequency distribution, results were expressed in term of percentages and were presented using tables and graphs. Bivariate analysis were computed to test whether there was associations between and selected independent variables respectively. Factor associated with diabetes mellitus at bivariate analysis were identified and the variable with p-value of 0.2 and less were taken to multivariable and the model was built with forward stepwise. The p-value less 0.05 was considered to be statistically significant.

3.12. Ethical Considerations

Clearance and supporting letter were obtained from research Ethical Review Committee of the College of Medicine and Health Sciences, school of public Health, Bahir Dar University and Amhara Regional Health Bureau respectively. The study was conducted with an informed written consent obtained from each participant after detailed explanation about the purpose of study and data collection was conducted confidentially, who also assured that they could withdraw from the study at any times if they so desired. The results of laboratory findings and abnormally high blood pressure were immediately informed to the study participants and those in need of medical attention were advised to visit a health institution and effort was made to link them with nearby health facility.

4. Results.

4.1. Socio demographic characteristics study participants

Using a structured questionnaire, a face-to-face interview was administered to 456 subjects with non-response rate of zero. The age of the study participants ranged from 19 to 85 years with the mean age of 41(SD ± 13.9). Among the study subjects, 181 (39.7%) were males. A third of respondents (35.5%) were aged 45 and above (Table 1)

The majority, 308 (66.7%) of study subjects were currently married. The dominant ethnic group was Amhara, accounting for 95.6% of the study population. Three hundred seventy-one (84.0%) of the study subjects belonged to the Orthodox Christian religion.

One hundred thirty five (29.6%) respondents had no formal schooling (illiterates); 331 (70.5%) had primary education and above, of whom 91(20%) attended college level and above. Average monthly income, 28.9% of the respondents was below 1123 ET Birr.

A total 55 (12.1%) study subjects had a family history of diabetes, the rest, 374 (82%) had no such history. About 13.5% female and 9.9% of male respondents had a positive family history

Table 1: Socio demographic characteristics of participants among adults in Bahir Dar City, Northwest Ethiopia, Feb 2017 (n = 456).

Socio demographic variables	Category	Frequency	percent
Sex	Male	181	39.7
	Female	275	60.3
Age	18-24	29	6.4
	25-34	141	30.9
	35-44	125	27.4
	≥45	161	35.3
Religion	Orthodox Christian	371	81.4
	Muslim	64	14
	Protestant	21	4.6
Ethnicity	Amhara	436	95.6
	Other	20	4.4
Marital status	Never married (single)	58	12.7
	Currently married	308	66.7
	Separated	14	3.1
	Divorced	28	6.1
	Widowed	52	11.4
Educational status	Unable to read and write	135	29.6
	Grade 1-8	128	28.1
	Grade 9-12	102	22.4
	College level and above	91	20
Occupation	Merchants	94	20.6
	Daily labor	66	14.5
	Governmental Employee	70	15.4
	Private Employee	61	13.4
	House wife	133	29.2
Monthly Income	<1123 ET birr	132	28.9
	1124-2124 ET birr	121	26.5
	2125-3125 ET birr	71	15.6
	3126-4126ET birr	65	14.3
	>4126ET birr	67	14.7
Family history of diabetes	Yes	55	12.1
	NO	374	82
	do not know	27	5.9

4.2. Behavioral characteristics of study participants

Overall, 11 (2.4%) respondents reported ever having smoked cigarette and all were male, of whom 8 (72.7%) smoked for more than 10 years. Nearly a tenth (8.8%) of respondents have chewed ‘khat.’

Two hundred eleven subjects (46.3%) have never consumed alcohol in their lifetime, while 245 (53.7%) did so; of those who consume alcohol, the majority (67.4%) were males and the remaining 123 (44.7%) females; and 22.6% of them had 1-3 drinks per day, nearly a fifth 4-6 drinks and nearly a tenth (8.7%) seven or more drinks a week.

Overall, 271 (59.4%) of the study participants were physically inactive or mostly sitting or standing with a little work, 131 (28.7%) with moderate exercises or activity that requires some efforts, 54 (11.8%) with activity that requires heavy efforts or heavy exercises. 397 (87.1) do not eat fruits and vegetables each day.

Table 2. Behavioral characteristics study subjects' in Bahir Dar City, Ethiopia, Feb, 2017.

Characteristics	Category	Percentage (%)	
Current smoker	Yes	11	(2.4)
	No	445	(97.6)
If smoking yes, how often	Yes, daily	10	(2.2)
	Yes, some times	1	(0.2)
Duration of smoking	Up to10 years	3	(27.3)
	>10 years	8	(72.7)
Ever users of 'Khat	Yes	40	(8.8)
	No	416	(91.2)
Duration of khat	Yes, daily	22	(4.8)
	Yes, some times	18	(3.9)
Ever taken Alcohol	Yes	245	(53.7)
	NO	211	(46.3)
On average, how often do you usually drink alcohol	< or = 3 drinks (30gm) a week	133	(29.2)
	>3 drinks (30gm) a week	112	(27.6)
Consumption of Fruits And vegetables	Do not eat at all	33	(7.2)
	Yes, do not eat ever day	397	(87.1)
	I take once a day	26	(5.7)
During the working Hours how do you practices	Mostly sitting or standing with a little work (mild exercise)	271	(59.4)
	Activities that requires some efforts (moderate exercise)	131	(28.7)
	Activities that requires heavy efforts (heavy exercise)	54	(11.8)
Outside the working hrs. how do you practices	Mild exercise	321	(70.4)
	Moderate exercise	129	(28.3)
	Heavy exercise	6	(1.3)

4.3. Anthropometric measurements of study participants

Three hundred eighty five (84.4%) of participants had systolic and diastolic blood pressure less than 140 mmHg and 90mmHg. In general 71 (15.6%) of the study participants were found to have hypertension. Out of the 71 hypertensive subjects, 34(18.5%) were males and 37(13.5%) were females.

Systolic hypertensive 69(15.1%) from this 32(17.7%) male and 37(13.5%) female. diastolic hypertensive 51(11.2), 25(9.5%) male and 26(13.9). Analysis of the blood pressure by aged, showed that highest in age group ≥45 years (28.6%).

The body mass index (BMI) of the respondents ranged from 16 to 35.8 kg m-2. Overall, 303 (66.1%) of subjects had normal body weight and 33.5% of respondents had (BMI ≥25.0 kg m2). Of these, 124 (27.2%) subjects were overweight, and 29 (6.4%) were obese. In addition, higher proportions of female respondents than males were overweight 30.5% versus 22.1 %, and obese (7.6 % females versus 4.4% of males). Central obesity of the respondents was 41 (9%), 10 (5.5%) were men and 31(11.3%) women.

Table 3: Anthropometric measurements of participants among adults in Bahir Dar City, Northwest Ethiopia, 2017.

Variable	Categories	All N=456 N (%)	Women N=275 N (%)	Men N=181 N (%)
BMI	**<18.5**	20 (4.7)	13 (58.2)	7(3.9)
	18.5- 24.9	271(59.4)	150(54.5)	121(66.9)
	25-29.9	128(28.1)	83(30.2)	45(29.9)
	≥30	37(8.1)	29(10.5)	8(4.4)
Central obesity	**N0**	415 (91)	244 (88.7)	171 (94.5)
	Yes	41 (9)	31 (11.3)	10 (5.5)
Systolic hypertension	**No**	387 (84.9)	238 (86.5)	149 (82.3)
	Yes	69 (15.1)	37 (13.5)	32 (17.7)
Diastolic hypertension	**No**	404 (88.8)	249 (90.5)	155 (86.1)
	Yes	51 (11.2)	26 (9.5)	25 (13.9)
Systolic & Diastolic hypertension				
	No	385 (84.4)	238 (86.5)	147 (81.2)
	Yes	71 (15.6)	37 (13.5)	34 (18.5)

4.4. Undiagnosed diabetes mellitus among adults aged 18 years and above

In the current study, out of the total number of participants (456), 27(5.9%) (95%CI: 3.7%-8.3%) were diabetic. Sex wise undiagnosed DM was found in 5% (n=9/181) of males and 6.5% (n=18/275) of females. .

4.5. Factors associated with undiagnosed DM among adult aged 18 years and above

Bivariate logistic regression model was used to asses any association between the dependent variable and the independent variables.

In this study, sex, age, persons with hypertension, central obesity, BMI, marital status, history of alcohol and low physical activity were found to be significantly associated with diabetes mellitus.

In multivariable logistic regression model, ($p< 0.05$), BMI, age and marital status were found to be significantly associated with diabetes mellitus.

Those person with overweight and obesity (BMI) of ≥25 kg/m2 were, 5.4 times more likely to develop Diabetes mellitus than those who had BMI of < 25 kg/m2, (AOR= 5.40, 95%CI: 2.224- 13.15), individuals with in the age group >35 years were, 4.2 times more likely to have Diabetes mellitus compared with those whose age was< 35 years (AOR=4.24, 95%CI: 1.15- 15.55) and those individual who had widowed, separated and divorce 73% less likely to get DM compared with those are single and married (AOR= 0.27, 95%CI: 0.11- 0.64).

Table 4: Bivariate and multivariable logistic regression analysis with undiagnosed diabetes mellitus among respondents in Bahir Dar city, Ethiopia, Feb 2017, (n=456).

Independent risk factors	DM status		COR (95% CI)	AOR(95%CI)	P-value
	Yes (%)	No (%)			
Sex					
male	9(33.3)	172(40.1)	1.00		
female	18(66.7)	257(59.9)	1.33(0.58, 3.04)		
Age					
<35	3(11.1)	185(43.1)	1.00	1.00	
≥35	24(88.9)	244(56.9)	6.06(1.79, 20.45)	4.24(1.15, 15.55)	0.029*
Marital status					
				.	
Single	1(3.7)	57(13.3)	1.00	1.00	
married	13(48.1)	291(67.8)	0.10(0.01, 0.85)	0.30(0.03, 2.78)	0.291
Other	13(48.1)	81(18.9)	0.27(0.12, 0.62)	0.027(0.11, 0.64)	0.003*
History of Alcohol					
	10(37)	235(54.8)	2.05(0.92, 4.60)		
Yes	17(63)	194(45.2)	1.00		
No					
Physical activities					
Active	21(77.8)	250(58.3)	0.40(0.18, 0.90)		
Moderate	6(22.2)	179(41.7)	1.00		
Lower					
BMI					
<25	8(29.6)	283(66)	1:00		.
>=25	19(70.4)	146(34)	6.60(1.96, 10.76)	5.40(2.22, 13.15)	000**
Hypertension					
Yes	8(29.6)	63(14.7)	2.44(1.02, 5.82)		
No	19(70.4)	366(85.3)	1.00		
Central obesity					
Yes	22(81.5)	36 (8.4)	2. 48(.88, 6.94)		

	No	5(18.5)	393(91.6)	1.00

5. Discussion

The prevalence of undiagnosed diabetes mellitus in the present study was 5.9% and it was found to have a statistically significant association with BMI (overweight and obesity), age and marital status (widowed, separated and divorce).

The actual prevalence of DM in Ethiopia has not been known. However, in 2013, a high prevalence of DM (as high as 8%) has been observed among HIV/AIDS patients who are taking HAART [8]. Another study conducted, in 2010, among permanent employees of the Commercial Bank of Ethiopia and teachers working in Addis Ababa, reported a 6.5% prevalence of diabetes and pre-diabetes 21.6% [24]. The current study show that high prevalence of DM compere to IDF 2014 report estimated DM prevalence of 4.85 % (7).

The prevalence of undiagnosed diabetes mellitus in this study is almost similar to the results of other studies done in Gondar (5.1%) and in Bishoftu Town, East Shoa (5%). In South Africa, in 2012, undiagnosed type 2 diabetes was estimated at 16.8%. However, the direct comparisons of prevalence rates are challenging owing to different methodologies applied and diverse characteristics of the study population [23].

The present study was observed, those person with BMI of ≥25 kg/m2 were, 5.4 times more likely develop Diabetes mellitus than those who had BMI of < 25 kg/m2, (AOR= 5,409, 95% CI: 2.22- 13.15), BMI was associated with undiagnosed DM. In agreement with the current study, Megerssa et al [25], On'Kin et al. in Congo [29] and Abebe et al. in Ethiopia [36].

Those individuals with in the age group >35 years were, 4.2 times more likely to develop Diabetes mellitus compared with those whose age was< 35 years (AOR=4.244, 95%CI: 1.158- 15.55). Similarly, a study conducted in Gondar showed that the prevalence of DM increased with age (AOR = 4.86; 95%CI: 1.99- 11 .9) [36]. This is in the line with the fact that individual in the early period of adulthood experience active physical activity which would have not to development of diabetes mellitus.

Marital status is also a significant factor, those individual who had widowed, separated and divorce 73% less likely to get DM compared with those are single and married (AOR= 0.27, 95%CI: 0.11- 0.64). Some studies reported that the risk of diabetes mellitus increase among single, divorced and widowed individuals [40].

Overall, the study observed no significant association between undiagnosed diabetes mellitus and ethnicity, gender, education status, occupation, income, family history of DM and hypertension. While this study which is carried out in an area inhabited by people with similar lifestyle and socio-cultural background, a significant disparity exists in the prevalence DM and ethnicity or race in the United States as it is racially and ethnically more diverse, where people have diverse lifestyle, consumption patterns and health behaviors and access to health care services [8].

5.1. Strength and Limitation of the Study

The strength of the study is base line information on undiagnosed DM in Bahir Dar city.

Limitation**:** The study did not include homeless and street people and respondents' information bias about income and age.

6. Conclusion

The current prevalence of newly diagnosed diabetes mellitus in Bahir Dar city was high (5.9%) than estimated national prevalence of Ethiopia, 4.85% reported by the IDF in 2014 [7] and age, marital status, over weight and obesity were the independent risk factors for diabetes in the studied community.

7. Recommendation

Urban health extension programs shall target households to implement dietary and physical activity practice that help reduce weight. Regional health bureau, Bahir Dar city health office and health professionals have to strengthen the effort to raise of diabetes related issues through promoting health education. Additionally where resources are available, screening of high-risk groups aged >35 years is recommended to early detect

and prevent the occurrence of diabetes mellitus and its complications in the study community.

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9. Annex

Annex I: Information sheet and consent form (both Amharic and English version)

A structured Questionnaire prepared an assessment of the prevalence Undiagnosed Diabetes Mellitus and Risk Factors, among adults18 years and above in Bahir Dar City, North West Ethiopia; February 2017.

Are you a known diabetes patient?	1. yes→ Discontinue the data collection 2. No →Continue the data collection

Respondent's code number_____

Introduction

My name is Abebech Adugna a master of Public Health student at Bahir Dar University, School of Public Health. This questionnaire is designed for research works which was approved by Bahir Dar university school of public health to be conducted in partial fulfillment of a master degree in public health. The purpose of this study is to find out how many people in Bahir Dar City have diabetes. Diabetes is a potentially serious long-term condition, which can result in severe disability or even death if not properly managed. However, early detection and control of the blood sugar level have been found to markedly reduce the risk of complications and this is what we hope to do here.

Confidentiality and consent form

I would like to request your participation in this study that will involve asking you some questions and conducting some tests. Before we proceed, I will request you to listen carefully to what I am going to read to you about the purpose of this study and what it

involves and tell me whether you are willing to participate in this research or not. The survey will be made up of three parts as follows:

1. Ask you some questions that have been found to be associated with the disease.
2. Take some body measurements such as weight, height, WHR and blood pressure.
3. Do a simple blood test to check your blood sugar level, and so determine if you are at risk of developing the disease now or in future.

Whole test will be take about one hour and the test done after meal. We would like to assure you that the information obtained will be strictly for our research use. Your name will not be used in our report and the information obtained will not be used in any way that will identify you. If you participate in this research, you may not direct benefit but your participation is likely to help us in assessing the prevalence and risk factors of DM, The interview is voluntary. Your participation/ non-participation, or refusal to answer questions will have no effect now or in the future on services that you or any member of your family may receive from health service providers.

Are you willing to participate in this study?

Yes. ☐ No. ☐ → Thank you.

If you are willing to participate, please continue to respond to the questions.

Thank you very much for your cooperation

Participate Signature---------- Date of interview----------

Name of the data collector ----------Signature ---------- date ----------

Name of the supervisor ----------Signature ---------- date ----------

If you need additional information you can contact Principal investigator;

Name: Abebech Adugna Tel.No; +251918781754

Questionnaires

Step 1. Socio-Demographic Information of Respondent

No	Questions	Alternative choices for response	Code
SD 001	Sex	Male 1 Female 2	
SD 002	Age (enter number)	_____ years	
SD 003	Religion	1. Orthodox Christian 2. Protestant 3. Catholic 4. Muslim Other, specific _____	
SD 004	To which Ethnicity group do you belong?	1. Amhara 2. Oromo 3. Tigre 4. Agew Other , specify _____	
SD 005	Marital status	1. Never married (single) 2. Currently married 3. Separated 4. Divorced 5. Widowed Other, specify _____	
SD 006	Which educational level did you attain	1. Unable to read and write 2. Grade 1-8 3. Grade 9-12 4. College level and above	

SD 007	What is your Occupational Status	1. Farmer 2. Merchant 3. Daily labor 4. Governmental Employee 5. Private Employee 6. House wife Others ,specify_____	
SD 008	What is your family's total average monthly Income?	1. _____ birr 2. Don't know	
SD 009	Do you have any first -degree relative or family with a history of diabetes?	1. Yes 2. NO 3. Don't know	
SD 010	Have you ever smoke cigarettes?	1. Yes 2. No →skip to Q013	
SD 011	If yes, to Q No 010, How often?	1. Daily 2. Every other day 3. Weekly Others, specify-------	
SD 012	When did you start smoking daily?	1. Since the last _____years 2. Since the last _____months 3. Since the last _____weeks	
SD 013	Do you chew Khat?	1. Yes 2. No	
SD 014	If yes, to Q No13, How often?	1. Yes, daily 2. Yes, sometimes 3. No, not at	
SD 015	Have you ever taken any type of alcoholic drink? (beer, wine, local 'arekie', 'tella' and 'tej')	1.Yes 2.Yes, but not in the past 12 months 3.No, I have never → skip to Q No 017	
SD 016	On average, how often do you usually drink alcohol * A standard alcoholic drink is the equivalent of one glass/can/bottle (330ml) of regular beer (with 3% ethanol), one glass (100ml) of wine (10% ethanol).	1. Less than one drink a week 2. One to three drinks a week 3. Four to six drinks a week 4. Seven or more drinks a week 5. Don't Know	

SD 017	How many times per day do you usually take fruits? (select one response)	1. Don't eat fruits at all 2. Don't eat fruit everyday 3. I take fruits once a day 4. I take fruits2-4 times per day 5. I take fruits 5 or more times per day	
SD 018	How many times per day do you usually eat vegetables? (select one response)	1. Don't eat vegetables at all 2. Don't eat vegetables everyday 3. I eat vegetables once a day 4. I eat vegetables 2-4 times per day 5. I eat vegetables 5 or more times per day	
SD 19	Work-related physical activity: Firstly, how many hours do you typically spend at work each day?	---------- hours	
SD 020	During these hours, how frequently do you practice the following? **(Fill 1-4 from the response choice in the space provided)** A. Mostly Sitting or Standing with only a short walking distance----(mild exercise) B. Activities that require the same physical effort as walking long distance or backyard gardening ---(moderate exercise) C. Activities that require the same effort as lifting heavy weights or heavy construction work ---(heavy exercise)	1. Always 2. Usually/Often 3. Sometimes 4. Never	
SD 021	Outside the working hours or transportation time, How often do you practice the following activities?**(Fill 1-4 from the choices in the space provided)** A. Mostly Sitting or Standing with only a little walking B. Activities that require the same effort as walking long distance, or backyard gardening, or climbing upstairs	1. Always 2. Usually/Often 3. Sometimes 4. Never	

	C. Activities that require the same effort as lifting heavy weight or strenuous exercise		

Note;
∗A first-degree relative refers to: your actual father/mother (not step-), full brother/sister and full child∗
∗ A standard alcoholic drink is the equivalent of one glass/can/bottle (330ml) of regular beer (with 3% ethanol), one glass (100ml) of wine (10% ethanol).
∗One helping of fruit includes one banana, one orange, one apple or one slice of pineapple etc.

Step 2 Physical Measurements

PM 101	Blood pressure (measured 2 times)	1st----------mmHg(systolic/diastolic) 2nd----------mmHg(systolic/diastolic)	☐
PM 102	Weight in kg	----------kg	☐
PM 103	Height in cm (measured 2 times)	1st----------cm 2nd ----------cm	☐
PM 104	Waist in circumference or abdominal girth (measured 3 times)	G1 ---------cm G2 --------cm G3 --------cm	☐
PM 105	Hip circumference (measured 3 times)	1_____ 2_____ 3_____	☐
PM 106	Body Mass Index (BMI)	Result: _____	☐
PM 107	Waist Hip Ratio(WHR)	Result: _____	☐

Step 3. Blood Glucose Tests

BST 201	Blood glucose analysis: Random blood sugar level (in mmol/l)	Result: _____ mmol/l	

AnnexII:- Amharic version questionnaire

ክፍል አንድ:- የስምምነት መግለጫ

የስኳር በሽታ ስርጭትን እና ተጽእኖ የሚያሳርፉ ነገሮችን ምጣብ ከወሰዱ በኋላ በሚደረግ ምርመራ መሰረት በባህርዳር ከተማ አስተዳደር ስር ከሚኖሩ ነዋሪወች ያለውን ስርጭት ለመገምገም የቀረበ መጠይቅ (የካቲት 2009).

የቃለመጠይቅ መለያ ቁጥር---------- እንደምን አደሩ/ዋሉ?

የስኳር በሽታ ታማሚ ነዎት? 1. አዎ ከሆነ ጥያቄው ይቋረጥ →

2. አይደለም መልሡ አይደለም ከሆነ ወደ ጥያቄ ይሀዱ →

እኔ አበበች አዱኛ እባላለሁ በባህርዳር ዩንቨርስቲ የሕብረተሰብ ትምህርት ክፍል የማስተርስ ተማሪ ነኝ::ይህ መጠይቅ የተዘጋጀው ለጥናት ዓላማ ሲሆን በባህርዳር ዩንቨርሲቲ ሕብረተሰብ ጤና ትምህርት ቤት የሚጸድቅ ሆኖ የሕብረተሰብ ጤና የማስተርስ ድግሪ የሚደረግ የማሟያ ጥናት ነው::የዚህ ጥናት አላማ በባህርዳር ከተማ አስተዳደር የሚገኙ ማህበረሰቦች ውስጥ የስኳር በሽተኞች እንደሚገኙና ለስኳር በሽታ አጋላጭ የሆኑትን ነገሮች ለማወቅ ነው:: ስኳር በሽታ በትክክለኛው መንገድ ካልስተናገደ ለረጅም ጊዜ ተጽንኦ የሚያሳድር ከፍተኛ የሆነ አካል ጉዳት ሊያስከትል የሚችል ሲሆን ሞትም ጭምር ሊያስከትል ይችላል::ሆኖም ግን በሽታው በጊዜ ከተደረሰበትና በደም ውስጥ ያለው የስኳር መጠን ከተቆጣጠርነው ሊከሰቱ የሚችሉ መወሳሰቦች ማስወገድ የሚቻል ሲሆን እኛም ይህንኑ ለማሳካት ተስፋ እናደርጋለን:: በዚህ ጥናት ላይ እንዲሳተፉልኝ እየጠየኩኝ ይህም የተወሰኑ ጥያቄዎችን መጠየቅ እና ምርመራዎችን ማድረግ ያካትታል:: ከመቀጠላችን በፊት ቀጥሎ የማነበውን በጥንቃቄ እንዲያዳምጡኝ እየጠየኩኝ የጥናቱን አላማ እና የሚያካትታቸውን እገልፃለሁ በዚህም መሰረት በጥናቱ ለመሳተፍ ያሎትን ፈቃደኝነት ወይም በተቃራኒውም ከሆነ ይገልፁልኛል:: በዚህ ጥናት በመሳተፈዎ ቀጥተኛ የሆነ ጥቅም አያገኙም:: ነገር ግን የእርሰዎ በጥናቱ መሳተፍ እና የሚሰጡት መረጃ በባህር ዳር ከተማ ለሚኖሩ የስኳር ህመምተኞች እና ለስኳር ህመም የሚያጋልጡ ሁኔታዎች በማጥናት ከህመሙ ሙሉ በሙሉ ባይድኑም ለሚደረጉ ጥንቃቄዎች የጤንነት ሁኔታ መረጃ በማግኘት የጤንነት ሁኔታ ይሻሻላል:: ይህ ጥናት የሚሰራው በሶስት ክፍሎች ሲሆን እንደሚከተለው ይሆናል

1. **ከበሽታው ጋር የተያያዙ የተወሰኑ ጥያቄዎችን እጠይቃለሁ::**
2. **የተወሰኑ የሰውነት መለኪያ እንደ ክብደት፣ቁመት እና የደም ግፊት ያሉትን እወስዳለሁ::**
3. **በሰውነትዎ ውስጥ ያለውን የሰውነት የስኳር መጠን ለማወቅ ቀላል ምርመራ አደርጋለሁ እናም አሁንም ሆነ ወደፊት በሽታው መጠቃት ያለውን እድል እንወስናለን::**

አጠቃላይ ጥናቱ ወደ አንድ ሰዓት የሚወስድ ሲሆን ጥናቱ ምግብ ከበሉ በኋላ የሚደረግ ምርመራ መሆሩን እንገልጽሎታለን:: በተጨማሪም ልናረጋግጥልዎት የምንወደው ነገር የሚሰበሰበዉ መረጃ ሙሉ በሙሉ በሚስጥር የሚያዝ መሆኑንና;; ለጥናታችን ብቻ እንደምንጠቀምባቸው እናረጋግጥልዎታለን::መረጃ መስጠት ካልፈለጉ መብትዎ ነዉ ወይም መመለስ ያልፈለጉትን ጥያቄ መዝለል/ማለፍ/ ይችላሉ:: ይሁን እንጂ የእርስዎ ትብብር እና ትክክለኛ ምላሽ ጥናቱና ምርምሩ እንዲሳካ ትልቅ አስተዋጽኦ ይኖረዋል:: ስለዚህ ለሚቀርብልዎት ጥያቄ ትክክለኛ መልስ ለመስጠት ፍቃደኛ ሆነዉ በትዕግስት እንዲመልሱልን ፤ ለመሳተፍ ፈቃደኛ ነዎት? አዎ ☐

አይደለሁም ☐ → **አመሰግናለሁ**

ለመሳተፍ ፈቃደኛ ስለሆኑ በጣም አመሰግናለሁ፤ እባክዎ ጥያቄዎቹን መመለስ ይቀጥሉ::

የስምምነት ፍቃዱን የወሰደው (የተቀበለው) ተጠያቂ ፊርማ----------

የቃለ መጠይቅ አድራጊው ስም---------- ፊርማ ----------ቃለ መጠይቁ የተደረገበት ቀን ----------

የተቆጣጣሪዉ ስም---------- ፊርማ ---------- ቃለ መጠይቁ የተደረገበት ቀን----------

ተጨማሪ መረጃ ከፈለጉ ዋናውን አጥኚ ሊያገኙ ይችላሉ:: ስም አበበች አዱኛ,ስልክ ቁጥር +251918781754

ክፍል ሁለት ማኅበዊራዊ - ዲሞግራፊ የመላሾች መረጃ

ተራ ቁጥር	ጥያቄ	የመልስ ምርጫ	ኮድ
SD 001	ጸታ	ወንድ 1 ሴት 2	
SD 002	እድሜ	---------- ዓመት	
SD 003	ሐይማኖት	1. ኦርቶዶክስ ክርስቲያን 2. ሙስሊም 3. ፕሮቴስታንት 4. ካቶሊክ ሌላ ከሆነ ይግለጹ _____	
SD 004	የትኛው ብሔረሰብ ነዎት?	1. አማራ 2. ኦሮሞ 3. ትግሬ 4. አገው ሌላ ከሆነ ይግለጹ_____	
S0 005	የጋብቻ ሁኔታ	1. አግብቼ አላውቅም 2. በአሁኑ ሰኣት ትዳር ውስጥ ነኝ 3. ተለያይቻለሁ 4. ባሌ /ሚስቴ ሞቶብኛል 5. ተፋትቻለሁ ሌላ ከሆነ ይግለጹ--------	
SD 006	የትምህርት ደረጃ	1.ማንበብ እና መጻፍ የማይችል 2. ከ1 -8ኛ ክፍል 3. ከ9-12ኛ ክፍል 4. ኮሌጅ እና ከዚያ በላይ	
SD 007	የሰራ	1. አርሶ አደር 2. ነጋዴ 3. የቀን ሰራተኛ 4. የመንግስት ሰራተኛ 5. የግል ሰራተኛ 6. የቤት እመቤት ሌላ ካለ ይግለጹ----------	
SD 008	ወርሃዊ የገቢ መጠን ምን ያክል ነው?	1. _____ ብር 2. አላዉቅም	

SD 009	የመጀመሪያ ደረጃ ዝምድና ያላቸው ዘመዶችዎ በስኳር በሽታ የተጠቃ አለ ?	1. አዎ 2. አይደለም 3. አላውቅም	
SD 010	በአሁኑ ሰዓት ሲጋራ ያጨሳሉ? (ማሳሰቢያ፡ በአሁን ሰዓት= ላለፉት12 ወራት)	1. አዎ 2. አይደለም አይደለም ከሆነ ወደ ጥያቄ 13 ይሂዱ	
SD 011	ጥያቄ 010 መልሱ አዎ ከሆነ ለምን ያህል ጊዜ?	1. በየቀኑ 2. ከሦስት ቀን አንድ ቀን 3. በሳምንት አንድ ቀን 4. ሌላ	
SD 012	መቼ ነዉ በየቀኑ ማጨስ የጀመሩት?	1. ባለፈዉ----------ዓመት 2. ባለፈዉ----------ወር 3. ባለፈዉ----------ሳምንት	
SD 013	ጫት ይቅማለ?	1. አዎ 2. አይደለም በጭራ	
SD 014	ጫት የሚቅሙ ከሆነ ለምን ያህል ጊዜ	1. አዎ በየቀኑ 2. አዎ አልፎ አልፎ 3. አይደለም በጭራ	
SD 015	ማንቸውም የአልኮል መጠጦችን ወስደው ያውቃለ? (ቢራ፣ አረቂ፣ ወይን ፣ ጠላ እና ጠጅ)	1. አዎ 2. አይደለም መልሱ አይደለም ከሆነ ወደ አመጋገብ ክፍል ይሂዱ	
SD 016	ጥያቄ 015 መልሱ አዎ ከሆነ፣ ባለፉት 12 ወራት ቢያንስ አንድ መለኪያ በምን ያክል በተደጋጋሚ ወስደዋል?	ከ5 የበለጡ ቀናት በሳምንት ውስጥ----------1 1-4 ቀናት በሳምንት ውስጥ----------2 በዚህ ወር ውስጥ ከሶስት ቀናት ያነሰ --------3 ከወር እንኳን ያነሰ---------- 4	
SD 017	በአብዛኛው ጊዜ በቀን ውስጥ ፍራፍሬዎች ለምን ያክል ጊዜ ይጠቀማለ?(አንድ ምላሽ ይምረጡ)	1. ፍራፍሬ በጭራሽ አልበላም 2. በየቀኑ ፍራፍሬ አልበላም 3. ፍራፍሬዎችን በቀን አንዴ እወስዳለሁ 4. በእያንዳንዱ ቀን 2-4 ጊዜ ፍራፍሬ እወስዳለሁ 5. በእያንዳንዱ ቀን ከ 5 ወይም በላይ ጊዜ ፍራፍሬ እወስዳለሁ	

SD 018	በአብዛኛው ጊዜ በቀን ውስጥ አትክልት ለምን ያክል ጊዜ ይጠቀማሉ?(አንድ ምላሽ ይምረጡ)	1. አትክልት በሞራሽ አልበላም 2. በየቀኑ አትክልት አልበላም 3. በቀን አንዴ አትክልት እበላለሁ 4. በየቀኑ 2-4 ጊዜ አትክልት እበላለሁ 5. በየቀኑ ከ 5 ወይም በላይ ጊዜ አክልት እ ወስዳለሁ	
SD 19	መደበኛ ወይም የለመደው የስራ ጊዜዎት በቀን ምን ያህል ነው?	---------- ሰዓት	
SD 20	**ከመደበኛ ስራ ሰዓት ውጭ ያለዎት እንቅስቃሴ ምን ይመስላል**? (ከ 1-4 ከተገለጡት ዉስጥ አንድ ምላሽ ይምረጡ) A. ስራዎት መቆም ወይስ መቀመጥ ይበዛበታል፣ በአንድ ጊዜ ከ 10 ደቂቃ ለማይበልጥ ጊዜ መራመድን አካቶ? (mild exercise) B. ስራዎት መካከለኛ የሆነ ጫና ያለበት ስራን ያካትታል ማለትም ፈጠን ያለ እርምጃ ወይም ቀለል ያለ እቃዎችን በአንድ ጊዜ ከ 10 ደቂቃ ለማያንስ ጊዜ መሸከምን? (moderate exercise) C. ስራዎት ከባባድ እንቅስቃሴዎችን፣ እንደ ከባድ እቃዎችን ማንሳት፣ መቆፈር ወይም የግንባታ ስራ ቢያን ስ 10 ደቂቃ በአንድ ጊዜ የሚፈጅ ነው? (heavy exercise)	1. ሁልጊዜ 2. ብዙጊዜ 3. አልፎአፎ 4. አይደለም	
SD 21	**ከመደበኛስራሰዓት ውጭያለዎት እንቅስቃሴምንይመስላል** **(ከ 1-4 ከተገለጡት ዉስጥ አንድ ምላሽ ይምረጡ)** A. ትርፍ ጊዜዎት መቀመጥ፣ ጋደም ማለት ወይም መቆምን ማናቸውም አካላዊ እንቅስቃሴ ሳያደርጉ ከ 10 ደቂቃ የበለጠ ጊዜ ይደርሳል? B. በትርፍ ጊዜዎት በመካከለኛ ደረጃ ጫና ያለበት ስራ እንደፈጣን እርምጃ ፣ ሳይክል መጋለብ ወይም ዋና ቢያንስ ለ 10 ደቂቃ በአንድ ጊዜ ያደርጋሉ? C. በትርፍ ጊዜዎት ከባድ እንቅስቃሴዎችን ማለትም ሩጫ ወይም አስቸጋሪ ስፖርት ፣ ክብደት ማንሳት ቢያንስ ለ 10 ደቂቃ ይቆያሉ?	1. ሁልጊዜ 2. ብዙ ጊዜ 3. አልፎ አልፎ 4. አይደለም	

ክፍል ሦስት የአካል ልኬት

ተራ.ቁ	መለኪያ	የልኪት ዉጤት	ኮድ
Pm 101	የደም ግፊት (ሁለት ጊዜ የተለካ)	1. ሲስቶሊክ/ዲያስቶሊክ---------- ሚሜሂግ 2. ሲስቶሊክ /ዲያስቶሊክ----------ሚሜሂግ	
Pm 102	ቁመት በሴ.ሜ	1. ---------- 2. ----------	
Pm 103	ክብደት በኬ.ግ.	----------ኬ.ግ.	
Pm 104	የወገብ ስፋት በሴ.ሜ	G1 --------- ሴሜ G2 -------- ሴሜ G3 -------- ሴሜ	
Pm 105	የዳሌ ዙሪያ በሴ.ሜ	1---------- 2---------- 3----------	
Pm106	የክብደት /ቁመት ንጽጽር	----------	
Pm 107	የወገብ ስፋት ከዳሌ ሲነጻጸር	----------	

ክፍል አራት የደም ምርመራ

SBT 201	ምግብ ከበሉ በሆላ የሚደረግ ምርመራ የደም ስኳር መጠን (በሚሊ ሞል/ሊ)	---------- ሚሊ ሞል/ሊ	

Declaration

I, the undersigned, senior MPH student declare that this thesis is my original work in partial fulfillment of the requirement for the degree of Master of Public Health.

Name: Abebech Adugna **Signature**: _____

Place of submission: Postgraduate, research and community service coordinator office of College of Medicine and Health Sciences, Bahir Dar University.

Date of Submission: _____

This thesis work has been submitted for examination with our approval as Bahir Dar University thesis advisors