

**WOLDIA UNIVERSITY
COLLEGE OF HEALTH SCIENCE
SCHOOL OF PUBLIC HEALTH**

**Prevalence of non-adherence to anti diabetic medications and
Associated factors among adult Type II DM patients on follow up
at North Wollo zone public Hospitals, East Amhara, Ethiopia.**

BY: Abebech Derbie (BSc)

**A Research Thesis to Be Submitted to Woldia university college of Health
science, school of Public Health in Partial Fulfillment of the Requirement
for the degree of Masters of public health in general MPH.**

**March, 2023
Woldia, Ethiopia**

WOLDIA UNIVERSITY
COLLEGE OF HEALTH SCIENCE
SCHOOL OF PUBLIC HEALTH

**Prevalence of non-adherence to anti diabetic medications and
Associated factors among adult Type II DM patients on follow up
at North Wollo zone public Hospitals, East Amhara, Ethiopia.**

BY: Abebech Derbie (BSc)

**Advisers: Mr. Ayelign Mengesha (BSc, MSc, Assistance professor in adult
health nursing)**

Mr. Abebe Tarekegn (MSc in clinical pharmacy)

**A Research Thesis to Be Submitted to Woldia university college of Health
science, school of Public Health in Partial Fulfillment of the Requirement
for the degree of Masters of public health in general MPH.**

March, 2023
Woldia, Ethiopia

ACKNOWLEDGEMENT

First and foremost, I would like to express my deepest gratitude to Woldia University, School of public health for giving me this opportunity. A special word of thanks extended for my advisor Mr. Ayelegn Mengesha and Mr. Abebe Tarekegne for their support, constructive comment and invaluable help. My gratitude also extends to North Wollo zone Health department for providing me the necessary information. Finally, I would like to say thank you my friends for their support and encouragement during this research proposal work.

ABBREVIATIONS AND ACRONYMS

AOR	Adjusted Odds Ratio
BSc	Bachelor of Science
CI	Confidence Interval
COR	Crude Odds Ratio
DM	Diabetes Mellitus
EDA	Ethiopian Diabetic Association
ETB	Ethiopian Birr
FBS: Fasting Blood Sugar	Fasting Blood Sugar
FMOH	Federal Ministry of Health
G.C.	Gregorian Calendar
IDF	International Diabetes Federation
LMICs	Lower –Middle –Income Countries
MMAS-8	The 8 –Items Morisky Medication Adherence
MODY	Maturity Onset Diabetes Of the young
OHA	Oral Hyperglycemic Agent
PA	Physical Activity
RBS	Random Blood Sugar
SNNPR	Southern Nations, Nationalities, and peoples Region
SPSS	Statistical Package for Social Science
WHO	World Health Organization

Table of contents

ACKNOWLEDGEMENT	I
ABBREVIATIONS AND ACRONYMS	II
Table of contents	III
List of Figures	V
List of Tables	VI
Abstract	Error! Bookmark not defined.
1. INTRODUCTION	1
1.1. Background	1
1.2. Statement of the Problem	2
1.3. Significance of the study	4
2. LITERATURE REVIEW	5
2.1. Prevalence of Non- Adherence	5
2.2. Factors Associated with non- adherence to antidiabetic medication	5
2.2.1 Patient related socio demographic, economic and behavioral factors	5
2.2.2. Drug related factor	7
2.2.3. Patient related factor	7
2.3. Conceptual frame work	9
3. OBJECTIVES	10
3.1. General objective	10
3.2. Specific objectives	10
4. METHODS	11
4.1. Study area and period	11
4.2. Study Design	11
4.3. Source population	11
4.4. Study population	11
4.5. Inclusion and Exclusion criteria	11
4.6. Sample size determination	12
4.7. Sampling technique and procedures.	13
4.8. Variables of the Study	14
4.9. Operational definitions	14
4.10. Data collection tool	14

4.11. Data collection procedure.....	15
4.11. Data quality control	15
4.12. Data processing and analysis.....	15
4.13. Ethical considerations	16
4.14. Dissemination of results	16
5. Result.....	17
5.1. Socio-Demographic Characteristics	17
5.2 Patient and Drug related factor	18
5.3. Patient adherence status	20
5.4. Factors Associated with Non-Adherence to Anti-Diabetic Drugs	21
6. Discussion.....	23
7. REFERENCES	26

List of Figures

Figure 1: Conceptual frame work on nonadherence to anti diabetic medication and associated factors among adult type II DM patients on follow up at North Wollo zone public Hospitals, East Amhara, Ethiopia, 2022 (20,31 ,42).	9
Figure 2: Schematic presentation of sampling procedure of the study on nonadherence to anti diabetic medication and associated factors among adult type II DM patients on follow up at North Wollo zone public Hospitals, East Amhara, Ethiopia, 2022.....	13
Figure 3:- Pattern of adherence, north wollo zone, Ethiopia, 2023.....	21

List of Tables

Table 1: sample size calculation for the second objective, 2022.....	12
Table 2:- Socio-Demographic Characteristics of the Study Participants, 2023 (N= 327)	17
Table 3:- patient and drug related factor of the Study Participants, 2023 (N= 327)	Error!
Bookmark not defined.	
Table 4: -patient adherence status, 2023 (N= 327).....	Error! Bookmark not defined.
Table 5:- Logistic Regression Analysis of Non-Adherence to Medication and Associated Factors Among Patients with type II Diabetes Mellitus at North wollo Zone, Ethiopia, 2023 (n=327)	22

ABSTRACT

Background: Diabetes is a common long-term health condition and is characterized by too much glucose in the blood. Medication non-adherence comprehends a wide range of behaviors whether they are encountered deliberately or not, leading to either underuse or overuse of medications prescribed. Despite the high prevalence and economic impact of diabetes, there are still a significant number of Type 2 Diabetes Mellitus patients who are non-adherent to their prescribed medications. This can complicate the challenges of improving health in developing countries, and lead to waste and underutilization of already limited resources.

Objective: To assess the prevalence of non-adherence to anti-diabetic medications and associated factors among adult Type 2 DM patients on follow up at North Wollo zone public hospitals, East Amhara, Ethiopia, 2022.

Methods: A facility based cross-sectional study was conducted among 327 adult Type-II Diabetes Mellitus patients who are on follow up at North Wollo zone public Hospitals. data was collected using a structured interviewer administered questionnaire and analyzed using bivariable and multivariable logistic regression models. Both COR and an AOR with 95 percent confidence interval were used to identify factors significantly associated with Non-adherence to anti diabetic medication. Finally, variables with P-value <0.05 were declared as statistically significant.

Result: The overall prevalence of Medication non-adherence among the 327 type II DM patients included in the study was 24.5%. living <3 years since diagnosed with DM [AOR (95% CI); 3.37 (1.91,5.95)], rural residence [AOR (95% CI); 2.67 (1.49,4.79)], having comorbidities [AOR (95% CI); 2.99 (1.67,5.34)], and having no formal education [AOR (95% CI); 3.26 (1.49,7.16)] were those factors significantly associated with non-adherence to anti diabetic medications.

Conclusion: The overall prevalence of non-adherence towards antidiabetic medications in this study was higher than WHO and Ethiopian MOH acceptable limit. Educational status, duration of diabetes, residence and the presence of comorbidities were significantly associated with non-adherence to antidiabetic medications.

Key Words: Type II diabetes, non- adherence, Anti diabetic medication, North Wollo zone Public Hospitals.

1. INTRODUCTION

1.1. Background

Diabetes mellitus (DM) is probably one of the oldest diseases known to man. It is defined as a “metabolic disorder caused by different factors characterized by a chronic high level of blood sugar with disturbances to carbohydrate, fat, and protein metabolism resulting from defects in insulin secretion, insulin action, or both. It is a complex, chronic diseases requiring continuous medical care with multifactorial risk-reduction strategies beyond glycemic control (^{1,2}).

Globally, diabetes mellitus is becoming a major public health problem. The most common is type 2 diabetes, usually in adults, which occurs when the body becomes resistant to insulin or doesn't make enough insulin (³). Type two diabetes mellitus (T2DM) accounts for 90% of the total diabetes prevalence (⁴) which causes great healthcare challenges of the 21st century (⁵).

Non-adherence to antidiabetic medication remains the most common reason for poor health outcomes among people with diabetes. The levels of non-adherence to antidiabetic recommendations are highly variable but have significant effects on diabetes outcomes and the effectiveness of treatments (^{6,7}) Continuous evaluation of adherence is vital to identify factors and barriers contributing to non-adherence and its better management through timely identification of contributing factors and provision of individualized suitable recommendations that are essential for better healthcare management (^{8,9}).

Methods for measuring medication adherence are broadly categorized as either direct or indirect. Direct methods include directly observed treatment and monitoring of specific drug metabolite or biological markers. Direct methods are considered more accurate than indirect methods, but they are quite expensive and not used routinely in clinical practice. Indirect methods include self-reports, patient questionnaires, patient diaries, prescription refill records, electronic medication monitors, and patient clinical response. However, each indirect method has strengths and weaknesses and the use of a specific method to determine the level of medication adherence depends on the availability of required data and the nature of the clinical care setting (^{10,11})

1.2. Statement of the Problem

WHO defines adherence to long-term therapy as “the extent to which a person’s behavior; taking medications, following a diet, and/or executing lifestyle changes, corresponds with agreed recommendations from a healthcare provider” ⁽¹²⁾. Medication non-adherence comprehends a wide range of behaviors whether they are encountered deliberately or not leading to either underuse or overuse of medications prescribed. Underutilization of medications is manifested by a delay or failure to fill prescriptions, splitting pills, skipping doses, stopping medication early, and not refilling a prescription ⁽¹³⁾.

Despite, the high prevalence and economic impact of diabetes, there is still a significant number of Type 2 DM patients who are non- adherent to their prescribed medication. In the developed nations only 50% of patients adhere to their long-term therapies and it also is much lower in developing nations ⁽¹⁴⁾. previous studies documented that, the proportion of non-adherence was different in different setting. These were: 21.9% in Asia ⁽¹⁵⁾; 80% in Switzerland ⁽¹⁶⁾; 41.8% in Botswana ⁽¹⁷⁾; 73.64–86.6% in Nigeria ^(18,19) and 31.5% in Ghana ⁽²⁰⁾ and in Ethiopia, the proportion of non-adherence was ranged from 21.8 to 25.4% ^(21,22).

The level of non-adherence to medications among diabetes patients is variable in Ethiopia ranging from 34% ⁽²³⁾ to 68.8% ⁽²⁴⁾. Diabetic related complications ^(25,26), sex ⁽²⁵⁾, age ⁽²⁷⁾, level of education ^(25,28), lower income ⁽²⁷⁾, cost of transport to the hospital ^(23,29), longer duration under treatment ^(27,30,31), history of admission ^(29,32), and taking alcohol ⁽²³⁾ were reported to be predictors of medication non-adherence. Improving adherence to diabetes treatment thus is a vital public health issue. Age, knowledge about medication, and the presence of co-morbidities are among the most commonly reported determinants of medication non-adherence to diabetic treatment ^(33,34).

Poor health status, service dissatisfaction ^(16, 22); educational level ^(15, 35); age, gender and comorbidity ^(16, 19) were factors affecting medication non-adherence. Non-adherence also affected by diabetes knowledge, disease duration ⁽³⁵⁾; perception of consequence ^(15, 36); psychological problems and forgetfulness ^(37,38).

Non-adherence to medical therapy in T2DM patients is a key factor that influences treatment outcomes. Studies evidenced that non-adherence to diabetes medication increased the risk of retinopathy, nephropathy, and neuropathy (³⁹), increased the risk of hospitalization (^{40,41}), high cost of medical expenses (39,^{42,43}), increased the incidence of mortality and increased the risk for all-cause hospitalization and mortality (43).

Poor metabolic control is usually associated with non-adherence to anti-diabetic medications. Both acute and long-term complications might then be encountered due to poor metabolic control (12,33). Studies showed that there is unsatisfactory adherence to anti-diabetic medications and glycemic self-control in type 2 diabetic patients globally (⁴⁴).

Non-adherence to medications is possibly the most common reason for poor health outcomes among people with diabetes. The safety and effectiveness of anti-diabetic medications are compromised due to poor adherence of patients which leads to a higher rate of morbidity and mortality. This also contributes to elevated costs of the health care system either directly or indirectly (44).

A latest WHO report indicates that because the magnitude of non-adherence and the scope of its sequelae are so alarming, more health benefits worldwide could be achieved by improving adherence to available medications than by developing new treatment approaches. Studies revealed that compliance to chronic medications in high income countries is 50%. In low income countries, the prevalence is even lower (12). Poor compliance complicates the challenges of improving health in developing countries, and leads to waste and underutilization of already limited resources. Compliance studies are peculiar to every community and culture.

Generally, diabetes care is provided at general outpatient clinics or hospitals. The Ethiopian Diabetes Association has tried to share its part in diabetes prevention, care, and treatment (8). The majority of studies conducted in Ethiopia are limited to a single health facility which is difficult to be generalized and as much as my literature search, no study conducted on adherence status of adult type II DM patients in the study area. Therefore, this study addresses those gaps by including multiple health facilities to assess prevalence of non-adherence and associated factors.

1.3. Significance of the study

The findings of this study will help those public hospitals included in the study and the health professionals to determine the adherence level of their patients and those factors which can affect it, in order to provide a patient centered adherence counseling with a focus on those identified key factors which intern helps those patients with type II DM to have proper adherence, reduced complications and to have improved quality of life. In addition to this, the findings of this study will be used as a baseline evidence for future researches and together with other studies, this study will help policy makers to develop policies which properly considers local factors which affect adherence.

2. LITERATURE REVIEW

2.1. Prevalence of Non- Adherence

A study conducted in southern India show that, the prevalence of non-adherence to medication among type II was 54.66%. Another cross-sectional study done in India show that non-adherence to medication among type II diabetic patient was 70% (45). Similarly, a cross-sectional study conducted in Saudi show that non-adherence to medication among type II diabetic patient was 38% (46). Another study conducted in Saudi 2012 show that non-adherence to medication among type II diabetic patient was 67.9% (47). According to a study conducted in Bangladesh show that non-adherence to medication among type II diabetic patients was 64.86% (48). a study done in Mangalore India show that, Factors influencing adherence to anti-diabetes medications among type 2 diabetes patients was 43.5% (49).

In Africa, the prevalence of non- adherence to type II DM ranged from 24.5% to 79%. More specifically, the prevalence of non-adherence to medication among type II diabetic patient in Nigeria was 24.5% (18), 28.3% in Kenya (32), 31.5% in Ghana (20), 38.1% in Uganda (50), 53.5% in Rwanda (51), 54.4% in Cameroon (31), 55% in Sudan (52), 56.5% and 73.9% in Egypt (53, 54). And a study conducted in Zimbabwe show that the prevalence of non-adherence to medication among diabetic patient was 38.9% (55).

In Ethiopia different studies conducted on non-adherence to medication among type II diabetic patients and the results show that the prevalence of non-adherence to medication among type II diabetic mellitus patients was 24.3%, 21.8%, 31.2%, 33.2%, 34%, 41.5%, 63.9% and 68.8% in Jimma (56), Adama (21), Assela General hospital (57), Addiss Ababa Tiku Anbesa hospital (25), Dilla university referral hospital, Gedio (23), Debre Markos (58), Tigray (29) and Bahir Dar, respectively (24).

2.2. Factors Associated with non- adherence to antidiabetic medication

2.2.1 Patient related socio demographic, economic and behavioral factors

A study conducted in Bangladesh shows that, participants aged 60 years or more, monthly family incomes, and smoking, were significant associated with non-adherence to medication. (48). financial constraints, eating out, lack of detailed information on how to

exercise were factors which increases non- adherence, However, receiving support from family, being a member of the Diabetic Association and having attended more than two health education sessions in the past six months appeared to be protective factors against non-adherence to treatment recommendations in another study conducted in Zimbabwe (55). A study conducted in Saudi 2012 show that the non-compliance medication adherence in the urban population was significantly higher than the rural population (47). According to finding from a study conducted in Uganda, Age groups between 24–60 years and above 60 years were 1.1 times and 6.2 times more likely to be non-adherent to their antidiabetic medication, respectively. Being unemployed was protective and therefore less likely to lead to non-adherence to antidiabetic medication (50). Another study done in Tanzania show that, Patients in the age group of 41-50 years had the poorest adherence to medication (⁵⁹) In addition to this study conducted in Cameroon show that age > 60 years, alcohol consumption were significant associated with non-adherence (31).

Similar study done in Ruanda, Saudi 2012 showed that the females and being perceived as burden of the family were found to have a greater odd to be non-adhered to medications than the males (47). Additional study conducted in Nigeria show that, Age and marital status were significant associated with non-adherence to medication (18). A study done in Egypt show that Marital status of the patient, and being educated frequently about the disease and treatment regimen were the most important predictors of medication adherence (53).

Therefore, in Ethiopia, A study conducted in Bishoftu General Hospital show that Age, sex, educational level, marital status, residence and occupational status have no significant association with non-adherence (⁶⁰). Another study done in Gedio, the study revealed that cost of transport to the hospital and taking alcohol were significantly associated with non-adherence to the diabetic treatment (23).

A study conducted in Assela show that level of education, monthly income were a significant association between adherence to the medication (57). Another study conducted in Bahr dare show that, age group from 18 to 35 years old, single, fear of diabetes related complication and feeling worse were significantly associated with non-adherence to prescribed diabetes medications. Patients with age 18–35 years had 2.62 times more likely non-adherence when compared to with those aged 36–80 years. Participants who were

single in marital status were 3.55 times more likely non-adherence than as compared to married. Those diabetes patients who live in rural were 2.35 times more likely non-adherence as compared to urban (24).

Another study conducted in Debre Markos, show that Male sex, rural residence, being divorced, being merchant and self- or family-borne medical cost, presence of comorbidities were significantly associated with increased rate of non-adherence to anti-diabetic medications (58).

2.2.2. Drug related factor

According to A study done in India show that, patient who poor knowledge about disease, myths, distance from medical facility, cost of treatment, lack of satisfaction and forget to take medication (45). Similarly, study conducted in Bangladesh show that uncontrolled glycemic status was significantly associated with non-adherence to medication (48). Another study conducted in Sudan show that Poor medications knowledge, drug brand unavailability and forgetfulness were the main reasons for medications non-adherence (52). A study done in Kenya, show that, patients reporting poor patient-provider communication and dismissing attachment were significantly less likely to adhere to their medication and consequently had poorer glycaemic control (32). A study done in Cameroon show that participants on insulin therapy were more likely to be non-adherent to their antidiabetic medication (31). Another study conducted in Assela show that side effect and presence of glucometer at home, were a significant association between adherences to the medication (57).

2.2.3. Patient related factor

A study conducted in Ruanda, Uganda and Zimbabwe show that Duration of diabetic mellitus more than 5 years under anti-diabetic drugs were more likely to be non-adherent to medications compared to who spent less than 5 years under anti-diabetic medications (9,10,15). Additionally, a study conducted in Zimbabwe show that distance from health facility and affordability of drugs were significant associated with non-adherence to medication (55). Similarly, study done in Kenya, show that Patients who have had diabetes for a period of 2 to 10 years were found in this study to have less adherence to the diabetes mellitus medication than newly diagnosed patients (duration of disease <2 years) (32). Another study done in Cameroon show that, Patients attributed their non-adherence to forgetfulness, lack of finances and disappearance of symptoms (31). Similarly, study done

in Egypt show that absence of comorbid disease and diabetes complication were significant associated with non-adherence (53). Another study conducted in Saudi show that forgetfulness, fear of hypoglycemia, weight gain and difficulties with injections were significant associated with non-adherence medication (46).

Therefore, In Ethiopia a study done in Adama show that Patients with duration of diabetes ≤ 5 years were more compliant to their medication than those with >5 year, which was found to be statistically significant (21). Additionally, a study conducted in Kenya show that ever being admitted for diabetes mellitus were significant associated with poor medication adherence (32). Another study conducted in Debre Markos, show that presence of comorbidities were significantly associated with increased rate of non-adherence to anti-diabetic medications (58).

2.3. Conceptual frame work

The Conceptual frame work is adapted after a thorough reviewing of the literatures (20,31 ,42).

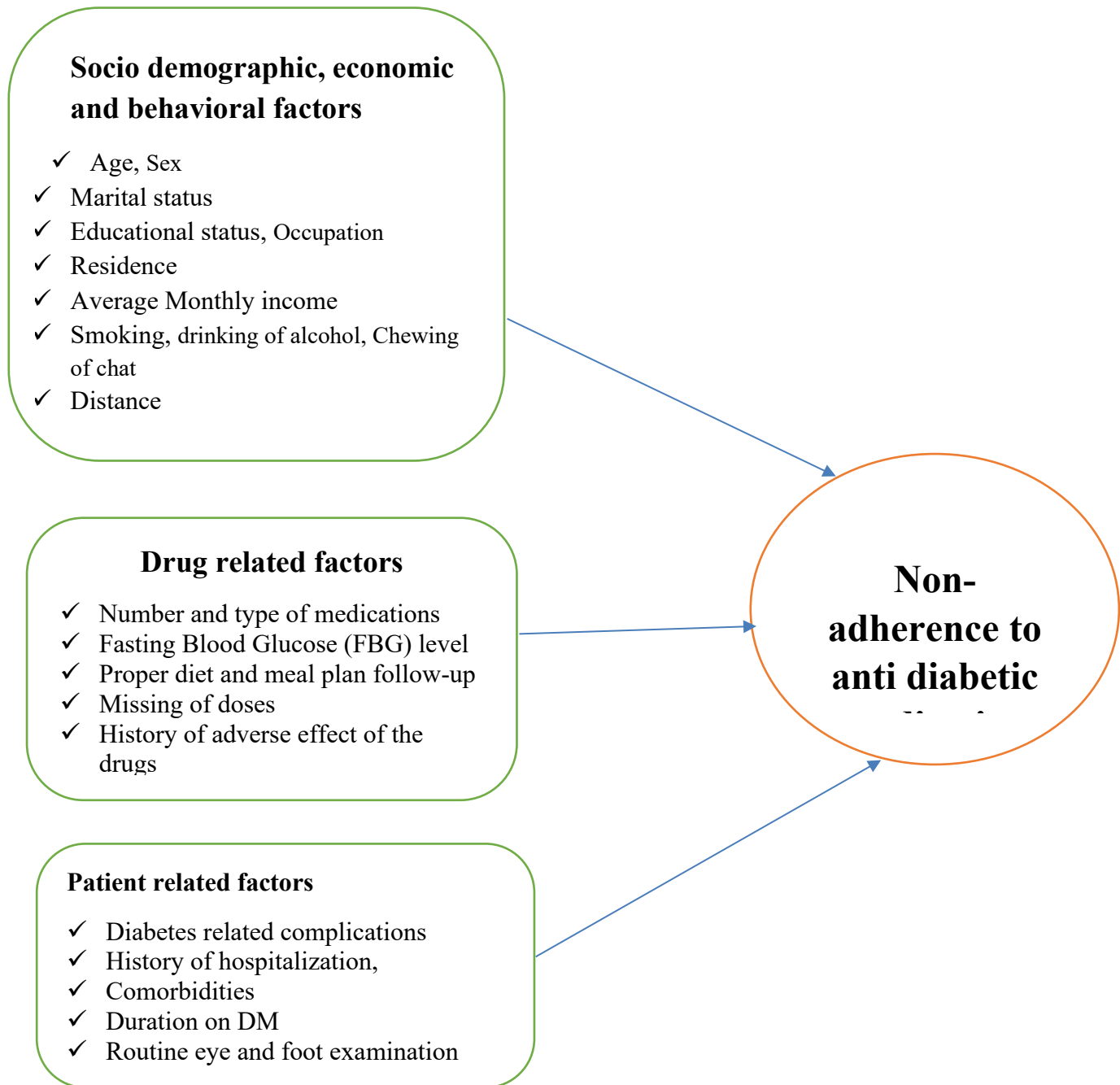


Figure 1: Conceptual frame work on nonadherence to anti diabetic medication and associated factors among adult type II DM patients on follow up at North Wollo zone public Hospitals, East Amhara, Ethiopia, 2022 (20,31 ,42).

3. OBJECTIVES

3.1. General objective

- To assess prevalence of non-adherence to anti diabetic medications and associated factors among adult type II DM patients on follow up at North Wollo zone public Hospitals, East Amhara, Ethiopia,2022.

3.2. Specific objectives

- To assess the prevalence of non-adherence to anti diabetic medications among adult type II DM patients on follow up at North Wollo zone public Hospitals, East Amhara, Ethiopia,2022.
- To identify factors associated with non-adherence to anti diabetic medications among adult type II DM patients on follow up at North Wollo zone public Hospitals, East Amhara, Ethiopia,2022.

4. METHODS

4.1. Study area and period

The study was conducted from December 1, 2022 to January 30, 2023 at selected North Wollo zone public Hospitals. The capital of North Wollo zone is Woldia town which is situated at a distance of 521 km from Addis Ababa, the capital city of Ethiopia. Based on the 2007 national census conducted by the Central Statistical Agency of Ethiopia (CSA), the town has a total population of 46,139, of whom 23,000 are men and 23,139 women (⁶¹). North Wollo zone has a total of 6 public Hospitals, 61 Health centers and 248 Health posts. Among the 6 public Hospitals located at North Wollo zone, 1 is comprehensive specialized hospital (Woldia CSH), 1 is General hospital (Lalibela GH), and four of them (Kobo, Mersa, Meket and Wadla) are primary hospitals. The total population served by those six public hospitals is estimated to be 18,042,743 and the total number of adults with type II DM having follow up at the 6 public hospitals are 1450 (⁶²).

4.2. Study Design

A facility based cross-sectional study was conducted.

4.3. Source population

All adult type II DM patients having follow up at North Wollo zone Public Hospitals.

4.4. Study population

All adult type II DM patients on follow up in selected North Wollo zone public Hospitals during data collection period.

4.5. Inclusion and Exclusion criteria

Inclusion criteria

All type II DM patients who are above 18 years of age and taking antidiabetic medications for greater than or equal to 6months and who have been on follow up during data collection

Exclusion criteria

Patients who had cognitive impairment and who were severely ill were excluded from the study since they cannot provide valid information.

4.6. Sample size determination

The sample size was calculated by using the single population proportion formula by taking the proportion of non- adherence to anti-diabetics medication, 41.5% from a previous study conducted in Debre Markos Compressive Specialized Hospital, 5% margin of error, 95% confidence interval (CI), The sample size will be calculated using the formula below (33)

$$n = \frac{(Z_{\alpha/2})^2 P (1-P)}{d^2}$$

$$= \frac{(1.96)^2 0.415(1-0.415)}{(0.05)^2} = 373$$

Since the total population (Total adult Type 2 diabetic patients followed at North Wollo zone Public Hospitals is 1450, which is less than 10,000 correction formula is used

$$n_f = \frac{n_i}{1+n_i/N}$$

Where n_f = final sample size
 n_i = initial sample size
 N = total population

$$= \frac{373}{1+373/1450} = 297$$

By adding 10% non-response rate, final sample size will be 327

For the second objective, sample size was calculated by using epi info version 7.2.5 stat calc for cross-sectional studies by assuming 95% two-sided confidence level and 80 % power by considering variables significantly associated with non-adherence from previous studies.

Table 1: sample size calculation for the second objective, 2022.

Variable	Ratio of unexposed: exposed	% out come among exposed	OR	Sample size	By Adding 10% non-response	reference
Age	1:1	49.48%	2.15	248	273	34
Duration of DM	1:9	60.9%	5.45	147	162	34
Knowledge towards DM and medications	5:1	68.88%	42.6	32	35	35

Since the sample size calculated for the first objective is larger than sample size calculated for the second objective, the final sample size for the study will be 327.

4.7. Sampling technique and procedures.

From the total of 6 public Hospitals located at North Wollo zone, 2 public hospitals (Woldia comprehensive specialized hospital and Lalibela general hospital) are selected by using simple random sampling and then, the study participants were enrolled proportionally from each selected Hospital by using lottery method after obtaining the list of medical record number of adult type II DM patients who have appointment in the two months data collection periods. since the total number of adult type II DM patients who have appointment over the two months is estimated to be 430 based on the selected facilities DM registration data, the study subjects were proportionally allocated with the formula $327/430$ which is 0.76. so, 76% of the total adults who will visit each selected hospital will be included.

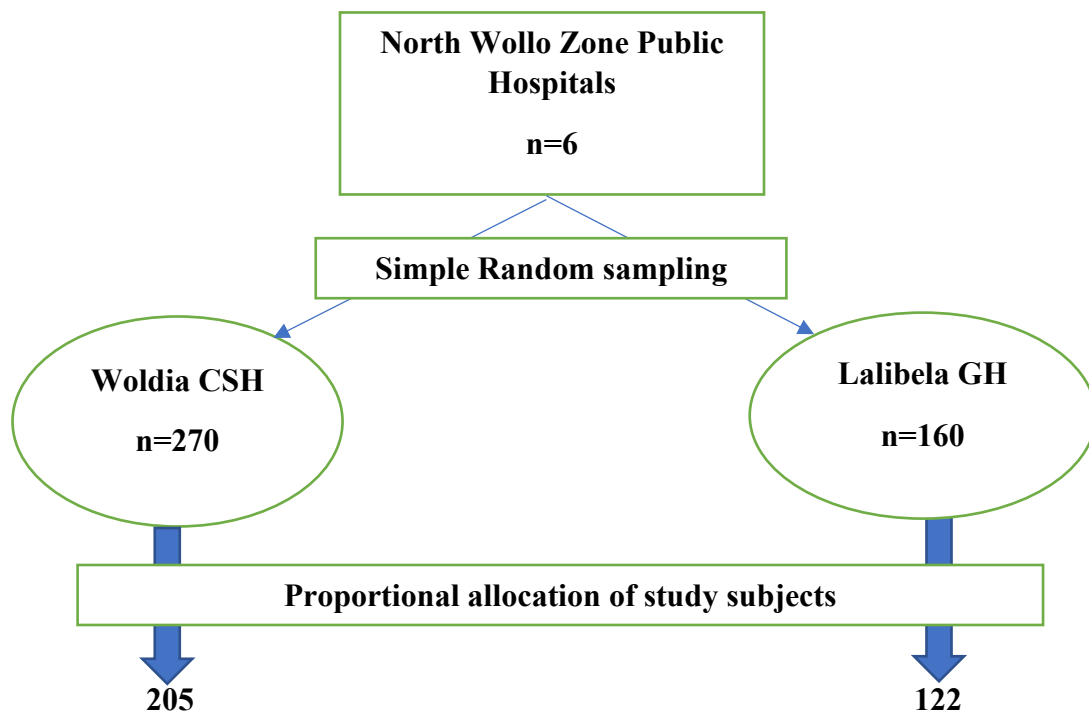


Figure 2: Schematic presentation of sampling procedure of the study on nonadherence to anti diabetic medication and associated factors among adult type II DM patients on follow up at North Wollo zone public Hospitals, East Amhara, Ethiopia, 2022.

4.8. Variables of the Study

4.8.1 Dependent variable

- Non-adherence to anti diabetic medication

4.8.2 Independent variables

Socio-demographic, economic and behavioral factors (Age, sex, marital status, educational status, Residence, occupation, smoking, distance, alcohol drinking, chat chewing and average monthly income)

Medication-related factors (Number and type of medications, Number of prescribed medications, Fasting Blood Glucose (FBG) level, history of adverse effect of the drugs)

Patient related factor (Diabetes related complications, History of hospitalization, Comorbidities, Duration since diagnosed of having DM, Routine eye and foot examination)

4.9. Operational definitions

Controlled Glycemic Level

An average fasting blood glucose (FBG) of 70 to 130 mg/ dl from the last three FBG reading retrieved from patients' records (56).

Uncontrolled Glycemic Level

An average FBG of >130 mg/dl and <70 mg/dl from the last three FBG reading retrieved from patients' records (56).

Medication Adherence status: will be assessed by using standardized medication adherence-assessment tools of the Morisky self-reporting scale which uses eight questions with “yes” or “no” responses. “no” response will be rated as 0, and each “yes” response will be rated as 1 (33).

Adherent-Those patients who scored less than or equal to 2 from the Morisky medication adherence scale (MMAS) (33).

Non-adherent-Those patient who scored more than 2 from the Morisky medication adherence scale (MMAS) (33).

4.10. Data collection tool

The data was collected by using a structured interviewer administered questionnaire which was prepared and utilized after reviewing relevant literature on the subject under investigation (Debre Markos, India Tigray). Simultaneously, the patient's medical card review were performed using a data abstracting tool (checklist) to assess the number of prescribed medications, glycemic control levels, DM-related complications, DM co-morbid conditions, and diabetes-related

admissions. Adherence status were assessed by using standardized medication adherence-assessment tools of the Morisky self-reporting scale.

4.11. Data collection procedure

Data were collected through face-to-face interviews and patient card review by one health professional (clinical nurse) for each hospital and one BSc nurse were assigned as supervisor for each hospital to check the data collection process on the spot to ensure completeness.

4.11. Data quality control

To ensure reliability, a standardized and valid medication adherence assessment tools was adopted and to ensure uniformity, the questionnaire were translated from English to Amharic by a language expert translator and then back to English by a second expert translator who is a health professional. The questionnaire were pretested on 5% of the overall sample size of DM patients on follow-up at Kobo primary hospital, with any necessary revisions made before it is used for actual data collection. Training on data collection tools and data collection process were given to data collectors and supervisors over the course of two days. The collected data were checked for completeness by the principal investigator and supervisor.

4.12. Data processing and analysis

The collected data was double-checked, coded, and entered into Epi-Data version 4.6. Then, it were exported to version 27 of the Statistical Package for the Social Sciences (SPSS) for statistical analysis. The study participants were described using descriptive statistics such as frequency, percentage, and measures of central tendency. Tables and figures were used to present the data. Then, to identify factors associated with non-adherence, bivariable and multivariable logistic regression model were used.

All independent variables with a p-value of ≤ 0.25 on bivariable logistic regression were entered to the multivariable logistic regression model. Using multivariable logistic regression analysis, those variables having a P-value of <0.05 were declared as statistically significant, both COR and an AOR with 95 percent confidence interval were used to identify factors significantly associated with Non-adherence to anti diabetic medication. Model fitness were checked by Hosmer and Lemshow statistic and multicollinearity were checked by using variance inflation factor (VIF).

4.13. Ethical considerations

Ethical clearance letter was obtained from the Ethical review board of Woldia University. Then, the letter were delivered to Woldia Compressive Specialized Hospital and Lalibela primary hospital to obtain permission to conduct the study. All participants recruited to the study receive a written information sheet regarding the study prior to data collection. To maintain confidentiality, patient name were not included in the questioner. After then, each study subject's agreement were obtained after the study's aims and methods have been explained to them. Finally, they were sign it as a confirmation.

4.14. Dissemination of results

The study's findings will be presented and submitted to Woldia University, Woldia comprehensive specialized hospital, Lalibela primary hospital to North Wollo Zone Health Department, to Amhara Regional Health Bureau, and other relevant governmental and nongovernmental organizations. And finally, Publication attempt will be made at international scientific journals.

5. RESULTS

5.1. Socio-Demographic Characteristics

A total of 327 participants completed the interview giving a response rate of 100%. Of these, 197(60.2%) were male diabetes patient. The majority 229(70%) of the study participants were in the age group 41-59 years and one hundred eight-four (56.3%) of the respondents were married. 142 (43.4%) had above secondary school and 112 (34.3%) were government employees. A total of 185 (56.6%) of the patients included in the study were urban. In addition, 197 one hundred ninety-seven (60.2%) were never drink Alcohol and 259 (79.2%) were did not Smoke cigarette currently. (Table 2)

Table 2:- Socio-Demographic Characteristics of the Study Participants, 2023 (N= 327)

variable	category	Frequency (n= 422)	Percentage
Age group	18-40	34	10.4%
	41-59	229	70%
	>= 60	64	19.6%
Sex	Male	197	60.2%
	Female	130	39.8%
Marital status	Single	34	10.4%
	Married	184	56.3%
	Divorced	31	9.5%
	Separated	42	12.8%
	widowed	36	11%
Level of Education	No formal education	50	15.3%
	Primary education	42	12.8%
	Secondary school	93	28.4%
	Above secondary school	142	43.4%
Occupation	Government employed	112	34.3%
	Self employed	67	20.5%
	Unemployed	54	16.5%
	Farmer	48	14.7%
	House wife	46	14.1%

Monthly income	<2000	103	31.5%
	2000-5000	145	44.3%
	5000-10000	41	12.5%
	>10000	38	11.6%
Residence	Rural	142	43.4%
	Urban	185	56.6%
Distance in HRs	<30minute	171	52.3%
	30 minute-1 hour	134	41%
	>1 hour	22	6.7%
Alcohol	Most of the time	42	12.8%
	Some time	88	26.9%
	Never	197	60.2%
Chew chat/khat	Yes	60	18.3%
	No	267	81.7%
Smoke cigarette currently	Yes	68	20.8%
	No	259	79.2%

5.2 Patient and Drug related factors

Among the study participant, 199 (60.9%) of them have been diagnosed for type II DM before three years and majority of the respondents 203(62.1%) had no complication. A total of 262 (80.1%) were regular eye and foot examination. The majority 236(72.8%) of the patients had no co-morbidities, while the rest 91 (27.2%) reported co-morbidity. Majority of respondents had no History of adverse effect of drugs 292 (89.3%). Concerning the type of medications they were taking, 136 (41.6%) had Single oral hypoglycemic agent, 119 (36.4%) of two oral hypoglycemic agent of 36 (11%) them utilized insulin, and 36 (11%) of them used insulin and one or more oral hypoglycemic agents.

Table 3:patient and drug related factors of Participants of the study on nonadherence to anti diabetic medication and associated factors among adult type II DM patients on follow up at North Wollo zone public Hospitals, East Amhara, Ethiopia, 2022.

Variable	Category	Frequency	Percent (%)
Duration in years since diagnosed with DM	< 3 years	128	39.1%
	>=3 years	199	60.9%
Complication	No complication	203	62.1%
	1 complication	103	31.5%
	2 or more complication	21	6.4%
Do you have regular eye and foot examination	Yes	262	80.1%
	No	65	19.9%
Do you have comorbidities	Yes	91	27.8%
	No	236	72.2%
Do you have history of hospitalization with DM	Yes	110	33.6%
	No	217	66.4%
Do you ever miss doses	Most of the time	37	11.3%
	Some times	83	25.4%
	Never	207	63.3%
History of adverse effect of drugs	Yes	35	10.7%
	No	292	89.3%
Patients FBS level(mg/dl)	Missing system	327	100%
Anti-diabetic medication currently use	Single oral hypoglycemic agent	136	41.6%
	Two oral hypoglycemic agents	119	36.4%
	Insulin	36	11%
	Insulin and oral hypoglycemic agent	36	11%

5.3. Patient adherence status

Two hundred sixty two (80.1%) participants claim they sometimes forget to take the prescribed medication(s). 67 (20.5%) of the respondents missed using their medications in the past two weeks; 71 (21.7%) did not bring along with their medicines during the journey; less than one-third (20.5%) of the study participants ever faced difficulty in remembering to consume their medicines. From the respondents, 66 (20.2%) discontinued their medication without consulting their physician because they feel the disease has improved.

Table 4: patient adherence status, 2022 (N= 327)

Variable	Category	Frequency	Percent (%)
Do you sometimes forget to take your medication	Yes	262	80.1%
	No	65	19.9%
Thinking over the past two weeks, were there any days when you did not take your medications	Yes	67	20.5%
	No	260	79.5%
Have you ever cut back or stopped taking your medications without telling your doctor, because you felt worse when you took it	Yes	71	21.7%
	No	256	78.3%
When you travel or leave home, do you sometimes forget to bring along your medications	Yes	67	20.5%
	No	260	79.5%
Did you take your medications yesterday	Yes	66	20.2%
	No	261	79.8%
When you feel like your health condition is under control, do you sometimes stop taking you medications	Yes	65	19.9%
	No	262	80.1%
Do you ever feel hassled about sticking to your treatment plan	Yes	69	21.1%
	No	258	78.9%
How often do you have difficulty remembering to take all your medications	Yes	70	21.4%
	No	257	78.6%

Prevalence of non-adherence

The overall prevalence of Medication non-adherence with score >2 using eight item Morisky adherence scale among the participants was 80 (24.5%).

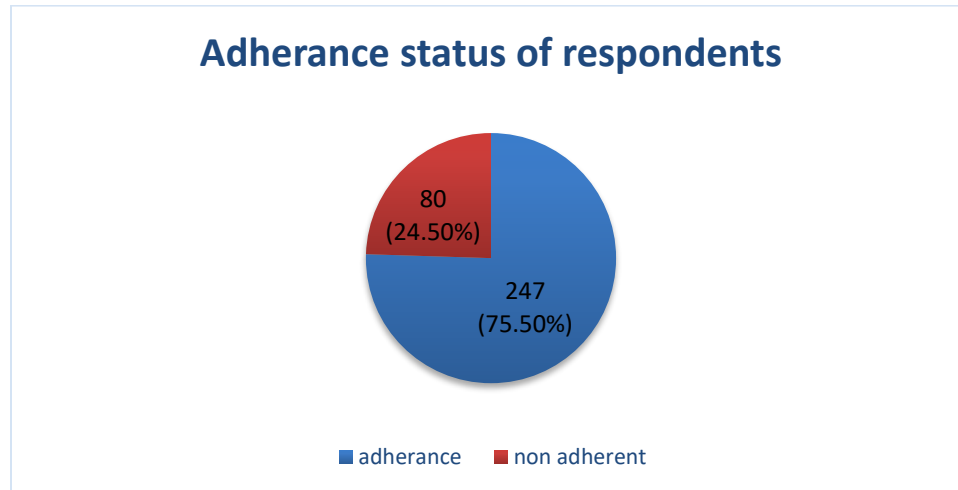


Figure 3:- adherence status of the study on nonadherence to anti diabetic medication and associated factors among adult type II DM patients on follow up at North Wollo zone public Hospitals, East Amhara, Ethiopia, 2022.

5.4. Factors Associated with Non-Adherence to Anti-Diabetic Medications

In the bivariable analysis, level of education, residence, duration of years since diagnosed with DM, comorbidity and having history of hospitalization with DM were associated with patients' non-adherence to anti-diabetic medications. However, in multivariable analysis only, level of education, residence, duration in years since diagnosed with DM, and the presence of comorbidity were significantly associated with patients' non-adherence to anti-diabetic medications.

Those who are Living for <3 years since being diagnosed of having DM had 3.37 times increased odds of Non-adherence to medications as compared to those who have ≥ 3 years since diagnosed of having DM [AOR (95% CI); 3.37 (1.91,5.95)].

Those patients who live in rural area were 2.67 times more likely to be non-adherent to anti diabetic medication compared to patients who live in urban areas while keeping all other variables in the model constant. [AOR (95% CI); 2.67 (1.49,4.79)].

Keeping all other variables in the model constant, those patients who have comorbidities are 3 times more likely to be non-adherent to anti diabetic medications as compared to their counter parts [AOR (95% CI); 2.99 (1.67,5.34)].

Those patients who have no formal education are 3.26 times non-adherent to anti diabetic medication than those patients attending above secondary education [AOR (95% CI); 3.26 (1.49,7.16)] while keeping all other variables in the model constant.

Table 5:- Logistic Regression Analysis of Non-Adherence to Medication and Associated Factors Among Patients with type II Diabetes Mellitus at North Wollo Zone, Ethiopia, 2022 (n=327)

Variable	Categories	Adherence status		COR (95%CI)	AOR (95%CI)	P-value
		Non-Adherent	Adherent			
Level of education	No formal education	21	29	2.82(1.41,5.65)	3.26(1.49,7.16)	0.003**
	Primary education	10	32	1.22(0.54,2.76)	1.51(0.62,3.67)	0.360
	Secondary education	20	73	1.07(0.56,2.03)	1.36(0.67,2.75)	0.397
	above Secondary	29	113	1	1	
Residence	Rural	47	95	2.28(1.36,3.81)	2.67(1.49,4.79)	0.001**
	Urban	33	152	1	1	
Duration since diagnosed with DM	<3years	50	78	3.61(2.13,6.11)	3.37(1.91,5.95)	0.000**
	>=3years	30	169	1	1	
Comorbidities	Yes	39	52	3.57(2.09,6.09)	2.99(1.67,5.34)	0.000**
	No	41	195	1	1	
History of hospitalization with DM	Yes	21	89	0.63(0.36,1.11)	0.81(0.43,1.50)	0.500
	No	59	158	1	1	

*P-Value <0.05, **P-Value < 0.005, Hosmer Lemshow model fitness p-value =0.229

6. DISCUSSION

The overall prevalence of non-adherence to medications among type II DM patients in this study was 24.5%. This finding is consistent with studies conducted in Nigeria (18), Kenya (32), Adama (21) and Assela general hospital (57) but the prevalence of non-adherence obtained in this study is lower when compared to studies conducted in India (45), Saudi Arabia (46), Sudan (52) and Egypt (53). This finding is also lower than the majority of studies conducted in Ethiopia (23,24,29,56). This might be due to the difference in study time since the majority of studies were conducted before 2020, the difference in study setting since some studies were conducted among both type I and II DM, and due to measurement differences since some of the studies utilized the oldest version of the MMA scale and others measure adherence with non-standardized tools.

In this study duration since diagnosed of having DM is significantly associated with non-adherence to anti diabetic medication with having less than three years since diagnosed with DM significantly increased non-adherence. This finding is supported by studies conducted in Kenya (32), Adama (21) and Gondar (35). This could be explained by the facts that having many years with the disease is related with increased exposure to health professionals which can increase the chance to get repetitive instruction on medication adherence and become aware of the acute and chronic complications of uncontrolled blood glucose. In addition, it could be a reflection of wider social interaction with other diabetic patients on antidiabetic medication adherence which can decrease non-adherence (35).

In addition, DM patients who live Rural residence can increase the likelihood of non-adherence compared to those patients who resides in Urban area and this finding is consistent with studies conducted in Bahrdar (24), Debre Markos (58) and Gondar (35). This might be due to the fact that living in rural area means increased transportation cost and more time wastage to comply with appointment dates for medication refill which can increase the likelihood of non-adherence (35).

The other factor which is significantly associated with non-adherence to medications is the presence of comorbidity and this study revealed that those patients who have comorbidities are three times more likely to be non-adherent to anti diabetic medications as compared to those who are free from comorbidities. This finding is supported by another study conducted in Debre

Markos (58) and the possible justification might be the fact that having comorbidities increases pill burden, drug side effect and cost of treatment which can increase non-adherence (58).

The other factor which is significantly associated with non-adherence was level of education and this study reported that having no formal education significantly increased the likely hood of non-adherence compared to those who have attending above secondary education. This finding is consistent with studies conducted in Gondar (35) and Assela (57). The possible justification of this could be the fact that educational level is the most important predictor of knowledge of patients. Low schooling makes learning more difficult; as diabetes drug therapy gets more complex, patients are required to have more complex cognitive skills to be able to understand the prescribed drug therapy and to adhere to medications (57).

7. CONCLUSION AND RECOMMENDATIONS

Conclusion

The overall prevalence of non-adherence towards antidiabetic medications in this study was higher than WHO and Ethiopian MOH acceptable limit. Educational status, duration of diabetes, residence and the presence of comorbidities were significantly associated with non-adherence to antidiabetic medications. Having less than three years since diagnosed with DM, having no formal education, having comorbidities and rural residence were those factors which increase non-adherence to antidiabetic medication.

Recommendations

Based on the findings of the study I provide the following recommendations to

Health professionals

- Better to assess the adherence status of all type II DM patients on follow up and give proper counseling regarding the health consequences of having poor adherence
- Should give special emphasis to those diabetic patients who had comorbidities

Public hospitals

- Should prepare group health education sessions on regular basis with a focus on the health risk of medication non-adherence and what drug resistance mean for all clients visiting the hospitals
- Better to take in to considerations on cost of medications with special emphasis for those type II DM patients with comorbidity, and those traveling long to reach the facility for regular appointments

8. REFERENCES

-
- ¹ . American Diabetes Association. Diagnosis and classification of diabetes mellitus. *Diabetes Care*. 2004; 27:5–10.
 - ² . Kaufman FR, editor. Medical management of type 1 diabetes. 6th ed. Alexandria: American Diabetes Association; 2012.
 - ³ Tabish SA. Is Diabetes Becoming the Biggest Epidemic of the Twenty-first Century? *Int J Health Sci (Qassim)*. 2007; 1: V–VIII. PMID: 21475425
 - ⁴ Dipiro JT, Talbert RL, Yee GC, Matzke GR, Wells BG, Posey LM. *Pharmacotherapy—a pathophysiologic approach*, 9th edn. USA: McGraw-Hill Professional; 2014
 - ⁵ World Health Organization. Global report on diabetes. Geneva: World Health Organization; 2016.
 - ⁶ Bagonza J, Rutebemberwa E, Bazeyo W. Adherence to anti-diabetic medication among patients with diabetes in eastern Uganda; a cross-sectional study. *BMC Health Serv Res*. 2015;15(1):168. doi:10.1186/s12913-015-0820-5
 - ⁷ WHO. Diabetes the problem. *Diabetes Fact Sheet*. 2010 this is not complete
 - ⁸ Ethiopian Diabetes Association, Adama, Ethiopia, 2009, <http://www.diabetesethiopia.org.et/.IDF>.
 - ⁹ IDF Diabetes Atlas 7th edition. International Diabetes Federation. 2015. <https://doi.org/10.1289/image.ehp.v119.i03>
 - ¹⁰ Ogurtsova K, da Rocha Fernandes JD, Huang Y, Linnenkamp U, Guariguata L, Cho NH, et al. IDF Diabetes Atlas: Global estimates for the prevalence of diabetes for 2015 and 2040. *Diabetes Res Clin Pract*. 2017; 128: 40–50. <https://doi.org/10.1016/j.diabres.2017.03.024> PMID: 28437734
 - ¹¹ IDF. *IDF diabetes atlas*, Eighth edition. 2017.
 - ¹² WHO. Towards the solution. In: *Adherence to long-term therapies*. 2003. p. 1–11.

-
- ¹³ Adisa R, Alutundu MB, Fakeye TO. Factors contributing to nonadherence to oral hypoglycemic medications among ambulatory type 2 diabetes patients in Southwestern Nigeria. *Pharm Pract (Granada)*. 2009;7(3):163–9.
- ¹⁴ De Geest S, Sabate E. Adherence to long-term therapies: Evidence for action. *Eur J Cardiovasc Nurs*. 2003; 2: 323. [https://doi.org/10.1016/S1474-5151\(03\)00091-4](https://doi.org/10.1016/S1474-5151(03)00091-4) PMID: 14667488
- ¹⁵ Manjusha S, Madhu P, Atmatam P, Amit M, Ronak S. Medication adherence to antidiabetic therapy in patients with type 2 diabetes mellitus. *Int J Pharm Pharm Sci*. 2014;6(2):564–70.
- ¹⁶ Huber CA. Medication adherence in patients with diabetes mellitus: does physician drug dispensing enhance quality of care? Evidence from a large health claims database in Switzerland. *Patient Prefer Adherence*. 2016;10:1803–9.
- ¹⁷ Rwegerera GM, Moshomo T, Gaenamang M, Oyewo TA, Gollakota S, Mhimbira FA, Fadare J, Godman B, Meyer JC, Rivera YP. Antidiabetic medication adherence and associated factors among patients in Botswana; implications for the future. *Alex J Med*. 2018;54(2):1039.
- ¹⁸ Abdulazeez I, Omole M, Lekan S. Medication adherence amongst diabetic patients in a tertiary healthcare institution in central Nigeria. *Trop J Pharm Res*. 2014;13(6):997–1001.
- ¹⁹ Olufunsho A, Jemmela AO. Medication adherence in type 2 diabetes patients: study of patients in Alimosho General Hospital, Igando, Lagos, Nigeria. *Afr Health Sci*. 2015;15(2):513–22.
- ²⁰ Prosper A, Amaltinga M. Non adherence to diabetic medication among diabetic patients, a case study of Dormaa Hospital Ghana. *Sci J Public Health*. 2017;5(2):88–97.
- ²¹ Gelaw BK, Mohammed A, Tegegne GT, Defersha AD, Fromsa M, Tadesse E, et al. Nonadherence and contributing factors among ambulatory patients with antidiabetic medications in Adama Referral Hospital. *J Diabetes Res*. 2014;1–9. <http://dx.doi.org/10.1155/2014>.
- ²² Abebe S, Berhane Y, Worku A. Barriers to diabetes medication adherence in North West Ethiopia. *Springerplus*. 2014;3(195):1–6.

-
- ²³ Boshe BD, Yimar GN, Dadhi AE, Bededa WK. The magnitude of non-adherence and contributing factors among adult outpatient with Diabetes Mellitus in Dilla University Referral Hospital, Gedio, Ethiopia. *PLoS One*. 2021 Mar 4;16(3):e0247952.
- ²⁴ Abate TW. Medication non-adherence and associated factors among diabetes patients in Felege Hiwot Referral Hospital, Bahir Dar city administration, Northwest Ethiopia. *BMC Res Notes*. 2019 Dec;12(1):1-6.
- ²⁵ Demoz GT, Berha AB, Woldu MA, Yifter H, Shibeshi W, Engidawork E. Drug therapy problems, medication adherence and treatment satisfaction among diabetic patients on follow-up care at Tikur Anbessa Specialized Hospital, Addis Ababa. *PLoS One*. 2019 Oct 1;14(10):e0222985.
- ²⁶ Kusa W, Tolessa D, Abdeta T. East African Journal of Health and Biomedical Sciences (2019) Type II DM Medication Non-Adherence in Adama Hospital Medical College , Central. *East African J Heal Biomed Sci*. 2019;23(3): 31-38.
- ²⁷ Kirkman MS, Rowan-Martin MT, Levin R, Fonseca VA, Schmittiel JA, Herman WH, et al. Determinants of adherence to diabetes medications: Findings from a large pharmacy claims database. *Diabetes Care*. 2015;38(4):604–9.
- ²⁸ Ali M, Alemu T, Sada O. Medication adherence and its associated factors among diabetic patients at zewditu memorial hospital, addis ababa, ethiopia. *BMC Res Notes*. 2017;10(1):1–5.
- ²⁹ Araya EM, Gebrezgabiher HA, Tekulu GH, Alema NM, Getnet D, Gebru HT, et al. Medication NonAdherence and Associated Factors Among Diabetic Patients Visiting General Hospitals in the Eastern Zone of Tigray, Northern Ethiopia. *Patient Prefer Adherence*. 2020;2020(14):2071–2083.
- ³⁰ Bagonza J, Rutebemberwa E, Bazeyo W. Adherence to anti diabetic medication among patients with diabetes in eastern Uganda; A cross sectional study *Health systems and services in low and middle income settings*. *BMC Health Serv Res*. 2015;15(1):1–7.

-
- ³¹ Aminde LN, Tindong M, Ngwasiri CA, Aminde JA, Njim T, Fondong AA, et al. Adherence to antidiabetic medication and factors associated with non-adherence among patients with type-2 diabetes mellitus in two regional hospitals in Cameroon. *BMC Endocr Disord*. 2019;19(1):1–9.
- ³² Waari G, Mutai J, Gikunju J. Medication adherence and factors associated with poor adherence among type 2 diabetes mellitus patients on follow-up at Kenyatta National Hospital, Kenya. *Pan Afr Med J*. 2018;29(82).
- ³³ García-Pérez LE, Álvarez M, Dilla T, Gil-Guillén V, Orozco-Beltrán D. Adherence to therapies in patients with type 2 diabetes. *Diabetes Ther*. 2013;4(2):175–94.
- ³⁴ Kalyango JN, Owino E, Nambuya AP. Nonadherence to diabetes treatment at mulago hospital in Uganda: Prevalence and associated factors. *Afr Health Sci*. 2008;8(2):67–73.
- ³⁵ Abebaw M, Messele A, Hailu M, Zewdu F. Adherence and associated factors towards antidiabetic medication among type II diabetic patients on follow-up at University of Gondar Hospital. Northwest Ethiopia. *Adv Nurs*. 2016;2016:8579157. <https://doi.org/10.1155/2016/8579157>.
- ³⁶ Habte BM, Kebede T, Fenta TG, Boon H. Barriers and facilitators to adherence to anti-diabetic medications: Ethiopian patients' perspectives. *Afr J Prim Health Care Fam Med*. 2017;9(1):1–9.
- ³⁷ Albuquerque C, Correia C, Ferreira M. Adherence to the therapeutic regime in person with type 2 diabetes. *Soc Behav Sci*. 2015;171:350–8.
- ³⁸ Al-Hayek A, Robert A, Alzaid A, Nusair H. Association between diabetes self-care, medication adherence, anxiety, depression, and glycemic control in type 2 diabetes. *Saudi Med*. 2012;33(6):681–3.
- ³⁹ Fukuda H, Mizobe M. Impact of nonadherence on complication risks and healthcare costs in patients newly-diagnosed with diabetes. *Diabetes Res Clin Pract*. 2017; 123: 55–62. <https://doi.org/10.1016/j.diabres.2016.11.007> PMID: 27940390

-
- ⁴⁰ Hong JS, Kang HC. Relationship Between Oral Antihyperglycemic Medication Adherence and Hospitalization, Mortality, and Healthcare Costs in Adult Ambulatory Care Patients With Type 2 Diabetes in South Korea. *Med Care.* 2011; 49: 378–384. <https://doi.org/10.1097/MLR.0b013e31820292d1> PMID: 21368684
- ⁴¹ Sokol MC, McGuigan KA, Verbrugge RR, Epstein RS. Impact of Medication Adherence on Hospitalization Risk and Healthcare Cost. *Med Care.* 2005; 43: 521–530. <https://doi.org/10.1097/01.mlr.0000163641.86870.af> PMID: 15908846
- ⁴² Breitscheidel L, Stamenitis S, Dippel F-W, Schoffski O. Economic impact of compliance to treatment with antidiabetes medication in type 2 diabetes mellitus: a review paper. *J Med Econ.* 2010; 13: 8–15. <https://doi.org/10.3111/13696990903479199> PMID: 19947905
- ⁴³ Ho P, Rumsfeld J, Masoudi F, McClure D, Plomondon M, Steiner J, et al. Effect of medication nonadherence on hospitalization and mortality among patients with diabetes mellitus. *Arch Intern Med.* 2006; 166: 1836–1841. <https://doi.org/10.1001/archinte.166.17.1836> PMID: 17000939
- ⁴⁴ Kasznicki J, Głowacka A, Drzewoski J. Type 2 diabetic patients compliance with drug therapy and glycaemic control. *Diabetol Dosw i Klin.* 2007;7(4):199–203.
- ⁴⁵ Divya S, Pratibha N. Factors contributing to non-adherence to medication among type 2 diabetes mellitus in patient attending tertiary care hospital in South India. *Asian J Pharm Clin Res.* 2015; 8(2):8–10.
- ⁴⁶ Dalia Almaghaslah, Arwa Khled Abdelrhman, Shroouk Khaled AL-Masdaf, Layla Mohammed Majrashi, Basayer Mostafa Matary, Wegdan Mohammed Asiri, Bayan Ali Alqhatani. Factors contributing to non-adherence to insulin therapy among type 1 and type2 diabetes mellitus patients in Asser region, Saudi Arabia, *Biomedical Research* 2018; 29 (10): 2090-2095.
- ⁴⁷ Khan AR, Lateef ZNA-A, Al Aithan MA, Bu-Khamseen MA, Al Ibrahim I, Khan SA. Factors contributing to non-compliance among diabetics attending primary health centers in the Al Hasa district of Saudi Arabia. *Journal of Family and Community Medicine.* 2012;19 (1):26.

-
- ⁴⁸ Khan II, Pullock OS, Pinky SD, Barua B, Dola TA, and Chowdhury P, et al. Treatment noncompliance level among patients with type 2 diabetes mellitus: A hospital based cross-sectional study in Bangladesh. September 13, 2022, PLOS ONE <https://doi.org/10.1371/journal.pone.0271107>
- ⁴⁹ Rekha Thapara,b, Ramesh Hollaa,b, Nithin Kumara,b,*, Shodhan Aithalc,d, Sahana Karkerac. Factors influencing adherence to anti-diabetes medications among type 2 diabetes patients attending tertiary care hospitals in Mangaluru India. *Clinical Epidemiology and Global Health* 8 (2020) 1089–1093
- ⁵⁰ Karekoona F, Tadele M, Jonans T, Factors Associated With Non-Adherence To Antidiabetic Medication Among Patients at Mbarara Regional Referral Hospital, Mbarara, Uganda. *BMC Health Serv Res.* 2021; <https://doi.org/10.21203/rs.3.rs-571953/v1>
- ⁵¹ Jean de Dieu Murwanashyaka, Albert Ndagijimana, Emmanuel Biracyaza2, François Xavier Sunday and Maryse Umugwaneza. Non-adherence to medication and associated factors among type 2 diabetes patients at Clinique Medicale Fraternite, Rwanda: a cross-sectional. *BMC Endocrine Disorders* 2022) 22:219, <https://doi.org/10.1186/s12902-022-01133-0>
- ⁵² El-Hadiyah TM, Madani AM, Abdelrahim HM, Yousif AK. Factors affecting medication non-adherence in type 2 Sudanese diabetic patients. *J PharmacolPharm.* 2016;7:1416. <https://doi.org/10.4236/> pp.2016. 74018.
- ⁵³ Rasha Abd Elhameed Ali, et al Medication adherence and predictors of non-adherence among patients with type 2 Diabetes Mellitus in Sohag, Egypt. *The Egyptian Journal of Community Medicine* Vol. 39 No. 4 Oct. 2021
- ⁵⁴ Heissam K, Abuamer Z, El-Dahshan N. Patterns and obstacles to oral antidiabetic medications adherence among type 2 diabetics in Ismailia, Egypt: a cross section study. *The Pan African Medical Journal.* 2015; 20.
- ⁵⁵ Winnie M, Edward, E D, Auxilia Chideme-M, George M. Non-Adherence To Treatment Among Diabetic Patients Attending Outpatients Clinic At Mutare Provincial Hospital, Manicaland Province, Zimbabwe. *International journal of scientific & technology research* volume 3, issue 9, September 2014, ISSN 2277-8616.

-
- ⁵⁶ Gebrehiwot T, Jemal H, Dawit T. Non-adherence and associated factors among type 2 diabetic patients at Jimma University Specialized Hospital, Southwest Ethiopia. *J Med Sci.* 2013;13(7):576–84.
- ⁵⁷ Kassahun A, Gashe F, Mulisa E, Rike WA. Non-adherence and factors affecting adherence of diabetic patients to anti-diabetic medication in Assela General Hospital, Oromia Region, Ethiopia. *J Pharm Bioallied Sci.* 2016;8(2):124–129. doi:10.4103/0975-7406.171696
- ⁵⁸ Yihunie Mitiku, Anteneh Belayneh, Bantayehu Addis Tegegne, et al. Prevalence of Medication Non- Adherence and Associated Factors among Diabetic Patients at Debre Markos, Northwest Ethiopia. *Ethiop J Health Sci.* 2022;32(4):755.doi:http:// dx.doi.org/10.4314/ejhs.v32i4.12
- ⁵⁹ Godfrey Mutashambara Rwegerera. Adherence to anti-diabetic drugs among patients with Type 2 diabetes mellitus at Muhimbili National Hospital, Dar es Salaam, Tanzania- A cross-sectional study. *Pan African Medical Journal.* 2014; 17:252 doi:10.11604/pamj.2014.17.252.2972
- ⁶⁰ Gebremeskel AT, Tegegne GT, Gelaw BK, et al. Non adherence and its contributing factors among ambulatory type two diabetic patients in Bishoftu General Hospital, South East, Ethiopia. *Int J Univers Pharm Biol Sci.* 2014;3(4):13–27.
- ⁶¹ CSA, Ethiopia, 2015.
- ⁶² North Wollo zone quarter report, Ethiopia, 2022. this is not complete

8. ANNEXES

ANNEX 1. INFORMATION SHEET AND INFORMED CONSENT

Dear respondent:

Hello, my name is _____. Today I am here to collect data to assess the prevalence of non-adherence to anti-diabetic medication and associated factors among Type 2 DM adult patients having follow up at Woldia comprehensive specialized hospital. I am asking you for a few minutes of your time to participate in this study. The information I interviewed and you give will be very useful in the realization of this study, and it will be kept confidential. your Name and Address will not be recorded. You have the right not to answer for any questions which might be inconvenient for you. However, your information is very important for the study. And we would like to confirm to you that all your data are confidential and used for research purpose only.

Are you willing to participate in this study?

Sign-----

Thank you for spending your precious and valuable time.

APPENDIX 2: ENGLISH VERSION QUESTIONNAIRE

Good morning/afternoon? I am healthcare professionals. I need to collect data regarding Prevalence of non-adherence to anti-diabetic medication and associated factors among adult Type II DM patients having follow up at North Wollo Zone public hospitals, using structured questionnaires. It will take 15 to 20 minutes. Your honest response is very important to produce quality data in the organization there by to plan appropriate measures that could be taken.

Thank you for your participation.

Table **Error! Main Document Only.:** Questioner tool

Section 1: Sociodemographic question	
1.1.Age (in Years)	_____
1.2.Sex	a) Male b) Female
1.3.Marital status	a) Single b) Married c) Divorced d) Separated e) Widow
1.4.Educational level	a) No formal education b) Primary school c) Secondary school d) Above secondary
1.5.Occupation	a) Government employed b) Self employed c) Unemployed d) Farmer e) House wife

1.6.Average Monthly income (Ethiopian birr)	_____
1.7.Place of residence	a) Rural b) Urban
1.8.Distance of your home from the hospital (by car)	_____ Hours
1.9. Do you drink alcohol?	a) Most of the time b) Some times c) Never
1.10. Do you chew chat?	a) Yes b) No
1.11. Do you smoke cigarettes'?	a) Yes b) No
Section 2: Patient and drug related factors	
2.1. duration (in years) since you have been diagnosed of having DM.	a) < 5 years b) 5-10 years c) 10-20 years d) > 20 years
2.2. Number of diabetes related complications	a) None b) 1 c) 2 or more
2.3. Do you get regular eye and foot examination?	a) Yes b) No
2.4. Do you have comorbidities?	a) Yes b) No
2.5. Do you have history of hospitalization with DM?	a) Yes b) No
2.6. Do you miss doses?	a) Most of the time b) Some times c) Never

2.7. History of adverse effect of drugs?	a) Yes b) No
2.8. Fasting blood glucose level	_____
2.9. Current anti diabetic medications	a) Single OHA b) Two OHA c) Insulin I d) Insulin and OHA

Section 3: Patient adherence status		
	Yes	No
3.1. Do you sometimes forget to take your medications?		
3.2. People sometimes miss taking their medications for reasons other than forgetting. Thinking over the past two weeks, were there any days when you did not take your medications?		
3.3. Have you ever cut back or stopped taking your medications without telling your doctor, because you felt worse when you took it?		
3.4. When you travel or leave home, do you sometimes forget to bring along your medications?		
3.5. Did you take your medications yesterday?		
3.6. When you feel like your health condition is under control, do you sometimes stop taking you medications?		

3.7. Taking medications every day is a real inconvenience for some people. Do you ever feel hassled about sticking to your treatment plan?		
3.8. How often do you have difficulty remembering to take all your medications?	<ul style="list-style-type: none"> • Never/rarely • Once in a while • Sometimes • Usually • All the time 	4 3 2 1 0

APPROVAL SHEET

PREVALENCE OF NON-ADHERENCE TO ANTI-DIABETIC MEDICATION AND ASSOCIATED FACTORS AMONG ADULT TYPE II DM PATIENTS ON FOLLOW UP AT NORTH WOLLO ZONE PUBLIC HOSPITALS, EAST AMHARA ETHIOPIA, 2022 G.C.

Submitted by:

Name of Researcher

Signature

Date

Approved by:

1. _____
Name

Signature

Date

2. _____
Name

Signature

Date

3. _____
Name

Signature

Date

አባሪ 1. የመረጃ ወረቀት እና በመረጃ የተደገፈ ስምምነት

ውድ ምላሽ ሰጪ፡-

ሰላም፡ ስሜ _____ . ዛሬ በወልድያ ኮምፕረኒንግ ስፔሻላይዝድ ሆስፒታል እና ላሊበላ ጠቅላላ ሆስፒታል ክትትል በሚደረግላቸው ዓይነት ሁለት ስኳር ጎልማሳ ህሙማን ላይ የፀረ-ስኳር በሽታ መድሀኒቶችን ያለመከተል ስርጭት እና ተያያዥ ምክንያቶችን ለመገምገም መረጃ ለመሰብሰብ መጥቻለሁ። በዚህ ጥናት ውስጥ ለመሳተፍ ለጥቂት ደቂቃዎች ጊዜዎን እጠይቃችኋለሁ. ቃለ መጠይቅ ያደረግኩት እና እርስዎ የሰጡት መረጃ ለዚህ ጥናት ተግባራዊነት በጣም ጠቃሚ ይሆናል እናም በሚስጥር ይጠበቃል። ስም እና አድራሻ አይመዘገብም። ለእርስዎ የማይመች ለሆኑ ጥያቄዎች መልስ ያለመስጠት መብት አልዎት። ሆኖም፣ የእርስዎ መረጃ ለጥናቱ በጣም አስፈላጊ ነው። እና ሁሉም የእርስዎ መረጃዎች ሚስጥራዊ እና ለምርምር ዓላማ ብቻ ጥቅም ላይ የሚውሉ መሆናቸውን ልናረጋግጥልዎ እንወዳለን። በዚህ ጥናት ለመሳተፍ ፈቃደኛ ነህ?

ይፈርሙ ----

ውድ እና ጠቃሚ ጊዜዎን ስላሳለፉ እናመሰግናለን።

አባሪ 2፡ የአማርኛ እትም ጥያቄ

ደህና አደሩ/ዋሉ? እኔ የጤና ባለሙያ ነኝ። በሰሜን ወሎ ዞን የህዝብ ሆስፒታሎች ክትትል በሚደረግባቸው አዋቂዎች መካከል የስኳር በሽታ መድሀኒቶችን አለማክበር እና ተያያዥ ምክንያቶችን በተመለከተ መረጃ መሰብሰብ አለብኝ. ከ 15 እስከ 20 ደቂቃዎች ይወስዳል. ትክክለኛ ምላሽዎ ሊወሰዱ የሚችሉ ተገቢ እርምጃዎችን በማቀድ በድርጅቱ ውስጥ ጥራት ያለው መረጃ ለማምረት በጣም አስፈላጊ ነው።

ክፍል 1፡ የሶሻሎኢኮኖሚክስ ጥያቄ	
1.1. ዕድሜ (በአመታት)	_____
1.2. ጾታ	ሀ) ወንድ ለ) ሴት
1.3. የጋብቻ ሁኔታ	ሀ) ነጠላ ለ) ያገባ ሐ) የተፋታ መ) ተለያይተዋል ሠ) መበለት
1.4. የትምህርት ደረጃ	ሀ) መደበኛ ትምህርት የለም። ለ) የመጀመሪያ ደረጃ ትምህርት ቤት ሐ) ሁለተኛ ደረጃ ትምህርት ቤት መ) ከሁለተኛ ደረጃ በላይ
1.5. ሥራ	ሀ) መንግሥት ተቀጣሪ ለ) በራስ ተቀጣሪ ሐ) ሥራ አጥ መ) ገበሬ ሠ) የቤት እመቤት
1.6. አማካይ ወርሃዊ ገቢ (የኢትዮጵያ ብር)	_____
1.7. የመኖሪያ ቦታ	ሀ) ገጠር ለ) ከተማ
1.8. የቤትዎ ርቀት ከሆስፒታል (በመኪና)	_____ ሰአታት
1.9. አልኮል ትጠጣለህ/ሽ?	ሀ) ብዙ ጊዜ ለ) አንዳንድ ጊዜ ሐ) በጭራሽ

1.10. ጫት ትቅማለህ/ሽ?	ሀ) አዎ ለ) አይ
1.11. ሲጋራ ታጨሳለህ/ሽ?	ሀ) አዎ ለ) አይ
ክፍል 2: ከታካሚ እና ከመድኃኒት ጋር የተያያዙ ምክንያቶች	
2.1. የ DM እንዳለቦት ከታወቀ በኋላ የሚቆይበት ጊዜ (በዓመታት)።	ሀ) <5 ዓመታት ለ) 5-10 ዓመታት ሐ) 10-20 ዓመታት መ) > 20 ዓመታት
2.2. ከስኳር በሽታ ጋር የተዛመዱ ችግሮች ብዛት	ሀ) ምንም ለ) 1 ሐ) 2 ወይም ከዚያ በላይ
2.3. መደበኛ የአይን እና የእግር ምርመራ ታደርጋለህ?	ሀ) አዎ ለ) አይ
2.4. ተጓዳኝ በሽታዎች አሉዎት?	ሀ) አዎ ለ) አይ
2.5. ከዲኤም ጋር ሆስፒታል የመግባት ታሪክ አለዎት?	ሀ) አዎ ለ) አይ
2.6. what???? መጠን ይናፍቀዎታል?	ሀ) ብዙ ጊዜ ለ) አንዳንድ ጊዜ ሐ) በጭራሽ
2.7. የአደንዛዥ ዕፅ አሉታዊ ተፅእኖ ታሪክ?	ሀ) አዎ ለ) አይ
2.10. 2.8. የጾም የደም ግሉኮስ መጠን when?	_____

2.11. 2.9. አሁን ያሉት የስኳር በሽታ መከላከያ መድሃኒቶች	ሀ) ነጠላ OHA ለ) ሁለት OHA ሐ) ኢንሱሊን I መ) ኢንሱሊን እና OHA
--	---

ክፍል 3: የታካሚ ተገዢነት ሁኔታ		
	አዎ	አይ
3.1. አንዳንድ ጊዜ መድሃኒቶችዎን መውሰድ ይረሳሉ?		
3.2. ሰዎች አንዳንድ ጊዜ መድሃኒቶቻቸውን ከመርሳት ውጪ በሌሎች ምክንያቶች መውሰድ ይኖታል። ላለፉት ሁለት ሳምንታት በማሰብ መድሃኒትዎን ያልወሰዱባቸው ቀናት ነበሩ?		
3.3. ለሐኪምዎ ሳትነግሩ መድሃኒቶችን ቆርጦህ ታውቃለህ ወይም ስትወስድ በጣም ስለተሰማህ ነው?		
3.4. ሲጓዙ ወይም ከቤት ሲወጡ አንዳንድ ጊዜ መድሃኒቶችዎን ይዘው መምጣት ይረሳሉ?		
3.5. መድሃኒትዎን ትናንት ወስደዋል?		
3.6. የጤና ሁኔታዎ በቁጥጥር ስር እንደዋለ ሲሰማዎት አንዳንድ ጊዜ መድሃኒቶችን መውሰድ ያቆማሉ?		
3.7. በየቀኑ መድሃኒቶችን መውሰድ ለአንዳንድ ሰዎች እውነተኛ ችግር ነው. ከህክምና እቅድዎ ጋር ስለመጣበቅ ተቸግረው ያውቃሉ?		
