College of Health Science

School of Nursing and Midwifery

Graduate Program of Cardiovascular Nursing

Low-Density Lipoprotein Cholesterol Goal Achievement and Associated Factors among Type 2 Diabetes Patients at Tikur Anbessa Specialized Hospital In Addis Ababa, Ethiopia: Cross-sectional Study, 2023

Principal investigator: Abdisa Beyene (B.Sc.)

A Research Thesis submitted to College of Health Sciences, School of Nursing And Midwifery, Department of Nursing, Addis Ababa University In Partial Fulfillment of the requirements for the degree of Masters of Science in Cardiovascular Nursing.

June 2023

Addis Ababa, Ethiopia

Addis Ababa University

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ADDIS ABABA UNIVERSITY

COLLEGE OF HEALTH SCIENCES

SCHOOL OF NURSING AND MIDWIFERY

DEPARTMENT OF NURSING AND MIDWIFERY

MASTER OF SCIENCE RESEARCH PROJECT SUBMISSION FORM

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DECLARATION

I, Abdisa Beyene, declare that the research project entitled "Low-Density Lipoprotein Cholesterol Goal Achievement and Associated Factors among Type 2 Diabetes Patients at Tikur Anbessa Specialized Hospital, Addis Ababa, Ethiopia. cross-sectional Study, 2023" is my original work and has not been presented for a degree in this university or any other university and that all sources of material used for the project have been duly acknowledged.

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Approval of Advisors

This research project has been submitted to Addis Ababa University College of Health Sciences School of Nursing and Midwifery with my approval as an advisor

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APPROVAL BY THE BOARD OF EXAMINATION

This thesis by _____ is accepted in its present form by the board of examiners as Satisfying thesis requirement for the degree of master in cardiovascular nursing.

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LIST OF ABBREVIATIONS AND ACRONYMS

CAD: Coronary Artery Disease

CVD: Cardiovascular Disease

CHD: Coronary Heart Disease

HDL: High-Density Lipoprotein

LDL-C: Low-Density Lipoprotein Cholesterol

MPR: Medication Possession Ratio

MMAS: Morisky Medication Adherence Scale

NCEP ATP III: National Cholesterol Education Program Adult Treatment Program III

NCD: Non-Communicable Disease

NCD STEPS: Noncommunicable Disease Surveillance, Monitoring, and Reporting

SPSS: Statistics product and service solution

TASH: Tikur Anbessa Specialized Hospital

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Abstract

Background: Achieving the recommended LDL-C goal is vital for managing cardiovascular risk. However, research on LDL-C goal achievement and associated factors in Sub-Saharan Africa, particularly in Ethiopia, is limited. While global rates vary from 18% to 73%, there is a need for further investigation in this region to better understand and address the factors influencing LDL-C goal attainment.

Objective: To evaluate low-density lipoprotein cholesterol goal achievement and associated factors among type 2 diabetes patients at Tikur Anbessa Specialized Hospital in Addis Ababa, Ethiopia.

Methods and Material: In a cross-sectional study at Tikur Anbessa Specialized Hospital, 338 patients diagnosed with type 2 diabetes from the diabetic follow-up clinic were included. The participants were selected using systematic random sampling. Data was collected using a pretested, structured questionnaire and analyzed using Epi info version 7.2 and SPSS version 25. Bivariate and multivariable logistic regressions were performed to examine the association between variables. Adjusted odds ratios (AOR) with 95% confidence intervals were calculated, and a p-value of ≤0.05 was considered statistically significant for associations between independent and outcome variables.

Result: The LDL goal achievement among type II diabetes patients is 58.9%.Total triglyceride level (AOR=0.19, 95%CI, 0.12, 0.54, P= <0.0001), history of smoking (AOR=0.198, 95%CI, 1.06, 1.10, P=<0.0001), 40-65 years of age (AOR=0.21, 95%CI, 0.05, 0.87, P= 0.03), BMI (AOR=0.19, 95%CI, 0.12, 0.54, P= <0.0001)., were found to be statistically significant independent predictors for LDL Goal Achievement in type II Diabetes patients.

Conclusion and recommendation: A study at Tikur Anbessa Specialized Hospital found that LDL-C goal achievement among Type 2 diabetes patients was acceptable but did not meet international standards. Factors like total triglyceride levels, smoking history, older age, and increased BMI influenced LDL-C goal achievement. It is important to raise awareness among healthcare professionals and patients about managing LDL-C levels in Type 2 diabetes. The Ministry of Health should prioritize interventions targeting total triglyceride levels and implement education campaigns. Healthcare professionals can optimize patient counseling and adhere to evidence-based guidelines for managing hypertriglyceridemia. Further research should explore additional factors like socio-economic status and comorbidities.

Keywords: low-density lipoprotein cholesterol, statin, goal achievement, type 2 diabetes

INTRODUCTION

1.1.Background of the study

Low-density lipoprotein (LDL), also referred to as "bad cholesterol," is a lipid condition that is characterized by hypercholesterolemia. LDL cholesterol values above 190 mg/dL, above 160 mg/dL with one major risk factor, or above 130 mg/dL with two cardiovascular risk factors are considered high (1). Atherosclerotic heart disease is significantly influenced by elevated LDL-C (2). Higher readings increase the risk of coronary artery disease, hence the suggested LDL-C objective is between 50 and 70 mg/dL to prevent plaque formation (3). The link between total cholesterol and coronary artery disease was initially made clear by the Framingham Heart Study (4). In patients who also have a family history of heart disease, smoking, high blood pressure, and low levels of high-density lipoprotein (HDL), achieving an LDL-C value of less than 100 mg/dL is especially critical to preventing the rapid development of coronary artery disease in people with, and a family history of coronary artery disease (5).

Reducing high cholesterol levels is essential in lowering the risk of developing cardiovascular disease (CVD) events, as high blood cholesterol is a substantial risk factor for these events. Statins, ezetimibe, bempedoic acid, bile acid sequestrants, proprotein convertase subtilisin/kexin type 9 (PCSK9) inhibitors, niacin, fibrates, and n-3 fatty acids are some of the cholesterol-lowering medications now on the market. Statins are regarded as first-line therapies, including simvastatin, pravastatin, and atorvastatin (5).

The World Heart Federation estimates that high cholesterol causes 4.4 million deaths yearly or 7.8% of all deaths and that 24% of deaths from cardiovascular disease are connected to high cholesterol. The prevalence of dyslipidemia (abnormal lipid levels), which ranges from 5.2% to 89.9%, varies greatly in Africa. One study in Mekelle City showed a prevalence of 66.7% and a high prevalence of increased LDL-C (49.5%), according to studies conducted in Ethiopia, which have indicated a very high prevalence of dyslipidaemias (7). 14.1% of people in Ethiopia were found to have high LDL cholesterol, according to a different community-based survey there (8).

1.2. Statement of the Problem

Raised total cholesterol levels raise the risk of ischemic heart disease and stroke and considerably contribute to the global disease burden. Age, high blood pressure, a family history of early atherosclerotic heart disease, diabetes, and low HDL cholesterol levels are all factors that contribute to hypercholesterolemia. About one-third of ischemic heart disease incidents worldwide are caused by high cholesterol. With differences between males and females, 39% of individuals had high total cholesterol in 2020. High LDL cholesterol has a significant negative impact on disability-adjusted life years (DALYs), contributing to millions of deaths and the overall burden of disease (9).

In Africa, the incidence of adult dyslipidemias was emphasized by a thorough review and meta-analysis. Dyslipidemia prevalence in the general population was 37.4%, while high LDL cholesterol (3.3 mmol/L) prevalence was 28.6%. The prevalence of elevated LDL cholesterol was 50.1% among those who had diabetes. There is a paucity of information on the prevalence of high LDL cholesterol in Ethiopia, although investigations carried out in different areas have revealed higher total cholesterol levels ranging from 30.8% in Mekelle to 38.7% in Hawassa [10].

The National Cholesterol Education Program's (NCEP-III) recommendations place a strong emphasis on managing high LDL cholesterol, especially in people with diabetes. LDL cholesterol reduction is the main goal of cholesterol-lowering medication to fend off cardiovascular illnesses. However, particularly in low-income nations like Ethiopia (11), there is a lack of studies on the causes of poor LDL cholesterol goal achievement. Therefore, the purpose of this study is to ascertain the percentage of type 2 diabetes patients who have met their LDL cholesterol targets at a chosen public hospital in Addis Ababa and to look for any correlations with clinical and socio-demographic variables. It is possible to improve disease prevention methods and the primary prevention of cardiovascular diseases in Ethiopia by filling this research gap.

1.3. Justification of the Study

Cardiovascular diseases are the world's leading cause of morbidity and mortality, and low-density lipoprotein cholesterol (LDL-C) has a substantial impact on their development. Patients with type 2 diabetes are particularly prone to cardiovascular issues, hence LDL-C treatment is essential in this population. This study seeks to discover effective techniques for improving cardiovascular risk management and lowering the burden of cardiovascular diseases among type 2 diabetes patients in Addis Abeba, Ethiopia by examining LDL-C goal achievement and related factors.

To lower the risk of cardiovascular events and enhance patient outcomes, LDL-C targets must be met. The achievement of these objectives may be hampered by poor adherence to statin medication, lifestyle changes, and other LDL-C management techniques. This study seeks to give healthcare practitioners useful insights into the hurdles and problems faced by type 2 diabetes patients in achieving their LDL-C goals by examining the associated elements, such as socio-demographic features, clinical issues, and behavioral aspects. The results can help develop patient-centered interventions and methods to increase adherence to medications and improve LDL-C management.

Conducting this study in a selected public hospital in Addis Ababa, Ethiopia, allows for a focused investigation of LDL-C goal achievement and associated factors within the local context. Factors such as cultural, economic, and healthcare system-specific aspects may influence LDL-C management and goal attainment. By examining these factors in a specific setting, the study findings will be contextually relevant and provide actionable recommendations for healthcare providers, policymakers, and other stakeholders in Addis Ababa and similar settings.

1.4. Significance of the Study

Low-density lipoprotein cholesterol (LDL-C) reduction has long been a key strategy for lowering the risk of coronary heart disease (CHD), especially in high-risk populations like diabetic people. Target blood cholesterol levels can also be reached by making therapeutic lifestyle changes rather than only taking medication.

The proportion of patients who met and failed to meet their LDL-C goals was calculated in this study, along with the sociodemographic and clinical characteristics that were linked to subpar LDL-C target accomplishment. To help healthcare professionals identify individuals who might not meet their LDL-C targets, this study may give baseline data on the variables linked to LDL-C target accomplishment. Additionally, by offering evidence-based care, they will be able to better serve their patients and provide information to them.

This study has important implications for public health policy and initiatives in addition to giving healthcare providers baseline data. Policymakers can create focused policies to improve outcomes for high-risk people, notably those with diabetes, by identifying the socio-demographic and clinical determinants linked to low LDL-C goal accomplishment. This knowledge can help in the development of treatments that are specifically designed to address the difficulties these people have in meeting their LDL-C goals, such as educational programs, counseling services, and community-based projects.

The results of this study also add to the body of knowledge about evidence-based treatment for cardiovascular health. Healthcare professionals can better comprehend the difficulties and barriers patients confront by identifying the factors linked to low LDL-C achievement of goals. The ability to provide more individualized and effective care while taking into consideration the individual needs and circumstances of each patient is made possible by this information. With this knowledge, healthcare professionals can create specialized interventions and treatment schemes that increase the possibility of effective LDL-C lowering and, ultimately, lessen the burden of coronary heart disease.

LITERATURE REVIEW

2.1. Literature Review on LDL-C Goal Achievement and Associated Factors

2.1.1 Medication Therapy-related Factors

Statin therapy adherence

The strict adherence of patients to statin medication is essential for the prevention of cardiovascular disease. According to several pieces of research, patients' compliance with statin therapy and LDL cholesterol (LDL-C) target accomplishment are positively correlated. In a retrospective cohort study at Kaiser Permanente Georgia, for instance, it was discovered that 44.7% of the patients had uncontrolled LDL-C and different degrees of statin adherence. Patients with high, intermediate, and low statin adherence had prevalences of uncontrolled LDL-C of 25, 45, and 66. percent, respectively (12).

Similar results were found in a cross-sectional analysis of baseline data from 393 types 2 diabetes patients receiving secondary care, which showed that a relatively high statin adherence was linked to significantly reduced LDL-C values (13). In a different trial, 204 people with type 2 diabetes who were taking statins met their target LDL cholesterol level of less than 100 mg/dL in 68.4% of cases. In comparison to those who were deemed non-adherent, patients who adhered to statin medication were considerably more likely to achieve their therapeutic target (P 0.01) (14).

Statin Intensity level and combination therapy

Studies have demonstrated that the degree of statin therapy intensity and the pairing of statins with other anti-hyperlipidemia medications result in a better lowering of LDL cholesterol levels. The accomplishment of LDL cholesterol objectives was found to be highest with moderate-intensity statin use in a cross-sectional investigation of 585 patients receiving statin medication, with lower rates seen in high-intensity patterns (15). Another research on 85 patients found that triple lipid-lowering medication was well tolerated and had few side effects, with all patients achieving LDL cholesterol levels of 55 mg/dL or less throughout follow-up (16). In a study conducted in Spain among 2894 patients with primary hypercholesterolemia, sub-optimal responses were observed in a percentage of subjects with different statin therapies. Different statins reduced LDL cholesterol levels by between 30.2% to 48.2%, and the addition of ezetimibe further lowered LDL cholesterol levels (17). These findings emphasize the need of taking statin medication intensity into account. and other

lipid-lowering medications in combination to reduce LDL cholesterol as effectively as possible.

2.1.2.Patient-related factors

To achieve LDL cholesterol (LDL-C) targets, patient-related factors, such as sociodemographic characteristics, obesity, and statin intolerance, have been identified as important determinants. Numerous research has looked into these variables and how they relate to LDL-C target achievement. Statin intolerance, overweight, obesity, female sex, current smoking, and higher levels of education were found to be independently linked with failing to meet LDL-C targets in observational studies carried out in various nations (18). Another study conducted in Indonesia found that patients in younger age groups were more likely to achieve their therapeutic LDL-C objectives and that there was no gender difference in this rate (19). Furthermore, studies from Turkey and China revealed that failure to meet LDL-C targets was linked to female gender, diabetes mellitus, coronary heart disease, and obesity (20,21). These results underline how crucial it is to take patients' needs into account when addressing clinical practice's LDL-C goal accomplishment.

2.1.3.Cardiovascular Risk Level

The association between levels of cardiovascular (CV) risk and LDL cholesterol (LDL-C) objectives has been examined in several studies. These studies frequently employ the Framingham risk score (FRS), a technique for calculating the 10-year risk of coronary artery disease (CAD). Results from a cross-sectional observational study carried out in numerous nations revealed that patients with very high CV risk attained their LDL-C targets at a lesser rate than those with high and moderate risk levels (22). The majority of patients with coronary heart disease (CHD) or CHD risk equivalents did not reach the anticipated reduction in LDL-C levels within one year of statin start, according to cohort research conducted in the USA (23). According to a study done in Vietnam, older patients with type 2 diabetes who are at high risk for cardiovascular disease frequently struggle to meet their LDL-C targets (24). Additionally, a considerable disparity in LDL-C goal accomplishment across various CV risk categories was seen in large-scale retrospective cohort research involving dyslipidemia patients (25). These results underline how crucial it is to take a patient's level of CV risk into account when establishing and maintaining LDL-C objectives.

2.2. Conceptual Framework

The conceptual framework for LDL-C goal achievement incorporates various factors that influence the outcome, including patient-related factors, socio-demographic factors, statin therapy adherence, and medication history. As shown in Figure 1 below, medication history encompasses individual characteristics such as CHD, obesity, and others, which can impact LDL-C goal attainment. The socio-demographic factors include variables like education level, and sex, which may influence patient behaviors and access to healthcare resources (26–28).

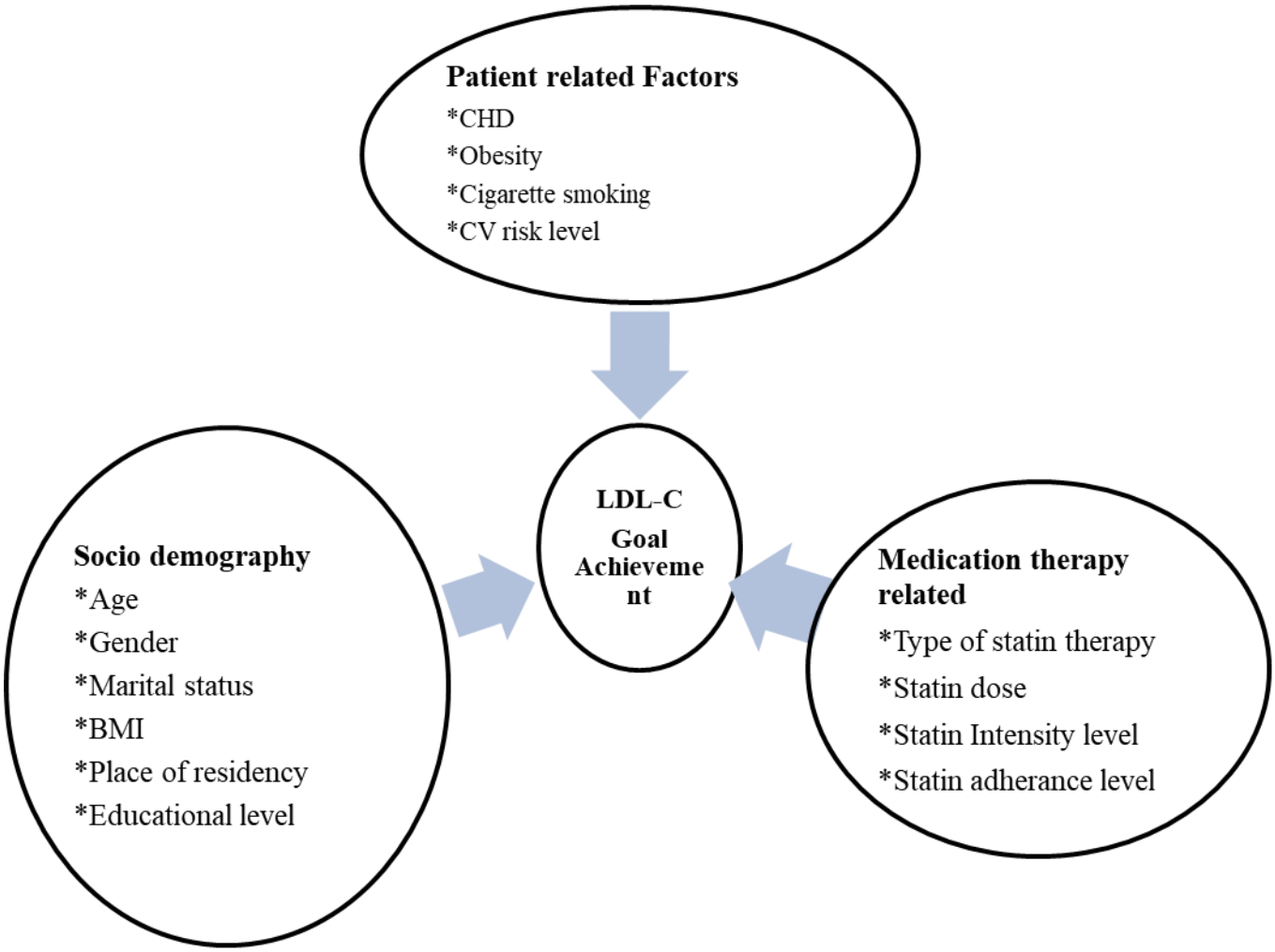

Figure 1: Conceptual framework for the study of Low-Density Lipoprotein Cholesterol Goal Achievement and Associated Factors among Type 2 Diabetes Patients at Tikur Anbessa Specialized Hospital in Addis Ababa, Ethiopia: cross-sectional Study, 2023

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OBJECTIVES

3.1. General Objective

This study aimed to assess low-density lipoprotein cholesterol goal achievement and associated factors among type 2 diabetes patients at Tikur Anbessa Specialized Hospital in Addis Ababa, Ethiopia.

3.2. Specific Objectives

- To determine low-density lipoprotein cholesterol goal achievement of type 2 diabetes patients at Tikur Anbessa Specialized Hospital in Addis Ababa, Ethiopia.
- To identify factors associated with low-density lipoprotein cholesterol goal achievement of type 2 diabetes patients at Tikur Anbessa Specialized Hospital in Addis Ababa, Ethiopia.

METHODOLOGY

4.1. Study setting and period

The study was conducted in Tikur Anbessa specialized hospital in Addis Ababa, Ethiopia Tikur Anbessa Specialized Hospital (TASH) is the largest specialized teaching hospital in Ethiopia, with over 700 beds, and serves as a training center for undergraduate and postgraduate programs. It is also an institution where specialized clinical services and tertiary-level referral treatment with 24-hour emergency services are rendered to the whole nation. Among different specialty clinics that provide follow-up services, the diabetic clinic is the largest referral clinic for diabetes in the country and provides services for about 300 - 400 patients per week. Currently, there are more than 7000 diabetes patients on follow-up in the clinic.

The study was from February 27 to April 27, 2023. Addis Ababa is the capital city of Ethiopia & located at 2355 meters above sea level. Based on the population projection of the Central Statistical Agency of Ethiopia (CSA) in 2021, Addis Ababa has a total population of 3,689,000 of whom 1,946,000 are women. There are a total of 99 health centers in Addis Ababa and 52 hospitals including private out of which 11 public hospitals in Addis Ababa; six hospitals under the administration of Addis Ababa Regional Health Bureau (AARHB), 5 under the administration of the federal government.

4.2. Study design

An institution-based cross-sectional study design with a quantitative method was conducted

4.3. Population

4.3.1. Source Population

All patients diagnosed with type 2 diabetes who were on follow-up at the diabetic clinic of Tikur Anbessa Specialized Hospital from January 2020 to February 2023G.C.

4.3.2. Study Subjects

Patients who were diagnosed with Type 2 diabetes mellitus and attending the outpatient service of the diabetic center with the fulfillment of the inclusion criteria at Tikur Anbessa Specialized Hospital from January 2020 to February 2023 G.C.

4.4. Eligibility Criteria

4.4.1. Inclusion criteria

- Patients who were diagnosed with Type 2 diabetes mellitus and attending outpatient service
- Age ≥ 18 years old
- Hemodynamically stable patients
- Patients on statin therapy for at least 3 months, with no dose exchange for at least 6 weeks

4.4.2. Exclusion criteria

- Type 1 diabetes mellitus Patients
- Patients with critically ill and psychiatric or neurological disability

4.5. Sample size Determination and Sampling technique

4.5.1. Sample size determination

The sample size was determined using the single population proportion formula. Since there is no literature available in Ethiopia 50% proportion was considered and, 5% marginal error, 95% confidence interval, and 10% non-response rate was added.

$$n = \frac{\left(\frac{Z\alpha}{2}\right) 2 * P(1 - P)}{d^2}$$

Where, Z = Confidence level (1.96)

n=required sample size

d = Margin of error (0.05)

P = Proportion (0.5)

$$n = \frac{\left(\frac{Z\alpha}{2}\right)2*P(1-P)}{d^2} = \frac{(1.96)2*0.5*0.5}{(0.05)2} = \underline{\mathbf{384}}$$

Since the total population is less than 10,000 **c**orrection formula was used and computed as follows:

$$n_f = \frac{no}{1+no/N} = \frac{384}{1+384/1500} = \sim \underline{\mathbf{307}}$$

The sample size and adding 10% non-available charts of 31 samples, the final calculated sample size became (307+31) =**338**

4.5.2. Sampling Technique and Procedures

.A systematic random sampling method was employed to choose study participants, guaranteeing a fair representation of the total population. Interviews were used to gather information from the source population, which covered the period from January 2020 to February 2023, and pertinent patient records were reviewed. 1500 people made up the entire population, which was divided by the intended sample size of 338 participants to arrive at a sampling interval of roughly 4.44. Every fourth person in the population list was added to the sample starting at a random location and continuing until the desired sample size was reached.

4.6. Study variables

4.6.1. Dependent variable

- Low-density lipoprotein goal achievement

4.6.2. Independent variables

- **Socio-Demographic variables**: Age, Gender, level of education, marital status, place of residence, Body mass index
- **Medication therapy-related factors:** statin adherence level, Statin dose, Statin Intensity level, type of statin therapy
- **Patient-related factors:** Obesity, CAD, Smoking**,** cardiovascular risk level

4.7. Operational definitions

- **LDL cholesterol goal achievement:** defined as an LDL level below 100mg/dl documented on patients' charts based on the NCEP-III recommendation for patients with diabetes.
- **Type 2 diabetes:** The patient's charts whose glycated hemoglobin (A1C) test blood sugar levels for the past two to three months were documented as 6.5% or higher on two separate tests.
- **LDL (low-density lipoprotein) cholesterol**: is often referred to as "bad" cholesterol because it contributes to the build-up of plaque in the arteries

- **HDL (high-density lipoprotein) cholesterol**: is often referred to as "good" cholesterol because it helps remove LDL cholesterol from the arteries and carries it back to the liver for processing. The classification of HDL cholesterol levels in mg/dL (milligrams per decilitre) according to the guidelines of the American Heart Association (AHA) is as follows: **Poor**: HDL cholesterol less than 40 mg/dL (for men), HDL cholesterol less than 50 mg/dL (for women) **Better**: HDL cholesterol between 40 and 59 mg/dL, **best**: HDL cholesterol 60 mg/dL or higher.
- **Triglyceride**: A level is generally based on guidelines provided by the National Cholesterol Education Program (NCEP) Adult Treatment Panel III (ATP III) and the American Heart Association (AHA). **Normal***:* Triglyceride level less than 150 mg/dL, **Borderline High**: Triglyceride level between 150 and 199 mg, **High**: Triglyceride level between 200 and 499 mg/dL, **Very High**: Triglyceride level of 500 mg/dL or higher
- **Total cholesterol:** A level is generally based on guidelines provided by the National Cholesterol Education Program (NCEP) Adult Treatment Panel III (ATP III) and the American Heart Association (AHA), **Desirable**: Total cholesterol level less than 200 mg/dL**, Borderline High**: Total cholesterol level between 200 and 239 mg/dL, **High**: Total cholesterol level of 240 mg/dL or higher

4.8. Data collection method, tool, and procedures

Data was collected by using an interviewer-administered semi-structured and pretested questionnaire which was adapted from studies done on similar topics and with similar socio-demographic characteristics. And some variables were also collected from the chart review. The questionnaire was prepared in English first and then translated into Amharic. It consisted of questions to assess sociodemographic characteristics, clinical characteristics, and questions used to assess statin therapy adherence level (Morisky Medication Adherence Scale).

4.9. Data collection procedure

A pre-tested and standardized questionnaire was adapted and modified from different literature. Data were collected by trained data collectors. A data collector was assigned to different classes and familiarized with the purpose of the study. After the end of filling the questionnaire, it was checked and ensured for completeness of the information

4.10. Data quality assurance

The quality of data was controlled starting from the time of questionnaire preparations. The questionnaire was developed by reviewing relevant literature on the subject to ensure reliability. First, the questionnaire which was prepared in English was translated into Amharic. To ensure the consistency of the tool it was translated back to English. The training was conducted for data collectors on the purpose of the study, and procedures of data collection for one day before the study. There was supervision for data collectors. After completing the training, trainees conducted a pre-test using 5% of the total sample size (34) at a non-study site (Zeweditu Hospital). The data collection was conducted by 2 Nurses who hold BSc degrees and was supervised by the principal investigator. In addition to this, a close follow-up by the principal investigator was done. During data collection, the supervisor received questionnaires from data collectors and review them for completeness, accuracy, and consistency on daily bases. Incomplete, inconsistent, and invalid data was refined properly to get the maximum quality of data before, during, and after data entry

4.11. Data processing and analysis

Data was entered into Epi Info Version 7.2 and then exported to Statistical Package for Social Studies (SPSS) version 25. Descriptive data analysis was performed using frequency, percentage, means, and inters quartile range; Continuous variables were expressed in mean and standard deviation. Bivariate and multivariable analysis was done to see the association between dependent and independent variables. That variable with p-value of less than 0.25 from Bivariable logistic regression was exported to multivariable logistic regressions to identify a significant predictor factor of LDL-C goal achievement level. A confidence limit of 95% and p-value of less than 0.05 was used as a cut-off point to see the presence of statistical significance. To control the effect of confounding variables multiple logistic regression analysis was done. Result statements tables and graphs were used to present the result.

4.12. Ethical approval and consent to participate

The study was approved by the institutional review board of Addis Ababa University Ethical Review Board with protocol number 01/SNM/15. A formal letter was submitted to the internal medicine department, matron, and head nurse of the respective ward. All participants of the study were provided written consent, clearly stating the objectives of the study and their right to refuse. Then, written informed consent was obtained from the study participants. The filled questionnaires were carefully handled ensuring confidentiality and kept under the secured custody of the principal investigator. The confidentiality of client-related data was maintained by avoiding potential identifiers and this study was conducted in consideration of the Helsinki Declaration

4.13. Plan for dissemination of findings

The result of the study is going to be presented for research thesis and a formal report will be submitted to Addis Ababa University, College of Health Sciences, School of Nursing and Midwifery. Furthermore, the findings of this study will be disseminated to Addis Ababa public health research and emergency management directorate and for publication in national or international peer-reviewed reputable journals. The study will also be presented during various research symposiums, conferences, or on seminars.

RESULTS

5.1. Socio-demographic Characteristics of Study Participants

A total of 338 participants out of 338 calculated samples with Type 2 diabetes took part in the study, resulting in a response rate of 100%. The study sample consisted of 160 male participants (47.3%) and 178 female participants (52.7%). The average age of the participants was 56.04 years with a standard deviation of ± 9.56 years. The majority of the participants, 293 individuals (86.7%), resided in urban areas. Regarding marital status, the largest proportion of participants, 257 individuals (76%), were currently married. Further details regarding the Sociodemographic characteristics of the study participants are provided below. (Table 1).

Table 1: Sociodemographic characteristics of the study participants in Tikur Anbessa Specialized Hospital, Addis Ababa, Ethiopia

Variable	Response	Frequency	Percent
Age in years (N=338)	Mean ± SD	56.04 ± 9.56	
	18-40	18	5.3
	40-65	268	79.3
	>65	52	15.4
Sex (N=338)	Male	160	47.3
	Female	178	52.7
Place of Residence (N=338)	Urban	293	86.7
	Rural	45	13.3
Marital status (N=338)	Married	257	76
	Single	81	24
Body Mass Index (BMI)(N=338)	Underweight	0	0
	Normal	169	50
	Overweight	154	45.6
	Obese	15	4.4
Educational status (N=338)	Illiterate	21	6.2
	Primary education	85	25.1
	Secondary education	108	32.1
	College/university	124	36.7

5.2. Clinical Characteristics of Study Participants

Among the surveyed respondents 338 (100%) of them are in Monotherapy. While the largest proportion of the respondents 300 (88.8%) are taking atorvastatin. About 300 (88.8 %) of them have no history of CHD. and about 331(97.9%) have no history of stroke. Details of the Clinical characteristics of the study participants are shown in the table below (Table 2).

Table 2: Clinical characteristics of the study participants in Tikur Anbessa Specialized Hospital, Addis Ababa, Ethiopia

Variable	Response	Frequency	Percent
Types of Statin Therapy (N=338)	Monotherapy	338	100
	Combination Therapy	0	0
Types of Statin (N=338)	Lovastatin	9	2.7
	Simvastatin	29	8.6
	Atorvastatin	300	88.8
	Pravastatin	0	0
History of CHD (N=338)	Yes	38	11.2
	No	300	88.8
History of Stroke/Carotid disease (N=338)	Yes	7	2.1
	No	331	97.9
History of PAD/Abdominal Aneurysm (N=338)	Yes	2	0.6
	No	336	99.4
History of Smoking (N=338)	Yes	24	7.1
	No	314	92.9
History of Hypertension (N=338)	Yes	277	82
	No	61	18
Systolic blood pressure (N=338)	Normal	77	22.8
	Elevated	17	5
	Hypertensive	244	72.7
Framingham Risk score (N=338)	High	273	80.8
	Intermediate	58	17.2
	Low	7	2.1
HDL (N=338)	Poor	181	53.6
	Better	154	45.6
	Best	3	0.9
LDL (N=338)	LDL Goal Achieved	199	58.9
	LDL Goal not Achieved	139	41.1
Triglyceride (N=338)	Normal	273	80.8
	Borderline High	51	15.1
	High	14	4.1
Total Cholesterol (N=338)	Desirable	332	98.2
	Borderline High	2	0.6
	High	4	1.2

5.3. Results of low-density lipoprotein cholesterol goal achievement

Among the total respondents, 199 (58.9%) achieved LDL goal and 139(41.1%) of them didn't achieve LDL goal. Figure 2 below shows the result of low-density lipoprotein cholesterol goal achievement

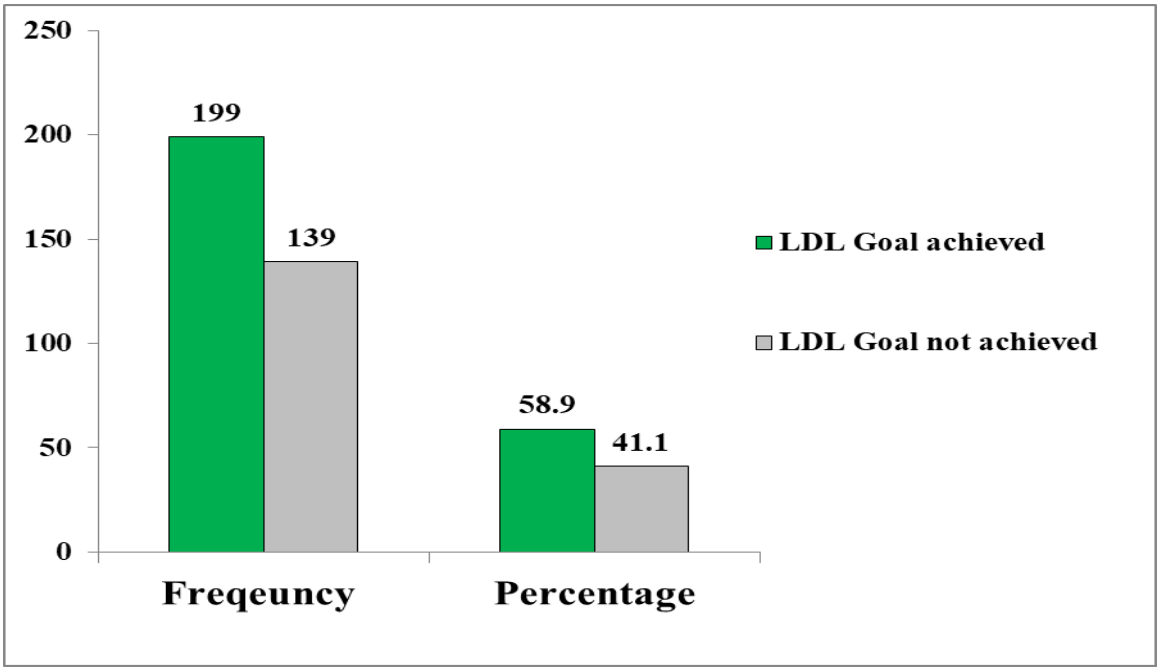

Figure 2:Low-density lipoprotein cholesterol goal achievement of the study participants in Tikur Anbessa Specialized Hospital, Addis Ababa, Ethiopia

5.4. Statin Therapy Adherence Assessment

Among the total respondents, 72 (21.3 %) had a high adherence level, 121 (35.8%) had a medium adherence level and 145 (42.9 %) had a low adherence level. Figure 3 below shows the statin adherence level.

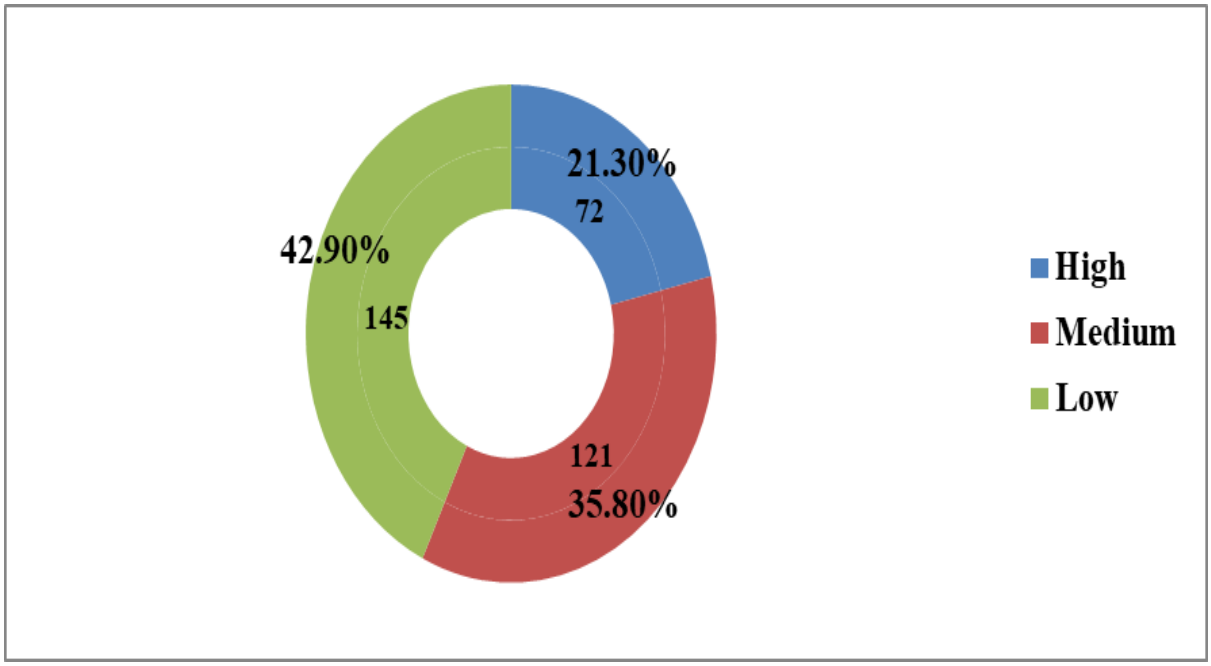

Figure 3: Statin Therapy Adherence Assessment of the study participants in Tikur Anbessa Specialized Hospital, Addis Ababa, Ethiopia

5.5. Bivariable & Multivariable analyses result of dependent variable with independent variables

5.5.1. Factors Associated with LDL Goal achievement using Bivariable Analysis

A bivariate analysis was used to explore the association between LDL Goal achievement and independent related variables. As shown in Table 3, educational status, age, history of smoking, history of hypertension, Systolic blood pressure level, HDL level, Body mass Index, Framingham risk score, Sex, Total cholesterol, and Triglyceride were associated with LDL Goal achievement. Criteria to take those factors into multivariable logistic regression are P<0.2, biological plausibility, and factors that were found to be significant in previous studies. The finding of other factors are listed in detail in Table 3.

Table 3: Bivariate analysis of factors and LDL Goal achievement among study participants in Tikur Anbessa Specialized Hospital, Addis Ababa, Ethiopia

Variables	**LDL Goal achievement**		**COR (95%CL)**	**P-value**
	Yes (%)	**No (%)**		
Sex				
Male	92 (46.2)	68 (48.9)	0.90 (0.58, 1.39)	**0.226***
Female	107 (53.8)	71 (51.1)	1	
Age (In years)				
18-40	9 (4.5)	9 (6.5)	1.00 (0.34,2.92)	1.000
40-65	164 (82.4)	104 (74.8)	0.63 (0.35,1.15)	**0.135***
>65	26 (13.1)	26 (18.7)	1	

Variables	LDL Goal achievement		COR (95%CL)	P-value
Marital status				
Married	149 (74.9)	108 (77.7)	1.17 (0.70,1.95)	0.550
Single	50 (25.1)	31 (22.3)	1	
Place of residence				
Urban	173 (86.9)	120 (86.3)	1.05 (0.56, 1.99)	0.872
Rural	26 (13.1)	19 (13.7)	1	
Body mass index				
Normal	122 (61.3)	47 (33.8)	1	
Overweight	73 (36.7)	81 (58.3)	0.14 (0.04, 0.46)	**0.001***
Obese	4 (2)	11 (7.9)	0.40 (0.12,1.32)	**0.134***
Educational status				
Illiterate	10 (5)	11 (7.9)	1.87 (0.74, 4.73)	**0.189***
Primary level	48 (24.1)	37 (26.6)	1.31 (0.75, 2.29)	0.350
Secondary level	63 (31.7)	45 (32.4)	1.21 (0.71, 2.05)	0.477
College /university	78 (39.2)	46 (33.1)	1	
Type of statin				
Lovastatin	9 (4.5)	0 (0)	0.12 (0.44, 2.41)	0.998
Simvastatin	15 (7.5)	14 (10.1)	1.34(0.65, 1.88)	0.998
Atorvastatin	175 (87.9)	125 (89.9)	0.9 (0.46, 2.18)	0.998
Total Cholesterol			1.7 (1.6,1.10)	**0.0001***
Desirable	198 (99.5)	134 (96.4)	0.96 (0.32, 2.87)	0.942
Borderline High	1 (0.5)	1 (0.7)	0.8 (0.4.1.6)	0.53
High	0 (0)	4 (2.9)	1.15 (0.59, 2.23)	0.69
Triglyceride			1.03 (1.02,1.04)	**0.0001***
Normal	182 (91.5)	91 (65.5)	0.12 (0.44, 2.41)	0.998
Borderline High	13 (6.5)	38 (27.3)	1.34(0.65, 1.88)	0.998
High	4 (2)	10 (7.2))	1	
HDL				
Poor	107 (53.8)	74 (53.2)	0.346 (0.03, 3.89)	0.390
Better	91 (45.7)	63 (45.3)	0.346 (0.03,3.90)	0.391
Best	1 (0.5)	2 (1.4)	1	
Systolic Blood Pressure				
Normal	52 (26.1)	25 (18)	1	
Elevated	10 (5)	7 (5)	1.46 (0.49,4.28)	0.494
Hypertensive	137 (68.8)	107 (77)	1.63(0.95,2.79)	**0.08***
Framingham Risk score				
High	156 (78.7)	117 (84.2)		1
Intermediate	36 (18.1)	22 (15)	0.82 (0.46,1.46)	0.49
Low	7 (3.5)	0 (0)	0.93 (0.46, 1.85)	0.826
History of CHD				
Yes	23 (11.6)	15 (10.8)	0.93 (0.46, 1.85)	0.826
No	176 (88.4)	124 (89.2)	1	
History of Stroke				
Yes	5 (2.5)	2 (1.4)	0.57 (0.11, 2.96)	0.502
No	194 (97.5)	137 (98.6)	1	
History of PAD				
Yes	0 (0)	2 (1.4)	0.08 (1.56, 4.18)	0.998

Variables	LDL Goal achievement		COR (95%CL)	P-value
No	199 (100)	137 (98.6)	1	
History of Smoking				
Yes	9 (4.5)	15 (10.8)	2.55 (1.08, 6.02)	**0.032***
No	190 (95.5)	124 (89.2)	1	
History of Hypertension				
Yes	158 (79.4)	119 (85.6)	1.54 (0.86,2.77)	**0.146***
No	41 (20.6)	20 (14.4)	1	

p-value significant at a level of P<0.25

5.5.2. Factors Associated with LDL Goal achievement using multivariable analysis

This research has revealed compelling findings regarding factors that might impact LDL-C goal achievement. After controlling the effects of potentially confounding factors using a multivariable logistic regression model, Total triglyceride level, BMI, history of smoking, and age of the patient, were found to be statistically significant independent predictors for LDL Goal Achievement in Type II Diabetes patients. Thus, individuals with a history of smoking are significantly associated with LDL-C goal achievement.

The research revealed several significant associations with LDL-C goal achievement. Smoking was found to decrease the likelihood of achieving the goal by 80.2% (AOR=0.198, 95% CI 1.06, 1.10, P=0.03). Middle-aged individuals (40-65 years) were less likely to achieve LDL-C goals compared to those aged 18-40 years, with a decrease of 79% in likelihood (AOR=0.21, 95% CI 0.05, 0.87, P=0.03).

Higher BMI levels were associated with a reduced likelihood of goal achievement, with overweight individuals having an 81% lower likelihood compared to those with normal BMI (AOR=0.19, 95% CI 0.12, 0.54, P<0.0001). Additionally, significant associations were found between total triglyceride levels and LDL-C goal achievement, with a strong relationship between overall lipid levels and LDL-C management (AOR=0.03, 95% CI 0.12, 0.54, P<0.0001). Details of the multivariable analysis are shown in Table 4 below.

Table 4: Multivariable analysis of factors and LDL Goal achievement among study participants in Tikur Anbessa Specialized Hospital, Addis Ababa, Ethiopia

	Bivariate Logistic regression		**Multivariable Logistic regression**	
	COR (95% CI)	**P-value**	**AOR (95% CI)**	**P-value**
Educational Level				
Illiterate	1.87 (0.74, 4.73)	0.189	0.60 (0.15,2.41)	0.474
Primary Education	1.31 (0.75, 2.29)	0.350	0.37 (0.09,1.51)	0.167
Secondary Education	1.21 (0.71, 2.05)	0.477	0.38 (0.09,1.52)	0.171
College/University(Ref)	1			
History of Smoking				
Yes	2.55 (1.08, 6.02)	0.032	0.198 (0.07,0.58)	**0.003****
No (Ref)	1			
History of Stroke				
Yes	0.57 (0.11, 2.96)	0.502	7.06(0.62,80)	0.115
No (Ref)	1			
Sex				
Male	0.90 (0.58, 1.39)	0.226	0.83 (0.47,1.48)	0.532
Female (Ref)	1			
History of Hypertension				
Yes	1.54 (0.86,2.77)	0.146	0.94 (0.28,3.09)	0.914
No (Ref)	1			
Age				
18-40	1			
40-65	0.56 (0.34,0.92)	0.045	0.21 (0.05,0.87)	**0.03***
>65 (Ref)	0.63 (0.35,1.15)	0.135	0.36 (0.07,1.80)	0.212
BMI				
Normal (Ref)	1			
Overweight	0.14 (0.04, 0.46)	0.001	0.19 (0.12,0.54)	**<0.0001****
Obese	0.40 (0.12,1.32)	0.134	0.26 (0.15,0.69)	**0.009****
Framingham Risk score				
High	1		1	
Intermediate	0.82 (0.46,1.46)	0.49	0.88 (0.46,1.46)	0.09
Low	0.93 (0.46, 1.85)	0.826	0.33 (0.46, 1.85)	0.126
Total Cholesterol				
Desirable	1			
High	1.7 (1.6,1.10)	0.0001	1.08 (1.09,1.12)	0.126
Systolic Hypertension				
Normal (Ref)	1			
Elevated	1.46 (0.49,4.28)	0.494		
Hypertensive	1.63(0.95,2.79)	0.08		
Level of Triglyceride	0.04 (0.02,0.06)	0.0001	0.03 (0.02,0.04)	**<0.0001****

**p-value significant at level of P<0.05, ** p- value significant at level of P <0.001. COR (Crude Odds ratio), AOR (adjusted odds ratio)*

DISCUSSION

Type 2 diabetes is a chronic disease, which is characterized by elevated blood sugar levels and is linked to some morbidities and deaths. Low-density lipoprotein cholesterol (LDL-C), the main cause of cardiovascular diseases (CVDs), is prone to be present in high levels in people with type 2 diabetes. Though these patients are monitored and treated accordingly for high LDL levels, the achievement of LDL-C goals varies among people, and several associated factors continue to be unidentified in Ethiopia. Thus, this study aimed to assess the achievement level of LDL-C goals and identify possible associated factors among type 2 diabetes patients at a selected public hospital in Addis Ababa, Ethiopia.

The present study showed that 58.9% of patients achieved their LDL-C goals out of the 338 participants. Despite the percentage reported above, it falls behind those findings reported in Nigeria (76%)(29). and Iran (65%)(30). In comparison, these variations are due to differences in socioeconomic, cultural, and demographic characteristics of the study population, as well as variations in guidelines used to manage lipid status. Additionally, the lower percentage of LDL-C goal achievement found in the study might be attributed to inadequate emphasis or lack of structured education given to patients on the proper management techniques of their condition (31).

According to the study, achieving LDL-C target levels was inversely correlated with total triglyceride levels. There is a lot of evidence-based research to back up this conclusion. The team of Bansal et al.'s meta-analysis confirmed the importance of the negative connection between total triglyceride levels and LDL-C levels in lowering LDL levels. Additionally, the authors of this meta-analysis proposed that lowering total triglycerides could lead to successful LDL-C level management, which could shield against cardiovascular disorders (31). This could be attributed to the fact that higher levels of triglycerides may contribute to the development of atherosclerosis, which in turn can lead to higher levels of LDL-C. A study by Toth et al. (2014) found that individuals with higher baseline triglyceride levels were less likely to achieve their LDL-C goals compared to those with lower triglyceride levels. This suggests that triglyceride levels should be closely monitored and managed in individuals with elevated LDL-C levels, to improve their chances of achieving optimal lipid levels (32).

This research found that older age was associated with lower rates of LDL-C goal attainment in patients with type 2 diabetes. This finding is consistent with previous studies that have shown that advancing age is a predictor of inadequate LDL-C control (33). A study by Lee et

al. found that older individuals (≥65 years) were less likely to achieve their LDL-C goals compared to younger individuals, even with the use of lipid-lowering medications. This may be due to a combination of factors, including the presence of other co-morbidities, medication adherence, and lifestyle factors. Therefore, it is important to consider age when developing treatment plans for individuals with high LDL-C levels, to account for these factors and optimize their chances of achieving their lipid goals (34).

One possible explanation for the lower rates of goal attainment in older patients is the presence of comorbid conditions such as cognitive impairment, functional disabilities, and frailty (35). These conditions may limit the ability of older patients to adhere to treatment recommendations for LDL-C control. Additionally, older patients may have a longer duration of diabetes, which may increase their risk for cardiovascular disease and make it more difficult to achieve LDL-C goals (36). Overall, these findings suggest that age is an important factor to consider in the management of LDL-C control in patients with type 2 diabetes. Healthcare providers should be aware of the challenges faced by older patients and tailor treatment plans to address these barriers. Future research is needed to identify effective interventions for improving LDL-C control in older patients with diabetes (37).

This study also showed that there is an association between body mass index and LDL-C goal achievement. This is consistent with a study published in the Journal of Clinical Lipidology; higher BMI levels are associated with lower LDL-C goal achievement which is consistent with the concept of a positive correlation between obesity and dyslipidemia. Participants who had a BMI≥30 had worse LDL-C goal attainment compared to those with a BMI<25 (38). Another study published in the Journal of Clinical Endocrinology and Metabolism found that higher BMI is associated with increased levels of LDL-C. The study also found that higher BMI levels are associated with an increase in total cholesterol levels and a decrease in HDL-C levels (39). Body mass index (BMI) has also been found to be a significant factor in achieving LDL-C goals. A study by Tenenbaum et al. (2016) found that individuals with a higher BMI were less likely to achieve their LDL-C goals compared to those with a lower BMI. This may be because obesity is associated with elevated levels of inflammation and oxidative stress, which can contribute to the development and progression of atherosclerosis and cardiovascular disease. Therefore, weight management interventions should be included in the treatment plan for individuals with high LDL-C levels, to optimize their chances of achieving their lipid goals (40).

The current study also identified a history of smoking as a predictor for LDL-C goal attainment in type II diabetes patients. This finding is consistent with a study published in the Journal of Clinical Lipidology in 2018 found that current smokers and those with a history of smoking had lower rates of achieving LDL-C goals compared to those who had never smoked (41). Similarly, a study published in PLOS ONE in 2020 found that current smokers had lower rates of achieving LDL-C goals compared to never-smokers (42). A study conducted by Ghandehari et al. (2013) found that smokers were less likely to achieve their LDL-C goals compared to non-smokers, even with the use of lipid-lowering medications. This is likely because smoking increases oxidative stress and inflammation, which can contribute to the development and progression of atherosclerosis and cardiovascular disease. Therefore, smoking cessation should be a primary goal for individuals with high LDL-C levels, as it can greatly improve their chances of achieving their lipid goals (43).

STRENGTHS AND LIMITATIONS OF THE STUDY

Strengths of the Study

- **Contribution to the literature**: The study adds to the existing literature by providing insights into LDL goal achievement and associated factors among type 2 diabetes patients.
- **Relevant and specific focus:** This specific focus allows for a more targeted investigation of factors contributing to goal achievement.

Limitations of the Study

- **Lack of detailed information**: The study had limitations in terms of the available data, such as the absence of information on food intake, family history of diabetes, and physical activity. These factors could potentially influence LDL control and should be considered in future studies.
- **Single-center study**: The study was conducted in only one center in Addis Ababa, Ethiopia, which may limit the generalizability of the findings to other healthcare settings or regions. Including multiple centers or a more diverse sample could enhance the external validity of the study.
- **Potential for selection bias**: As the study relied on patients attending a Tikur Anbessa specialized hospital, there may be inherent selection bias, as individuals with more severe or poorly controlled diabetes might be more likely to seek medical care. This could affect the representativeness of the sample and limit the generalizability of the findings to the broader population of type 2 diabetes patients in Ethiopia.

CONCLUSIONS AND RECOMMENDATIONS

8.1. Conclusions

The LDL-C goal achievement among type 2 diabetes patients at Tikur Anbessa Specialized Hospital was acceptable but still falls behind some international standards. The study identified that total triglyceride levels, age, history of smoking, and body mass index were found to be associated with LDL-C goal achievement.

8.2. Recommendations

Recommendation for Ministry of Health

- ❖ Increase awareness through education campaigns about the importance of LDL-C goal achievement among Type 2 diabetes patients.
- ❖ Implement targeted interventions to improve the total triglyceride levels and LDL-C goal achievement.

Recommendations for Healthcare Professionals

- ❖ Ensure optimal patient counseling on lifestyle modification, medication adherence, and attending regular follow-up appointments to improve LDL-C goal achievement.
- ❖ Follow evidence-based guidelines for the management of hypercholesterolemia in Type 2 diabetes patients.
- ❖ Healthcare providers should be aware of the challenges faced by older patients and tailor treatment plans

Recommendations for Researchers

- ❖ Conduct further research to explore other factors associated with LDL-C goal achievement among type 2 diabetes patients, such as socio-economic status, race, and comorbidities.

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ANNEXES

Annex I: Informed Consent form

Research Title: Low-Density Lipoprotein Cholesterol Goal Achievement and Associated Factors among Type 2 Diabetes Patients at Tikur Anbessa Specialized Hospital in Addis Ababa, Ethiopia. Cross-sectional Study, 2023

Principal Investigator (PI): Abdisa Beyene (B.Sc.)

Part I: Information Sheet

1. Introduction

The objective of the study is to assess Low-Density Lipoprotein Cholesterol Goal Achievement and Associated Factors among Type 2 Diabetes Patients at Tikur Anbessa Specialized Hospital in Addis Ababa, Ethiopia. This study will be helpful to improve the health care of Clients with type II Diabetes.

2. Aim of the study

The achievement of the recommended low-density lipoprotein cholesterol (LDL-C) goal is crucial in managing the risk of cardiovascular events. Thus, I aim to assess Low-Density Lipoprotein Cholesterol Goal Achievement and Associated Factors among Type 2 Diabetes Patients at Tikur Anbessa Specialized Hospital in Addis Ababa, Ethiopia.

3. Procedure

This study involves a questionnaire being filled out by data collectors by reviewing the chart. To study the assessment of Low-Density Lipoprotein Cholesterol Goal Achievement and Associated Factors among Type 2 Diabetes Patients at Tikur Anbessa Specialized Hospital in Addis Ababa, Ethiopia. All the information you give will be kept private

4. Participant selection

We are inviting all clients who fulfill the inclusion criteria for the study in selected government to participate in the research on the assessment of the quality of life and its associated factors among infertile women on follow-up at infertility clinics and fertile women attending outpatient departments of public hospitals for family planning services in Addis Ababa, Ethiopia

5. Risks and Benefits

There is no risk in participating in this research. Participating in this study may not get direct benefit, but an opportunity to improve health care delivery for type II diabetes patients.

6. Confidentiality

The information collected from this research project will be kept confidential and all records and other information obtained will be kept strictly confidential and health information will not be used without permission. All data collection tools will be identified by a number or otherwise coded to protect any information that could be used to identify your child

7. Number of Participants

A total of 338 clients participated in this study.

8. Whom to Contact

One can contact the principal investigator for any doubt that you want to clear. This research was reviewed and approved by TASH, the institutional review board. If you want more information and check about this study, you can contact the following person.

Abdisa Beyene: +251919912547

This Informed Consent form is for those who have a follow-up at the Diabetes clinic at TASH G we are inviting you to participate in research on the assessment of Low-Density Lipoprotein Cholesterol Goal Achievement and Associated Factors among Type 2 Diabetes Patients at Tikur Anbessa Specialized Hospital in Addis Ababa, Ethiopia. Cross-sectional Study, 2023The title of our research project is "Low-Density Lipoprotein Cholesterol Goal Achievement and Associated Factors among Type 2 Diabetes Patients at Tikur Anbessa Specialized Hospital in Addis Ababa, Ethiopia."

My name is _____. I am here on behalf of Abdisa Beyene, who is currently a Master of Science in Cardiovascular Nursing student at TASH and is now going to conduct a survey. The objective of the study is to assess Low-Density Lipoprotein Cholesterol Goal Achievement and Associated Factors among Type 2 Diabetes Patients at Tikur Anbessa Specialized Hospital in Addis Ababa, Ethiopia. This study will be helpful to improve the health care of clients with type II diabetes mellitus.

Annex II: Questionnaire – English Version

A Questionnaire designed to analyze Low-Density Lipoprotein Cholesterol Goal Achievement and Associated Factors among Type 2 Diabetes Patients at Tikur Anbessa Specialized Hospital in Addis Ababa, Ethiopia. The study has approval and ethical clearance from the research and publication committee of TASH institutional review board.

Part-I Socio-Demographic Characteristics			
Date of Data collection…….		Phone No……..	
101.	Residence	1. Urban 2. Rural	
102.	Age in years	----------years	
103	Marital status	1. Married 2. Living together without marriage 3. Other Specify	
104.	Level of education	1.No formal education 2. primary education 3. Secondary and preparatory education 4. Diploma 5. Degree and above.	
105.	Sex	1. Male 2. Female	
Part II: Clinical characteristics of the patients			
201.	BMI	----------	
202.	LDL (mg/dl)	----------	
203	HDL (mg/dl)	----------	
204	Triglyceride	----------	
205	Total cholesterol	----------	
206	Statin dose	----------	
207	Framingham risk score	----------	
208	Systolic blood pressure	----------	
209	Type of statin therapy	1. Monotherapy 2. Combination therapy	
210	Types of statin	1. Yes 2.No	
211	History of CHD	1. Yes 2.No	
212	History of stroke/carotid disease	1. Yes 2.No	
213	History of PAD or abdominal aneurysm	1. Yes 2.No	
214	History of Smoking	1. Yes 2.No	

208	History of Hypertension	1. Yes 2.No	
Part III: Statin Therapy Adherence Assessment questions (Morisky Medication Adherence Scale)			
301	Do you sometimes forget to take your prescribed medicines?	1. Yes 2.No	
302	Over the past 2 weeks, were there any days when you did not take your prescribed medicines?	1. Yes 2.No	
303.	Have you stopped taking medications because you feel worse when you took them?	1. Yes 2.No	
304	When you travel or leave home, do you sometimes forget to bring along your meds?	1. Yes 2.No	
305.	Did you take your prescribed medicine yesterday?	1. Yes 2.No	
306.	When you feel your health is under control, do you sometimes stop taking your meds?	1. Yes 2.No	
307.	Do you feel hassled about sticking to your prescribed treatment plan?	1. yes 2.No	
308	How often do you have difficulty remembering to take all the prescribed medicine? (please circle the correct number)	0. Never/rarely 1. Once in a while 2. Sometimes 3. Usually 4. All the time	

Annex III: Questionnaire – Amharic Version

አነስተኛ ውፍረት ያለው የፕሮቲን ኮሌስትሮል ግብ ስኬት እና ከሁለተኛው ዓይነት የስኳር ህመምተኞች ጋር ተያያዥነት ያላቸውን ጉዳዮች ለመተንተን የተነደፈ መጠይቅ በአዲስ አበባ፣ ኢትዮጵያ በሚገኘው በጥቁር አንበሳ ስፔሻላይዝድ ሆስፒታል። ጥናቱ ከTASH ተቋማዊ ገምጋሚ ቦርድ የምርምር ኮሚቴ ይሁንታ እና የስነምግባር ማረጋገጫ አግኝቷል።

ክፍል-1 ሶሺዮ-ስነ-ሕዝብ ባህሪያት			
መረጃ የሚሰበሰብበት ቀን ……. ስልክ ቁጥር……..			
101.	መኖሪያ	3. ከተማ 4. ገጠር	
102.	ዕድሜ በዓመታት	--------ዓመታት	
103	የጋብቻ ሁኔታ	1. ያገባ 2. ያለ ትዳር አብሮ መኖር 3.ሌሎች ይግለጹ	

104.	የትምህርት ደረጃ	1. ምንም መደበኛ ትምህርት 2.የመጀመሪያ ደረጃ ትምህርት 3.የሁለተኛ ደረጃ እና የመሰናዶ ትምህርት 4.ዲፕሎማ 5. ዲግሪ እና ከዚያ በላይ.	
105.	ጾታ	1. ወንድ 2. ሴት	
ክፍል II: የታካሚዎች ክሊኒካዊ ባህሪያት			
201.	BMI	----------	
202.	LDL (mg/dl)	----------	
203	HDL (mg/dl)	---	
204	ትራይግሊሰርይድ	---	
205	ጠቅላላ ኮሌስትሮል	---	
206	የስታቲን መጠን	---	
207	የፍራሚንግሃም ስጋት ነጥብ	---	
208	ሲስቶሊክ የደም ግፊት	---	
209	የስታቲን ሕክምና ዓይነት	1. ሞኖቴራፒ 2. ጥምር ሕክምና	
210	የስታቲስቲክስ ዓይነቶች	1. አዎ 2.አይ	
211	የ CHD ታሪክ	1. አዎ 2.አይ	
212	የስትሮክ / ካሮቲድ በሽታ ታሪክ	1. አዎ 2.አይ	
213	የ PAD ወይም የሆድ አኦኢሪዝም ታሪክ	1. አዎ 2.አይ	
214	የማጨስ ታሪክ	1. አዎ 2.አይ	
208	የደም ግፊት ታሪክ	1. አዎ 2.አይ	
ክፍል III፡ የስታቲን ቴራፒ ታዛዥነት ግምገማ ጥያቄዎች (የሞሪስኪ መድሀኒት ተገዢነት መለኪያ)			
301	አንዳንድ ጊዜ የታዘዙትን መድሃኒቶች መውሰድ ይረሳሉ?	1. አዎ 2.አይ	
302	ባለፉት 2 ሳምንታት ውስጥ የታዘዙትን መድሃኒቶች ያልወሰዱባቸው ቀናት ነበሩ?	1. አዎ 2.አይ	
303.	መድሃኒቶችን በሚወስዱበት ጊዜ መጥፎ ስሜት ስለሚሰማዎት መድሃኒቶችን መውሰድ አቁመዋል ?	1. አዎ 2.አይ	

304	ሲጓዙ ወይም ከቤት ሲወጡ አንዳንድ ጊዜ መድሃኒትዎን ይዘው መምጣት ይረሳሉ?	1. አዎ 2.አይ	
305.	የታዘዘልዎትን መድሃኒት ትናንት ወስደዋል?	1. አዎ 2.አይ	
306.	ጤናዎ በቁጥጥር ስር እንደዋለ ሲሰማዎት አንዳንድ ጊዜ መድሃኒትዎን መውሰድ ያቆማሉ ?	1. አዎ 2.አይ	
307.	ከታዘዘልዎት የሕክምና ዕቅድ ጋር ስለመቆየት ችግር ይሰማዎታል?	1.አዎ 2.አይ	
308	የታዘዘለትን መድሃኒት ሁሉ ለመውሰድ ምን ያህል ጊዜ ለማስታወስ ይቸገራሉ? (እባክዎ ትክክለኛውን ቁጥር ክብ ያድርጉ)	0. በጭራሽ / አልፎ አልፎ 1. አንድ ጊዜ 2. አንዳንድ ጊዜ 3.በተለምዶ 4. ሁል ጊዜ	