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Knowledge of the Therapeutic Goals of Diabetes care among Patients with Type 2 Diabetes at
Tikur Anbessa Specialized Hospital: A Hospital-Based Cross-Sectional Study, 2020.

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Abbreviations and Acronyms

ADA	American Diabetes Association
AOR	Adjusted Odds Ratio
BMI	Body Mass Index
BP	Blood Pressure
CI	Confidence Interval
CVD	Cardiovascular Disease
DBP	Diastolic Blood Pressure
DM	Diabetes Mellitus
ETB	Ethiopian Birr
IRB	Institutional Review Board
LMICs	Low- and Middle-Income Countries
NCD	Non-Communicable Disease
NSAP	National Strategic Action Plan
ODK	Open Data Kit
SBP	Systolic Blood Pressure
T2DM	Type 2 Diabetes Mellitus
TASH	Tikur Anbessa Specialized Hospital
WHO	World Health Organization

Table of Contents

Acknowledgment.....	iii
Abbreviations and Acronyms	iv
List of tables	vii
Abstract.....	viii
1. Introduction	1
1.1 Background	1
1.2 Statement of the problem	2
1.3 Significance of the study.....	2
2. Literature Review.....	4
2.1 Glycemic control.....	4
2.2 Knowledge about diabetes and self-care practice.....	5
2.3 Knowledge of therapeutic goals of diabetes management.....	5
3. Objectives of the Study.....	7
3.1 General objective	7
3.2 Specific objectives.....	7
4. Methods and Materials.....	8
4.1 Study setting	8
4.2 Study design	8
4.4 Source and study population	8
4.5 Eligibility criteria	8
4.5.1 Inclusion criteria	8
4.5.2 Exclusion criteria	9
4.6 Sample Size Determination	9
4.7 Sampling techniques and sampling procedure.....	10
4.8 Study variables.....	10
4.8.1 Outcome variables.....	10
4.8.2 Explanatory variables.....	10
4.9 Data collection techniques	11
4.10 Data quality and management.....	12
4.11 Data processing and analysis	12
4.12 Operational definitions.....	13

4.13 Ethical Considerations	13
4.14 Plan for dissemination of research finding	13
5. Results.....	14
5.1 Demographic characteristics of the respondents.....	14
5.2 Clinical characteristics of the respondents	15
5.4 Patient-reported knowledge of the therapeutic goals of diabetes management	16
5.5 Determinants of knowledge score on the therapeutic goals of diabetes management.....	17
6. Discussion.....	20
7. Strength and limitation of the study.....	22
8. Conclusions	23
9. Recommendations	24
Annexes.....	32
Annex 1: declaration	32
Annex 2: Questionnaire.....	33
English version.....	33
የአማርኛ መጠይቅ.....	44

List of tables

TABLE 1: DEMOGRAPHIC AND SOCIO-ECONOMIC CHARACTERISTICS OF PEOPLE WITH TYPE 2 DIABETES ON FOLLOW-UP AT TASH, ADDIS ABABA, ETHIOPIA, 2020	14
TABLE 2: CLINICAL PROFILES OF PEOPLE WITH T2DM ON FOLLOW-UP AT TASH HOSPITAL, ADDIS ABABA, ETHIOPIA, 2020.....	15
TABLE 3: METABOLIC FACTORS OF PEOPLE WITH T2DM ON FOLLOW-UP AT TASH HOSPITAL, ADDIS ABABA, ETHIOPIA, 2020.....	16
TABLE 4: PATIENT-REPORTED KNOWLEDGE OF THE THERAPEUTIC GOALS AND CURRENT LEVELS OF PEOPLE WITH T2DM ON FOLLOW-UP AT TASH HOSPITAL, ADDIS ABABA, ETHIOPIA, 2020	17
TABLE 5: BIVARIABLE AND MULTIVARIABLE BINARY LOGISTIC REGRESSION ANALYSIS RESULTS OF FACTORS ASSOCIATED WITH KNOWLEDGE SCORE AMONG PEOPLE WITH TYPE 2 DIABETES ON FOLLOW-UP AT TASH HOSPITAL, ADDIS ABABA, ETHIOPIA, 2020.....	18

Abstract

Background

Diabetes is a growing public health challenge worldwide, including Ethiopia. Comprehensive multifactorial cardiovascular risk reduction is recommended to reduce diabetes-associated morbidity and mortality but achieving the triplet goals (optimization of blood glucose, blood pressure and low density lipoprotein levels) remained a global clinical challenge. Patients' knowledge of these therapeutic goals of diabetes care contributes to improved self-care and glycemic control. However, the patients' knowledge of the therapeutic goals in diabetes and its determinants have not been studied comprehensively in Ethiopia.

Objective

This study was conducted to assess patients' knowledge of the therapeutic goals of diabetes management and the factors associated with the knowledge score.

Methods

A cross-sectional survey was conducted from March 3 to June 10, 2020, at the diabetes clinic in Tikur Anbessa Specialized Hospital. Data were collected using a pretested, structured, interviewer-administered questionnaire. Then, the open data kit (ODK) completed form was exported and analyzed using SPSS version 25. To identify determinants of knowledge, bivariable and multivariable binary logistic regression analyses were done. Statistical significance was considered at the level of significance of 5%, and adjusted odds ratio (AOR) with 95% confidence interval (CI) was used to present the estimates of the strength of the association

Results

A total of 419 participants were included. The mean knowledge score was 4.7 ± 2.2 points (out of 10). Overall, the percentage of patients with a good understanding of the therapeutic goals of diabetes management was 59.5%. The percentages of patients who reported knowing their target goals for blood pressure, fasting blood sugar, hemoglobin A1C, and low-density lipoprotein were 79.5, 77.3, 11.7, and 7.2% respectively. Correct target goals for BP, FBS, A1c, and LDL-C were reported by 75.7, 73.0, 4.1, and 1.0% respectively. The percentages of patients who reported

knowing their recent levels for BP, FBS, A1C, and LDL-C were 72.3, 80.2, 16.7, and 8.1% respectively. The multivariable binary regression analysis demonstrated that patients with longer diabetes duration (AOR = 1.04, 95% CI: 1.01-1.07) and an increased household income by 1000 Ethiopian birr (AOR = 1.12, 95% CI: 1.02-1.23) were associated with the odds of having good knowledge of the therapeutic goals. For each one year increase in the age of participants, the odds of having good knowledge of diabetes therapeutic goals decreases by 3% [AOR = 0.97; 95% CI: 0.95-0.99]. However, compared to higher education level, having no formal education or primary education was significantly associated with poor knowledge (AOR = 0.03; 95% CI: 0.006-0.13 and AOR = 0.27; 95% CI: 0.15-0.49, respectively). Besides, the odds of having good knowledge of the therapeutic goals for divorced patients with diabetes decreases by 63% as compared to married participants [AOR = 0.37%; 95% CI: 0.18-0.76].

Conclusion: This study demonstrated that the majority of participants knew their BP and FBS targets and own recent levels while only a minority of patients understood their A1c and LDL-C targets and recent values. It highlighted the need for the provision of patient-centered diabetic education and sharing responsibility for patients achieving diabetes treatment goals.

Keywords: diabetes mellitus, knowledge of therapeutic goals, Tikur Anbessa Specialized Hospital, cross-sectional study

1. Introduction

1.1 Background

Diabetes mellitus is a progressive metabolic disorder characterized by hyperglycemia resulting from insulin resistance and/or insulin deficiency. The main categories of diabetes include type 1, type 2, and gestational diabetes. Type 2 diabetes accounts for the vast majority (around 90%) of diabetes globally. It has become one of the fastest rising global public health challenge with significant morbidity and mortality. Nearly half a billion people (9.3% of adults) are living with diabetes worldwide with over 4 million diabetes-related deaths. The majority of diabetes occurs in low and middle-income countries, imposing a significant economic burden ¹.

Ethiopia is among the highest hit African countries. The estimated national prevalence of diabetes is 3.2% in adults 20-79 years ². The pooled prevalence of diabetes in Addis Ababa is about 5%³.

Comprehensive diabetes care with multifaceted cardiovascular risk reduction strategies and ongoing self-management education is required to prevent acute complications and reduce the risk of chronic complications. Optimized control of glycemia, hypertension, and dyslipidemia is an integral part of diabetes management. Glycated hemoglobin (A1c) target of <7%, FBS <130 mg/dl, and post-prandial blood glucose <180 mg/dl, while minimizing hypoglycemia, is recommended for most non-pregnant adults. For patients with diabetes and hypertension with high cardiovascular risk, a BP goal of <130/80 mmHg is recommended if it can be achieved safely while LDL-C should be reduced by ≥50% and <70 mg/dl ^{4, 5}.

Despite the established benefits of integrated multiple risk factor reduction including glycemic control, blood pressure optimization and lipid lowering therapy, achieving these triplet goals remained a global clinical challenge. Achievement of these triple goals of diabetes care concurrently was successful in less than 10% of patients with type 2 diabetes ^{6,7,8}.

Effective diabetes self-management and support are foundational for achieving treatment goals of diabetes care. Patient-centered diabetes education to improve knowledge and self-care improves clinical outcomes and wellbeing cost-effectively ⁹.

Patients' knowledge of overall diabetes therapeutic goals improves adherence to care. Patients with good knowledge of the therapeutic goals of diabetes care are more likely to attain these goals whereas a lack of knowledge of the targets predicts less likelihood of attaining the goals ^{10,11,12}.

This study was aimed to assess the patients' knowledge of the therapeutic goals of diabetes management among patients with type 2 diabetes attending the diabetic clinic at Tikur Anbessa Specialized Hospital (TASH), Addis Ababa, Ethiopia that can help to implement optimal interventions through improved diabetes education.

1.2 Statement of the problem

Diabetes has become a major non-communicable disease (NCD) in Ethiopia. It is growing at an alarming rate, and so are its associated morbidity and mortality rates. It is one of the focus areas of a national strategic action plan in an attempt to curb the burden of the disease. However, diabetes has continued to be the main challenge amongst NCDs in the country ^{13,14,15,16}.

Studies on diabetes in different regions of Ethiopia, focused mainly on the level of glycemic control, consistently showed poor glycemic control overall. Other small hospital-based studies demonstrated low diabetes self-care and medication adherence ^{17,18,19,20}.

It has been studied that patients' knowledge of the therapeutic goals of diabetes management improves self-care, medication adherence, and glycemic control. Lack of patients' knowledge of the therapeutic goals has been a strong predictor of poor compliance, suboptimal glycemic level, and inadequate control of other cardiovascular risk factors ^{11,12}.

Yet, there is a dearth of information on this topic in our country. This study tried to address this gap for subsequent improvement of intervention strategies.

1.3 Significance of the study

Type 2 diabetes remains a challenge to many developing countries including Ethiopia with a substantial economic burden. Reducing diabetes-related morbidity and mortality by optimizing glycemic control and other risk reduction strategies is invaluable. Knowing the clinical goals of

diabetes treatment is of fundamental importance for patients to improve diabetes self-care, medication adherence, and attain glycemic targets.

Therefore, this study assessed patients' knowledge of the therapeutic goals of diabetes management that can be used as baseline information for further studies to implement appropriate interventions.

2. Literature Review

2.1 Glycemic control

Optimal, individualized glycemic control reduces diabetes-related complications. The benefit of early glycemic control and maintaining it is well established in many clinical trials. Long term observational follow-ups demonstrated that early glycemic control has durable effects with reductions in microvascular and cardiovascular events ^{21,22}.

A1c testing is the most standardized tool for assessing glycemic control with strong predictive value. Each 1% reduction in mean A1c is associated with a reduction in risk of 21% diabetes-related deaths, 14% for myocardial infarction, and 37% for microvascular complications. American Diabetes Association recommends A1c testing in all patients with diabetes at initial assessment and as part of continuing care at a reasonable interval. Besides, it recommends self-monitoring of blood glucose for patients taking insulin ^{5,23}.

A review of the global standards of glycemic control showed that about half (40-60%) of patients with type 2 diabetes failed to achieve or maintain optimal target blood glucose levels across all geographic regions, both low –and higher-income countries. There was a significant delay in initiating or intensifying therapy when needed ²⁴.

A hospital-based cross-sectional study in Uganda demonstrated that more than two-thirds of patients have suboptimal glycemic control, especially those remaining on monotherapy for long. Median A1c was 9% (IQR 6.8-12.4%) ²⁵.

Another institution-based survey in Eastern Sudan showed a very high rate of poor glycemic control, about 71%. It depicted that adding sugar to drinks was significantly associated with uncontrolled diabetes ²⁶.

A Kenyan study also depicted a high prevalence of suboptimal glycemic control. About 81% of study participants had suboptimal targets of blood sugar levels ²⁷.

Several hospital-based cross-sectional studies in different parts of Ethiopia found out that the majority of patients have poorly controlled diabetes. A lower level of diabetic education,

medication noncompliance, and multiple comorbidities was associated with poor glycemic control. The majority of these studies used FBS as the test for assessment of glycemia ^{28,29,30,31}.

A systemic review of several observational studies in Ethiopia stated that high proportions of patients with diabetes were unable to achieve target glycemic goals. Only one-third of patients meet the target fasting blood sugar level or A1c ³².

A retrospective cross-sectional study in Addis Ababa also showed the time to optimal glycemic control was longer than expected. The median time to optimal glycemic control was about 9 months. Multimorbidity was predictive of time to target glycemic control ³³.

2.2 Knowledge about diabetes and self-care practice

Diabetes education is an essential component of care. It facilitated the knowledge and skills necessary for optimal diabetes self-care and improve overall clinical outcomes ^{34,35,36}.

Several western studies demonstrated that better knowledge of diabetes was associated with a greater likelihood to perform self-care activities, better medication adherence, and improved glycemic control. Poor glycemic literacy has been associated with worse glycemic control and a higher rate of diabetic complications. Many factors were found to be associated with poor diabetes knowledge including low educational status, lower socioeconomic status whereas attending diabetic education sessions and being a member of diabetic association was associated with better diabetes knowledge ^{37,38,39,40}.

Different studies on diabetes knowledge and self-care practices in Ethiopian patients showed that very high proportions of patients have poor diabetes knowledge and substantially low diabetes self-care practice. Patients from rural areas and lack of access for self-monitoring of blood glucose were strong predictive factors for poor diabetes knowledge ^{41,42,43,44}.

2.3 Knowledge of therapeutic goals of diabetes management

Studies suggested that improving patients' understanding of diabetes therapeutic goals led to improved diabetes self-care behavior and better glycemic control. However, A1c was generally poorly understood and recalled among patients with diabetes. Besides, only a small percent of patients knew what the target blood glucose levels are. The rest majority were unknowing of their

glycemic goals. A gain in the knowledge of targets of diabetes care with continuous diabetic education improved the achievement of glycemic goals ^{10, 11, 12, 45, 46, 47, 48}.

A multi-center, cross-sectional study in China stated that only a quarter of patients have a good understanding of A1c and their blood sugar goals. Higher education level and longer duration of diabetes were related to good knowledge status. The patients who had a good understanding of their A1c demonstrated significantly better diabetes self-management behavior and had lower A1c levels than those who did not ⁴⁹.

Another study in Kuwait also confirmed the alarmingly low rates of understanding the therapeutic goals of diabetes management. Those with higher educational status and having a family history of diabetes knew their targets. Knowledge of therapeutic goals and their recent values were associated with better adherence to self-care and lifestyle modification ^{50, 51}.

An institution-based survey in Dessie, Ethiopia, found out that less than a third of patients know their glycemic targets. Patients with poor knowledge were more likely to be non-compliant to medications and lifestyle advice, and less likely to attain their fasting glycemic targets ⁵². Another survey in TASH showed that only 25% of patients with diabetes know their fasting glycemic targets ³¹.

3. Objectives of the Study

3.1 General objective

- To assess the knowledge of therapeutic goals of diabetes management among patients with type 2 diabetes attending the diabetes clinic in TASH, Addis Ababa, Ethiopia, 2020.

3.2 Specific objectives

- To assess knowledge of the therapeutic goals of blood pressure, FBS, HbA1c, and LDL-C among patients with type 2 diabetes attending the diabetes clinic in TASH, Addis Ababa, Ethiopia, 2020.
- To assess knowledge of own recent levels of blood pressure, FBS, HbA1c, and LDL-C among patients with type 2 diabetes attending the diabetes clinic in TASH, Addis Ababa, Ethiopia, 2020.
- To assess determinants of knowledge of the therapeutic goals of blood pressure, FBS, HbA1c, and LDL-C among patients with type 2 diabetes attending the diabetes clinic in TASH, Addis Ababa, Ethiopia, 2020.

4. Methods and Materials

4.1 Study setting

The study was conducted in the diabetes clinic of Tikur Anbessa Specialized Hospital, Addis Ababa, Ethiopia. TASH is the largest tertiary hospital in Ethiopia. It is also the main teaching hospital for the College of Health Sciences, Addis Ababa University. The hospital launched a digital record system in 2018 where the clinical data and other pertinent profiles of the patients be stored and retrieved when needed.

It has several specialty clinics providing service for more than half a million clients from all corners of the country. The diabetes clinic, where this study was done, serves patients with diabetes on all working days of the week. This clinic provides outpatient services to about one thousand patients a month.

It was conducted from March 3 to June 10, 2020.

4.2 Study design

An institution-based cross-sectional study design was used for this study.

4.4 Source and study population

The source population comprised all patients with type 2 diabetes attending the diabetes clinic in TASH. The study population was patients with type 2 diabetes attending the diabetes clinic in TASH for regular follow up during the study period.

4.5 Eligibility criteria

4.5.1 Inclusion criteria

All adult patients with type 2 diabetes attending TASH diabetes clinic during the study period with at least one prior visit to the clinic, age of ≥ 18 years, and diabetes duration of 1 or more years since diagnosis were included in the study.

4.5.2 Exclusion criteria

- Those patients who were too ill for an interview.
- Those patients with incomplete medical records.
- Pregnant mothers have a different intensity and target of therapy.

4.6 Sample Size Determination

The least sample size (n) required for the study was calculated using the formula to estimate a single population proportion.

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

Where;

n = required sample size

Z_{α/2} = critical value for normal distribution at 95% confidence interval= 1.96 (α = 0.05).

P = Proportion = 50%

d = margin of error= 5%

So, **n** = **(1.96)²*(0.5)(1-0.5)** = **384**,
(0.05)²

Taking 10% non-responders rate, the total sample size was **422**.

4.7 Sampling techniques and sampling procedure

The first participant was chosen based on simple random sampling. After that, every consecutive patient eligible for the study who came to the clinic for their routine diabetes follow-up during the data collection period were included until the sample size of 422 was reached.

4.8 Study variables

4.8.1 Outcome variables

- Knowledge of the therapeutic goals of diabetes management

4.8.2 Explanatory variables

Sociodemographic variables:

- Age, sex, educational status, marital status, occupation, average monthly household income, and residence.

Behavioral and lifestyle factors:

- Smoking status, drinking an alcoholic drink, diet, salt consumption, sedentary activity, adherence to exercise, adherence to medication, attending a diabetic education session, regular monitoring of blood glucose, having a glucometer, and membership at diabetes association

Clinical and laboratory profiles:

- Duration of diabetes, diabetes medications, comorbidity, BMI, mean FBS, and hemoglobin A1c, serum cholesterol, serum HDL-C, serum LDL-C, serum triglyceride, serum creatinine, and urine dipstick protein test.

4.9 Data collection techniques

ODK version 1.25.2 software was used to collect the data along with the KoboToolbox server to store the collected data. Four BSc nurses were recruited for the data collection. Training on how to use the software and collect the data was given to the data collectors.

Data on socio-demographic and behavioral factors was collected by face to face interview using “WHO STEPS Instrument for Chronic Disease Risk Factor Surveillance”⁵³. To assess the study participants’ knowledge of the therapeutic goals of diabetes, a 21 item questionnaire was administered. These items were adapted from prior studies on this area¹¹. Participants were asked about 4 therapeutic goals of diabetes management; namely, BP, FBS, A1c, and LDL-C and recent own levels of BP, FBS, A1c, and LDL-C. Participants who reported knowing therapeutic goals and/or their recent levels were prompted to indicate exact value.

However, data on clinical and laboratory profiles of the participants were obtained through a review of digital records of the clinic using a data extraction tool. Once the data collected from the record, it was marked to prevent duplication of the information.

The questionnaire was prepared in English and translated into Amharic. Finally, it was translated back to English to check its consistency. A pretest was conducted on 21 type 2 diabetes patients who were out of the study population at TASH before actual data collection. Besides, anthropometric data and blood pressure were collected by direct measurement as described below.

A detailed explanation was given on the definition of the medical terms, purpose, and importance of the research to participants appropriate to their level of literacy.

Automated office blood pressure was taken. It was measured in a sitting position from the left arm with feet on the floor and arm supported at heart level after the patient rested for at least 5 minutes. Those patients who have taken caffeine during the hour preceding the reading and those who have smoked during the preceding 30 minutes were let to stay for at least 1 hour and 30 minutes respectively from the time of those events. To reduce inter-observer bias, trained nurses were recruited for data collection, and to reduce patient variability, 2 measurements were taken and the averaged value was used for the analysis.

The weight of participants was taken using standard beam balance and the scale was checked and calibrated to zero before each measurement. Participants' weight was measured after removing heavy clothes and recorded to the nearest 0.1KG. Height was measured using the standard measuring scale. Participants' take off their shoes, stand erect, and look straight in a horizontal plane. The occiput, shoulder, buttocks, and heels touched the measuring board, and height was recorded to the nearest 0.1cm. To compute BMI, height, and weight was automatically calculated using ODK as $\text{weight in kg/height in m}^2$.

4.10 Data quality and management

To ensure the quality of data, a pre-test was conducted on 21 patients with type 2 diabetes at TASH, and training was given to data collectors on-site for one day before the survey to ensure consistency and reduce intra and inter observation difference in the measurement of variables. Excel template for the ODK was prepared with relevant restrictions and necessary commands and tested before actual data collection. The collected data were checked for completeness and consistency on each day of data collection. Supervision and monitoring were made every day by the assigned supervisor.

4.11 Data processing and analysis

After data collection by ODK version 1.25.2, each completed forms were checked for completeness and was exported to SPSS 25 for analysis.

Descriptive statistics included mean with SD and median with IQR for continuous variables, while frequency and percentage tables were used for categorical data.

Simple cross-tabulation and binary logistic regression analysis were used to study the association of independent variables with the knowledge of the therapeutic goals of diabetes management. Model fitness was checked using the Hosmer-Lemeshow goodness-of-fit test and was found to be fit. First, a bivariable analysis was done to identify the variables associated with the knowledge of the therapeutic goals of diabetes management. Then variables with P-value <0.25 in the bivariable analysis were selected as candidate variables and entered together to multivariable analysis to control for confounders. Lastly, variables with p-value <0.05 in multivariable analysis were

considered as statistically significant and AOR with 95% CI were estimated to measure the strength of the associations. The result was presented by using text and tables, and finally interpreted into valuable information.

4.12 Operational definitions

- Therapeutic goals of diabetes: A1c $\leq 7\%$, FBS 70-130 mg/dl, BP <130/80 mmHg, LDL-C <70 mg/dl.
- Good knowledge: knowing at least 5 out of 10 therapeutic target knowledge questions summed up.
- Exercise adherence: walking briskly for 30 to 40 minutes or more in 4 or more days of a week, and or a minimum of 150 minutes per week of moderate-intensity and/or 90 minutes per week of vigorous cardio-respiratory exercise.

4.13 Ethical Considerations

The study was done in conformity with the ethical guidelines. Ethical approval was obtained from the department's research and ethics committee. The purposes and importance of the study were explained and informed written consent was obtained from each study participant. Data has been anonymized and de-identified.

All study participants were informed that participation in this research project has no incentives nor direct benefits. Participants who were unwilling to participate in the study and those who wish to quit their participation at any stage were informed to do so without any restriction.

4.14 Plan for dissemination of research finding

The finding of this study will be submitted to the Department of Internal Medicine, College of Health Sciences, and Addis Ababa University. It will also be shared with the Ethiopian Diabetes Association. It will be presented at different seminars and workshops. All efforts will be made to publish the findings in peer-reviewed medical journals.

5. Results

5.1 Demographic characteristics of the respondents

In this study, a total of 419 people participated making a response rate of 99.2%. Two hundred sixteen participants (51.6%) were females. The mean age ($\pm$ SD) was 57.4 ($\pm$ 10.8) years. The vast majority of the respondents, 404 (96.4%), were urban residents. About a third of the patients reported positive family history of diabetes. The details are shown in table 1.

Table 1: Demographic and Socio-economic characteristics of people with type 2 diabetes on follow-up at TASH, Addis Ababa, Ethiopia, 2020

Variable (n = 419)	Number (percent)
Sex	
Male	203 (48.4)
Female	216 (52.6)
Age category	
<35 years	2 (0.5)
35-44 years	55 (13.1)
45-54 years	109 (26.0)
55-64 years	137 (32.7)
$\geq$ 65 years	116 (27.7)
Residence	
Urban	404 (96.4)
Rural	15 (3.6)
Current marital status	
Single	16 (3.8)
Married	298 (71.1)
Divorced	44 (10.5)
Widowed	61 (14.6)
Education	
No education	28 (6.7)
Primary education	100 (23.9)
Secondary education	128 (30.5)
Higher education	163 (38.9)
Occupation	
Private worker	85 (20)
Government employee	79 (19)
Housewife	139 (33)
Retired	97 (23)
Others	19 (5)
Monthly income	
$\leq$ 1000 ETB	106 (25.3)

1001-5000 ETB 252 (60.1)
>5000 ETB 61 (14.6)

5.2 Clinical characteristics of the respondents

The median duration of diabetes was 12 years with IQR of (7, 20). Two hundred thirty-four (55.5%) of the participants had diabetes longer than 10 years duration. Only 109 (26%) patients achieved the fasting glycemic goal. The median BMI was 25.6 (23.4, 28.6) kg/m². Two hundred thirty-three (55.6%) of them have diagnosed hypertension. The median SBP was 130 mmHg with IQR (120, 140) and median DBP was 80 (75, 85) mmHg. Regarding antidiabetics prescribed, 333 (79.5%) of the respondents were using metformin. Besides, 250 (59.7%) of the patients were taking insulin. Statins and aspirin were used in 308 (73.5%) and 164 (39.1%). The majority of them, 303 (72.3%), reported that they attended diabetic education sessions. Only about half of them had their A1c and LDL-C checked in the last 1 year. A quarter of them achieved fasting glycemic control, a fifth of them achieved A1c goal and only 3% achieve triple targets. (Table 2-3)

Table 2: Clinical profiles of people with T2DM on follow-up at TASH Hospital, Addis Ababa, Ethiopia, 2020

Variables	Frequency (percent)	
Attended diabetic education (n = 419)	Yes	303 (72.3)
	No	116 (27.7)
Member of diabetes association (n = 419)	Yes	97 (23.2)
	No	322 (76.8)
Have glucometer at home (n = 419)	Yes	284 (67.8)
	No	135 (32.2)
Days in which glucose was measured/week (n = 419)	None at all	89 (21.2)
	Once or twice	227 (54.1)
	Three times or more	103 (24.6)
Frequency of LDL-C checked in the last 1 year (n = 391)	None at all	173 (44.1)
	Once	101 (25.8)
	Twice	76 (19.4)
	Three-time or more	42 (10.7)
BMI (n = 419)		

	Underweight	5 (1.2)
	Normal	180 (43.0)
	Overweight	162 (38.7)
	Obese	72 (17.2)
Exercise adherence (n = 419)		
	Adherent	279 (66.6)
	Non-adherent	140 (33.4)
A1c (n = 207)		
	≤7%	48 (23.2)
	>7%	159 (76.8)

Table 3: Metabolic factors of people with T2DM on follow-up at TASH Hospital, Addis Ababa, Ethiopia, 2020

Variables	Median	IQR (Q1, Q3)
Mean SBP (n = 415)	130	120, 140
Mean DBP (n = 415)	80	75, 85
Hemoglobin A1c (n = 207)	8.4	7.2, 10.0
Mean FBS (n = 352)	145	124, 170
Total cholesterol (n = 214)	171	134, 213
LDL (n = 217)	107	81, 136
HDL (n = 217)	42	34, 49
Triglyceride (n = 219)	142	109, 196

5.4 Patient-reported knowledge of the therapeutic goals of diabetes management

The mean knowledge score was 4.7 ± 2.2 points (out of 10). Two hundred fifty patients (59.7%) had a composite index of good knowledge of the therapeutic targets and recent levels of blood pressure, FBS, A1c, and LDL-C. One hundred sixty-eight (40.1%) patients reported knowing A1c testing. The majority of patients reported knowing their BP and FBS goals while the only minority of them knows their A1c and LDL-C goals. Knowledge about blood pressure and FBS targets was

correct for 75.7% and 73% respectively while only 4.1% reported the correct target for A1c. Besides, knowledge about the target goal for LDL-C was poor as only 4 patients gave a correct answer.

Table 4: Patient-reported knowledge of the therapeutic goals and current levels of people with T2DM on follow-up at TASH Hospital, Addis Ababa, Ethiopia, 2020

Variable (n = 419)	Reports knowing target		Knows correct target		Knows own recent level	
	Number	Percent	Number	Percent	Number	Percent
BP (SBP or DBP)	333	79.5	317	75.7	303	72.3
FBS	324	77.3	306	73.0	336	80.2
A1c	49	11.7	17	4.1	70	16.7
LDL-C	30	7.2	4	1.0	34	8.1

5.5 Determinants of knowledge score on the therapeutic goals of diabetes management

In this study, based on the p-value of the bivariable analysis, 12 variables were identified as candidate variables for the multivariable analysis. These are age, sex, occupation, marital status, educational level, average monthly household income, duration of diabetes, receiving diabetes education, membership in a diabetic association, having glucometer, frequency of glucose measurement, and exercise adherence. The result of the multivariable analysis however identified age, marital status, educational status, average monthly household income, and duration of diabetes as independent determinants of knowledge score among people with type 2 diabetes. The findings are presented in table 5.

For each one year increase in the age of participants, the odds of having good knowledge of diabetes therapeutic goals decreases by 3% [AOR = 0.97; 95% CI: 0.95-0.99]. Besides, the odds of having knowing the therapeutic goals for divorced patients with diabetes decreases by 63% as

compared to married participants [AOR = 0.37%; 95% CI: 0.18-0.76]. Likewise, the odds of having a good knowledge score for participants with no education decreases by 97% compared to participants with above secondary education [AOR = 0.03; 95% CI: 0.006-0.13]. The odds of primary educated participants to have good knowledge of therapeutic goals decreases by 73% [AOR = 0.27; 95% CI: 0.15-0.49] as compared to participants with higher education.

As income increases by 1000 ETB, the odds of having good knowledge of therapeutic goals increases by 12% [AOR = 1.12; 95% CI: 1.02-1.23]. Besides, for each 1-year increase in the duration of diabetes, the odds of having good knowledge increases by 4% [AOR = 1.04; 95% CI: 1.01-1.07].

Table 5: Bivariable and multivariable binary logistic regression analysis results of factors associated with knowledge score among people with type 2 diabetes on follow-up at TASH Hospital, Addis Ababa, Ethiopia, 2020

Explanatory variable	Composite knowledge score		COR 95% CI	AOR 95% CI
	Good	Poor		
Age (years)	56.4 ±10.4 [€]	58.9 ±11.4 [€]	0.97 (0.96-0.99)	0.97 (0.95-0.99)*
Sex				
Male	137 (54.8)	66 (39.1)	1.89 (1.27-2.81)	1.19 (0.59-2.43)
Female	113 (45.2)	103 (60.9)	1	1
Marital status				
Single	7 (2.8)	9 (5.3)	0.58 (0.19-1.76)	0.40 (0.13-1.26)
Married	193 (77.2)	105 (62.1)	1	1
Divorced	15 (6.0)	29 (17.2)	0.38 (0.17-0.86)	0.37 (0.18-0.76)*
Widowed	35 (14.0)	26 (15.4)	1.37 (0.78-2.39)	1.59 (0.80-3.13)
Occupation				
Private worker	61 (24.4)	24 (14.2)	1	1
Government employee	53 (21.2)	26 (15.4)	1.25 (0.64-2.43)	2.15 (0.92-4.99)
Housewife	65 (26)	74 (43.8)	0.43 (0.24-0.77)	1.46 (0.65-3.12)
Others	71 (28.4)	45 (26.6)	0.77 (0.43-1.41)	1.49 (0.66-3.39)
Education				
No education	2 (0.8)	26 (15.4)	0.02 (0.01-0.11)	0.29 (0.01-0.13)*
Primary	42 (16.8)	58 (34.3)	0.23 (0.13-0.39)	0.27 (0.15-0.49)*
Secondary	82 (32.8)	46 (27.2)	0.56 (0.34-0.93)	0.65 (0.37-1.13)
Higher	124 (49.6)	39 (23.1)	1	1
Monthly income (ETB)	3000 (1600, 5000) [¥]	1900 (1000, 3000) [¥]	1.25 (1.14-1.37)	1.12 (1.02-1.23)*
Duration of diabetes (years)	14 (8, 20) [¥]	10 (5, 18) [¥]	1.02 (0.99-1.05)	1.04 (1.01-1.07)*
Diabetes Education				
No	61 (24.4)	55 (32.5)	1	1

	Yes	189 (75.6)	114 (67.5)	1.49 (0.97-2.30)	1.38 (0.82-2.34)
Membership of DM association					
	No	187 (74.8)	135 (79.9)	1	1
	Yes	63 (25.2)	34 (20.1)	0.75 (0.47-1.19)	1.02 (0.58-1.77)
Have glucometer					
	No	69 (27.6)	135 (79.9)	1	1
	Yes	181 (72.4)	34 (20.1)	1.68 (1.11-2.54)	0.89 (0.50-1.56)
Glucose measurement					
	None	40 (16)	49 (29.0)	1	1
	Once weekly	72 (28.8)	53 (31.4)	1.66 (0.96-2.88)	1.38 (0.72-2.64)
	Twice weekly	70 (28)	32 (18.9)	2.68 (1.48-4.84)	1.94 (0.94-3.98)
	≥3 times weekly	68 (27.2)	35 (20.7)	2.38 (1.33-4.27)	1.57 (0.74-3.31)
Exercise adherence					
	Non-adherent	73 (29.2)	67 (39.7)	1	1
	Adherent	177 (70.8)	102 (60.3)	1.59 (1.05-2.40)	1.19 (0.73-1.95)

* Statistically significant at P-value ≤0.05, € mean ±SD, ¥ median with (Q1, Q3).

6. Discussion

This was the first comprehensive assessment of the knowledge of the three therapeutic goals of diabetes care and its determinant factors amongst type 2 diabetes patients in Ethiopia. It showed that the proportion of patients with good composite knowledge score was 59.7% with mean knowledge score of 4.7 ± 2.2 points (out of 10).

The patient population analyzed was representative of the patients with diabetes following at TASH. The mean age, sex, duration of diabetes, educational status, and place of residence in prior studies conducted in TASH diabetes clinic ^{43,31}. The fasting glycemic control level in this study was also similar to a recent survey looking at the achievement of diabetes treatment goals in TASH ²⁰. However, the percentage of patients taking insulin was higher in this study, probably due to higher likelihood of clinic visits by patients taking insulin than those on oral drugs who were being managed virtually during the beginning of the COVID-19 pandemic.

On the other hand, knowledge of fasting glycemia targets was better than a previous study in TASH ³¹. The percentage of patients knowing their FBS target was also higher than that reported by an institution based cross sectional survey done in Dessie, Ethiopia ⁵². The differences in educational level and urban residency could contribute to this significant disparity in the knowledge of the FBS target. Similarly, the measurements of lipid profile and statin use were higher than previous studies in TASH and Jimma ^{20,54}. This is an encouraging finding that indicates successful efforts of the hospital's Endocrine unit and Ethiopian diabetes association.

Overall, patients' knowledge of BP and FBS targets and their recent levels were far better than that for A1c and LDL-C. These are much in line with those reported by a study conducted in South Carolina and China where the knowledge of therapeutic goals was reported by less than one-third of patients while the rest majority were unknowing of their therapy targets ^{10,4955}. The higher familiarity of the respondents to BP and FBS targets and their recent values could be attributed to the fact that these measurements are commonly performed at each clinic visit compared to A1c and LDL-C tests which are less frequently determined. The higher cost and less availability of A1c and LDL-C testing could also contribute to a very low understanding of these tests while automated BP cuffs and glucometers are more accessible.

Multivariable analysis of this study identified five factors as independent determinants of knowledge score of therapeutic goals and own recent values among patients with type 2 diabetes. Better knowledge was found in younger patients, higher educational status, and married individuals. Likewise, increasing monthly household income and longer duration of diabetes are statistical predictors of a good knowledge score.

The relationship of increasing age and low educational level with poor knowledge was in agreement with studies from China^{56,49}, Kuwait⁵⁰, and Saudi Arabia⁵⁷. Age was found to negatively correlate with diabetes knowledge in these studies. Older patients scored lower in diabetes knowledge. It could be due to increased cognitive impairment and memory loss with increasing age.

Attending diabetes education sessions, being a member of diabetes association and having positive family history of diabetes were not associated with good knowledge of the therapeutic goals of diabetes in this study. In western studies, however, these factors were associated with overall diabetes knowledge scores^{37,38,39,40}. Attending diabetes education has also been shown to positively associated with good diabetes-related knowledge in Ethiopia^{42,41}. Lack of informing patients clearly about their goals of care during diabetes education sessions could be a possible reason but it needs further assessment.

Several studies suggested that improving patient understanding of diabetes therapeutic goals led to improved diabetes self-care behavior and better glycemic control. However, A1c is generally poorly understood and recalled among patients with diabetes. An only a small percent of patients showed know what the target blood glucose levels are. A gain in the knowledge of targets of diabetes care with continuous diabetes education significantly improved achievement^{11,12,45,46,47,48}.

In comparison to several previous studies done in Ethiopia that evaluated different aspects of diabetes-related knowledge and self-care activities^{44,43,42,52}, this study confirmed a relevant knowledge deficit among patients with type 2 diabetes about the most relevant, proximate triple markers of diabetes management, namely glycemic, BP and dyslipidemia control.

7. Strength and limitation of the study

The use of relatively large sample size, exhaustive inclusion of potential confounders in the model, and the use of relevant commands in ODK to obtain quality data are among the strengths of this study. Comprehensive assessment of the patients' knowledge about the triple goals of diabetes care also provides broader view of patients' about their diabetes management.

In contrast, the major limitation of this study is that it is a single centered survey with a cross-sectional design, and recall biases. Besides, understanding A1c and LDL-C are often difficult. Moreover, the findings may reflect an overestimate of the overall knowledge status due to the predominance of urban living participants with higher education and access to better information.

8. Conclusions

The majority of participants reported knowing their BP and FBS targets and own recent levels while only a minority of patients understood their A1c and LDL-C values and targets. Overall, the composite knowledge score about the triple therapeutic goals of diabetes care among patients with type 2 diabetes was suboptimal. Age, educational status, marital status, household income, and duration of diabetes were identified as independent determinants of knowledge score. The findings of this study may help to improve diabetes education targeting on the knowledge of the therapeutic goals as achieving goals of diabetes care is difficult without patients knowing these specific targets.

9. Recommendations

Based on the findings of our study, the following recommendations are forwarded to the respective bodies:

Patients with diabetes:

- People with type 2 diabetes especially those with increasing age, low educational status, lower income, short duration of diabetes are recommended to improve their knowledge of the therapeutic targets of diabetes care.

Diabetes educators:

- All diabetes educators are advised to educate patients about their therapy goals of diabetes care with emphasis especially those with increasing age, low educational status, lower income, short duration of diabetes.

Researchers:

- Researchers are recommended to conduct larger prospective studies to identify the cause and effects of poor knowledge status among patients with diabetes.

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Annexes

Annex 1: declaration

I, the undersigned, declare that this postgraduate thesis is an original work. All sources of material used for this thesis has been duly acknowledged.

Postgraduate candidate: Melaku Taye (MD, resident)

Signature _____

Submission date _____

This thesis has been submitted with my approval as advisor.

Advisor: Getahun Tarekegn (MD, Endocrinologist)

Signature _____

Date _____

December 2020

Addis Ababa, Ethiopia

Annex 2: Questionnaire

English version

MRN_____Date_____of_____interview_____interviewer
name_____

Ser. No	Questions	Response and coding	Skip
Section 1: demographic data			
101	How old are you?	_____yrs	
102	Sex	1. Male 2. Female	
103	Where is your residence?	1. Urban 2. Rural	
104	What is your current marital status?	1. Single 2. Married 3. Divorced 4. Widowed	
105	Which of the following best describes your main work status over the past 12 months?	1. Government employee 2. Self-employed 3. House wife 4. Farmer 5. Others (specify).....	
106	What is your level of education	1. No formal education 2. Primary school 3. Secondary school 4. Higher education	

107	What is your average household monthly income?	_____ (Birr)	
Section 2: cardiovascular history			
201	How long have you been diagnosed with diabetes ?	_____ years	
202	Do you have family history of diabetes?	1. Yes 2. No	
203	Have you been diagnosed with hypertension ?	1. Yes 2. No	204
204	If yes to Q20, for how long?	_____ years	
205	Have you been diagnosed with ischemic heart Disease?	1. Yes 2. No	
206	Did you have previous TIA or stroke?	1. Yes 2. No	
207	Do you have peripheral arterial disease?	1. Yes 2. No	
Section 3: life style factors			
Now I am going to ask you some questions about various health behaviors. This includes things like smoking, drinking alcohol, diet and physical activity. Let's start with tobacco.			
301	Have you ever smoked any tobacco products, such as cigarettes, cigars or pipes?	1. Yes____ 0. No____	307

302	Do you currently smoke tobacco products daily?	1. Yes____ 0. No____	
303	How old were you when you first started smoking daily?	____years. If known, go to 305 DON'T KNOW 77	
304	Do you remember how long ago it was? (RECORD ONLY 1, NOT ALL 3)	____yrs OR ____months OR____wks DON'T KNOW 77	
305	On average, how many of the following do you smoke each day? RECORD FOR EACH TYPE	Manufactured cigarettes____ Hand-rolled cigarettes____ Pipes full of tobacco____ Cigars, cheroots, cigarillos____ Other____ Please specify other____	
306	How old were you when you stopped (if any) smoking daily?	____years. Don't know, how long ago it was____	
The next questions ask about the consumption of ALCOHOL.			

307	Have you ever consumed an alcoholic drink such as beer, wine, spirits, fermented cider or tejj, tella, areke?	1. Yes____ 0. No____	312
308	During the past 12 months, how frequently have you had at least one alcoholic drink?	1. Daily 2. 5-6 days per week 3. 1-4 days per week 4. 1-3 days per month 5. Less than once a month 6. Never	
309	When you drank alcohol, on average, how many standard alcoholic drinks did you have during one drinking occasion?	_____drinks	
310	What was the largest number of standard alcoholic drinks you had on a single occasion, counting all types of alcoholic drinks together?	Largest no. _____ Don't Know 77	
311	In a typical month, how many times did you have (for men: five or more, for women: four or more) standard alcoholic drinks in a single drinking occasion?	_____ times Don't Know 77	
DIET: The next questions ask about diet that you usually eat. As you answer these questions, please think of a typical week in the last year.			
312	In a typical week, on how many days do you eat fruit ?	_____days/wk	

313	How many servings of fruit do you eat on one of those days?	_____ servings/day	
314	In a typical week, on how many days do you eat vegetables?	_____ days/wk	
315	How many servings of vegetables do you eat on one of those days?	_____ servings/day	
316	What type of oil or fat is most often used for meal preparation in your household?	1. Vegetable oil 2. Cholestrol oil 3. Butter or ghee 4. Other specify.....	
317	On average, how many meals per week do you eat that were not prepared at a home? By meal, I mean breakfast, lunch and dinner.	_____ meals /wk	
318	How is your salt consumption after DM diagnosis?	1. No change from prediabetic period 2. Minimally decreased 3. Substantially decreased 4. Stopped at all	

Physical Activity: Next I am going to ask you about the time you spend doing different types of physical activity in a typical week. Please answer these questions even if you do not consider yourself to be a physically active person. Think first about the time you spend doing work. Think of work as the things that you have to do such as paid or unpaid work, study/training, household chores, harvesting food/crops, fishing or hunting for food, seeking employment.

319	Does your work involve vigorous-intensity activity that causes large increases in breathing or heart rate like [carrying or lifting heavy loads, digging or construction work] for at least 10 minutes continuously?	1. Yes____ 0. No____	322
320	In a typical week, on how many days do you do vigorous-intensity activities as part of your work?	_____days	
321	How much time do you spend doing vigorous-intensity activities at work on a typical day?	____:____Hr:min /day	
322	Does your work involve moderate-intensity activity that causes small increases in breathing or heart rate such as brisk walking [or carrying light loads] for at least 10 minutes continuously?	1. Yes____ 0. No____	325
323	In a typical week, on how many days do you do moderate-intensity activities as part of your work?	_____days	
324	How much time do you spend doing moderate-intensity activities at work on a typical day?	____:____Hr:min /day	

The next questions exclude the physical activities at work that you have already mentioned. Now I would like to ask you about the usual way you travel to and from places. For example to work, for shopping, to market, to place of worship, to taxi station			
325	Do you walk or use a bicycle (pedal cycle) for at least 10 minutes continuously to get to and from places?	1 Yes____ 0. No____	328
326	In a typical week, on how many days do you walk or use a pedal cycle for at least 10 minutes continuously to get to and from places??	_____days	
327	How much time do you spend walking or bicycling for travel on a typical day?	____:____Hr:min /day	
The next questions exclude the work and transport activities that you have already mentioned. Now I would like to ask you about sports, fitness and recreational activities (leisure)			
328	Do you do any vigorous-intensity sports, fitness or recreational (leisure) activities that cause large increases in breathing or heart rate like [running or football or lifting weight] for at least 10 minutes continuously?	1. Yes____ 0. No____	331
329	In a typical week, on how many days do you do vigorous-intensity sports, fitness or recreational (leisure) activities?	_____days	
330	How much time do you spend doing vigorous-intensity sports, fitness or recreational activities on a typical day?	____:____Hr:min /day	

331	Do you do any moderate-intensity sports, fitness or recreational (leisure) activities that cause a small increase in breathing or heart rate such as brisk walking, [cycling, swimming, volleyball] for at least 10 minutes continuously?	1. Yes____ 0. No____	334
332	In a typical week, on how many days do you do moderate-intensity sports, fitness or recreational (leisure) activities?	_____days	
333	How much time do you spend doing moderate-intensity sports, fitness or recreational (leisure) activities on a typical day?	____:____Hr:min	
The following question is about sitting or reclining at work, at home, getting to and from places, or with friends including time spent sitting at a desk, sitting with friends, traveling in car, bus, train, reading, playing cards or watching television, but do not include time spent sleeping.			
334	How much time do you usually spend sitting or reclining on a typical day? (Sedentary behavior)	____:____Hr:min	
335	How many hours of actual sleep do you get in a 24-hour period?	_____hr	
Section 4: Knowledge on diabetes treatment goals			
401	Have you heard of A1c measure?	1. Yes	405

		0. No	
402	How many times was your A1C checked in the last one year?	_____ times	
403	Do you know your recent/last level of HbA1c?	1. Yes 0. No	
404	If yes to Q403, what was the exact value?	_____ %	
405	Do you know what level of HbA1c is considered as a good glycemic control?	1. Yes 0. No	407
406	If yes to Q405, what is the level?	_____ %	
407	How many times was your FBS checked in the last one year?	_____ times	
408	Do you know your recent/last level of FBS?	1. Yes 0. No	410
409	If yes to Q408, what is the value?	_____ mg/dl	
410	Do you know what the level of FBS is considered as a good glycemic control?	1. Yes 0. No	
411	If yes to Q410, what is the level?	_____ mg/dl	
412	How many times was your BP checked in the last one year?	_____ times	
413	Do you know your recent/last level of BP?	1. Yes 0. No	415
414	If yes to Q413, what is the BP level?	SBP_____ mmHg DBP_____ mmHg	

415	Do you know what the level of BP is considered as a good BP control?	1. Yes 0. No	417
416	If yes to Q415, what is the level of BP?	SBP_____ mmHg DBP_____ mmHg	
417	How many times was your LDL-C checked in the last one year?	_____ times	
418	Do you know your recent/last level of LDL-C?	1. Yes 0. No	420
419	If yes to Q419, what was the level?	_____ mg/dl	
420	Do you know what the level of LDL-C is considered as a good glycemic control?	1. Yes 0. No	
421	If yes to Q420, what is the level?	_____ mg/dl	
	Section 5: physical exam		
501	Office BP	_____ mmHg	
502	Weight	----- kg	
503	Height	_____ cm	
504	Waist circumference	_____ cm	
505	Hip circumference	_____ cm	

	Section 6: lab tests		
601	HgA1c	_____ %	
602	FBS	_____ mg/d l	
603	Total cholesterol		
604	LDL-C		
605	HDL-C		
606	Triglycerides		
607	Serum creatinine		
608	Albuminuria	1. None 2. +1 3. +2 4. +3	
	Section 7: current medications	Specify drug, dose, duration	
701	antidiabetics		
702	Antihypertensives		
703	Lipid lowering agents		
704	ASA		
705	Others		

የአማርኛ መጠይቅ

የጥናቱ ተሳታፊ ኮድ.....የተጠየቀው ቀን.....

ተ.ቁ	ጥያቄዎች	መልስ እና ምስጢር ቁጥር	ዝላል
	አጠቃላይ መረጃ		
101	ዕድሜዎ ስንት ነው?	_____ ዓመት	
102	ጾታ (በማየት ይመዝግቡ)	1. ወንድ 2. ሴት	
103	መኖሪያዎ የትኑት?	1. ከተማ 2. ገጠር	
104	የአሁኑ የጋብቻ ሁኔታዎ ምንድነው?	1. ያላገባች 2. ያገባች 3. የተፋታች 4. ባል/ሚስት የሞተበት	
105	የሥራዎ ሁኔታ ባለፉት 12 ወራት ምንድን ነበር?	1. የመንግስት ሠራተኛ 2. የግል ሥራ 3. የቤት እመቤት 4. አርሶአደር 5. ሌላ (ጥቀስ)_____	

106	የትምህርት ደረጃዎት ምንድን ነው?	1. አልተማርኩም 2. የመጀመርያ ደረጃ 3. ሁለተኛ ደረጃ 4. ከፍተኛ ትምህርት	
107	የቤታችሁ የወር ገቢ ምን ያህል ነው?	_____ ብር በወር	
ክፍል 2: ከጤና ጋር የተያያዙ መረጃዎች			
201	የስኳር ህመም እንዳለብዎት ካወቁ ወዲህ ምን ያክል ጊዜ ሆነ?	_____ ዓመት	
202	የደም ግፊት አለበዎት?	1. አዎን 2. የለም	204
203	ለጥያቄ ቁጥር 202 መልስዎ አዎ ከሆነ የደም ግፊት እንዳለበዎት ካወቁ ስንት አመት ሆነው?	_____ ዓመት	
204	የኢስኬሚክ የልብ በሽታ አለበዎት?	1. አዎን 2. የለም	
205	ስትሮክ አለበዎት?	1. አዎን 2. የለም	
206	የእግር የደም ስር ጥበት አለበዎት?	1. አዎን 2. የለም	✓
ክፍል III የህይወት ዘይቤ እና የባህሪ ምክንያቶች አሁን ስለ የተለያዩ የጤና ጠባይ አንዳንድ ጥያቄዎችን ልጠይቅዎት እፈልጋለሁ :: ይህ እንደ ማጨስ ፣ አልኮልን መጠጣት ፣ አመጋገብ እና የአካል እንቅስቃሴ ያሉ ነገሮችን ያጠቃልላል። ከትንባሆ እንጀምር ::			
301	እንደ ሲጋራና የመሳሰሉ ማናቸውንም ዓይነት የትምባሆ ምርቶች አጭሰው ያውቃሉ?	1. አዎን 0. አይደለም- (ወደ 307 ይሂዱ)	
302	በአሁኑ ጊዜ የትምባሆ ምርቶችን በየቀኑ ያጨሳሉ?	1. አዎን 0. አይደለም	

303	በየቀኑ ማጨስ ሲጀምሩ ዕድሜዎ ስንት ነበር?	_____ዓመት:: ምታወቅ ከሆነ ወደ 305	
304	ማጨስ የጀመርከው ከምን ያክል ጊዜ በፊት እንደነበር ታስታውሳለህ?	_____	
305	በአማካይ በየቀኑ ከሚከተሉት ውስጥ ምን ያህል ያጨሳሉ? የትኞችን የትንባሆ ዓይነት ከሆነ (ከአንድ በላይ መመለስ ይቻላል)	በፋብሪካ የተመረቱ ሲጋራዎች____ በእጅ የተጠቀሱ ሲጋራዎች____ ጋያ____ ሌላ____ እባክዎ ሌላ ከሆነ ስሙን ይጥቀሱ_____	
306	ማጨስ አቁመው ከሆነ ያቆሙት በስንት ዓመትዎ ነበር? ማጨስ ስያቆሙ ዕድሜዎ ስንት እንደነበረ ካላወቁ ማጨስ ካቆሙ ምን ያክል ጊዜ ሆነው_____	_____ዓመት ካላወቁ ምን ያክል ጊዜ ሆነው_____	
አልኮሆል: የሚቀጥሉት ጥያቄዎች ስለ አልኮሆል ፍጆታ ይጠይቃሉ ::			
307	የአልኮል መጠጥ ጠጥተው ያውቃሉ? (ቢራ ፣ ወይን ፣ ጠላ፣ጠጅ፣ አረቄ...)	1. አዎን 0. አይደለም	
308	በአለፉት 12 ወራት ውስጥ ቢያንስ አንድ የአልኮል መጠጥ የሚጠጡት ስንት ጊዜ ነበር?	1. በየቀኑ 2. 5-6 ቀናት በሳምንት 3. 1-4 ቀናት በሳምንት 4. 1-3 ቀናት በወር 5. በወር አንዴ 6. ጠጥቼ አላውቅም	311

309	የአልኮል መጠጥ በሚጠጡበት ጊዜ በአማካይ ስንት አልኮል መጠጦች በአንድ የመጠጥ ጊዜ ውስጥ ይጠጣሉ?	_____	
310	በአንድ የመጠጥ ጊዜ ትልቁ የጠጣሪው የአልኮል መጠጦች ሁሉንም የአልኮል መጠጦችን በመቁጠር ስንት ነበሩ?	ትልቁ የጠጣሪው _____	
311	በተለመደ ወር ውስጥ ወንድ 5 እና ከዚያ በላይ ፊት 4 እና ከዚያ በላይ የአልኮል መጠጥ በአንድ የመጠጥ ጊዜ የወሰዱት ምን ያህል ጊዜ ነው?		
አመጋገብ: የሚቀጥሉ ጥያቄዎች አብዛኛውን ጊዜ ስለሚመገቡት የፍራፍሬና የአትክልት አመጋገብ ይጠይቅዎታል። እባክዎን መልስዎን ሲመልሱ ባለፈው ዓመት ውስጥ የእርስዎን አመጋገብ ስለሚወክለው ሳምንት ያስቡ።			
312	በተለመደው ሳምንት ምን ያክል ቀን ፍራፍሬ ትመገባለህ?	_____ ቀን	
313	ከእነዚህ ቀናቶች በአንዱ ላይ ምን ያክል የፍራፍሬ ገበታ ይመገባሉ?	_____	
314	በተለመደው ሳምንት ምን ያክል ቀን አትክልት ትመገባለህ?	_____ ቀን	
315	ከእነዚህ ቀናቶች አንዱ ላይ ምን ያክል የአትክልት ገበታ ይመገባሉ?	_____	
316	ብዙ ጊዜ ምግብ ለማብሰል ምን ዓይነት ዘዴት ነው የምትጠቀሙት?	1. የአትክልት ዘዴት 2. የምረጋ ዘዴት 3. ቂቤ 4. ሌላ.....	
317	በሳምንት ከቤት ውጪ በአማካይ ምን ያክል ጊዜ ይመገባሉ? ቁርስ፣ምሳና እራት ተቆጥረው ተቆጥረው ማለቴ ነው	_____ ጊዜ በሳምንት	

318	የስኳር በሽታ እንዳለብዎት ከተነገርዎት በኋላ የጨው ፍጆታዎ እንዴት ነው?	1. በፊት ከሚጠቀሙት መጠን ለውጥ የለውም 2. በጥቂቱ ቀንሰዋል 3. በጣም ቀንሰዋል 4. መጠቀም አቁመዋል	
የአካል ብቃት እንቅስቃሴ- ቀጣይ በተለመደ ሳምንት ውስጥ የተለያዩ የአካል ብቃት እንቅስቃሴ ዓይነቶችን በመሥራት ያሳለፉትን ጊዜ እጠይቅዎታለሁ :: ምንም እንኳን እርስዎ አካላዊ እንቅስቃሴ የሚያደርጉ ሰው ባይሆኑም እባክዎን እነዚህን ጥያቄዎች ይመልሱ :: ሥራን ስለሚሰሩበት ጊዜ በመጀመሪያ ያስቡ :: እንደ ደመወዝ ወይም ያልተከፈለ ሥራ ፣ ጥናት / ስልጠና ፣ የቤት ውስጥ ሥራዎች ፣ ምግብ / ስብሎች መሰብሰብ ፣ ዓሳ ማጥመድ ወይም ምግብ መፈለግ ላይ እንደመሰማራት ያሉ መሥራት ያለብዎት ነገሮችን ያስቡ ::			
319	ሥራዎ አተነፋፈሏቸው ወይም ልብ ምትዎን በጣም ሊጨምር የሚችል ከባድ እንቅስቃሴን እንደመሸከም ከባድ ነገርን እንደማንሳት ወይም እንደ ግንባታ ሥራ ቢያንስ ለ10 ደቂቃ ያለማቋረጥ መስራትን ያካትታል?	0. አዎን ____ 1. አይደለም ____	
320	እንዲህ አይነት ከባድ ስራዎችን በሳምንት ምን ያክል ቀን ይሰራሉ?	____ ቀን	
321	በሥራዎ ውስጥ በአንድ በተለመደ ቀን ከባድ እንቅስቃሴዎችን በመከወን ምን ያህል ጊዜ ያሳልፋሉ?	____:____	
322	ሥራዎ የመተንፈስ ወይም የልብ ምት በትንሹ የሚጨማሩ መካከለኛ እንቅስቃሴን እንደ [ፈጣን እርምጃ ወይም ቀላል ጭነቶችን እንደመሸከም] ያሉ እንቅስቃሴን ያለማቋረጥ ቢያንስ ለ 10 ደቂቃዎች መሥራትን ያካትታል?	0. አዎን ____ 1. አይደለም ____	
323	በተለመደው ሳምንት ውስጥ እንደስራዎ አንድ ከፍል እንዲህ አይነት መካከለኛ-እንቅስቃሴዎችን ስንት ቀናት ያደርጋሉ?	____ ቀን	
324	በሥራዎ ውስጥ በአንድ በተለመደ ቀን መካከለኛ እንቅስቃሴዎችን በመከወን ምን ያህል ጊዜ ያሳልፋሉ?	____:____	

የሚቀጥሉት ጥያቄዎች ቀደም ሲል እርስዎ የገለጹትን በስራ ላይ ያሉትን የአካል ብቃት እንቅስቃሴዎችን አያካትቱም :: አሁን ወደ ቦታዎች ለመሄድና እና ከቦታዎች ለመመለስ ስለሚጓዙበት የተለመደ ጉዞ ልጠይቅዎ እፈልጋለሁ :: ለምሳሌ ለመስራት ፣ ዕቃ ለመግዛት ፣ ለገበያ ፣ ለአምልኮ ቦታ ፣ ለታክሲ መያዣ			
325	ወደ ቦታዎች ለመሄድ እና ለመመለስ ብስክሌትን ወይም የእግር ጉዞን ያለማቋረጥ ቢያንስ ለ 10 ደቂቃዎች ይጠቀማሉ?	0. አዎን ____ 1. አይደለም ____	
326	በተለመደው ሳምንት ወደ ቦታዎች ለመሄድ እና ለመመለስ ብስክሌትን ወይም የእግር ጉዞን ያለማቋረጥ ቢያንስ ለ 10 ደቂቃዎች ስንት ቀን ይጠቀማሉ?	____ ቀን	
327	በተለመደው ቀን ለጉዞ ብስክሌትን በመንዳት ወይም የእግር ጉዞን በመጓዝ ምን ያህል ጊዜ ያሳልፋሉ?	____:____	
የሚቀጥሉት ጥያቄዎች እርስዎ ቀደም ሲል የጠቀሷቸውን የሥራ እና የትራንስፖርት እንቅስቃሴዎችን አያካትቱም :: አሁን ስለ ስፖርት ፣ የአካል ብቃት እና የመዝናኛ እንቅስቃሴዎች (መዝናኛ) ልጠይቅዎት እፈልጋለሁ ::			
328	ቢያንስ ለ 10 ደቂቃዎች ያለማቋረጥ እንደ ሩጫ ወይም እግር ኳስ ወይም ክብደት ማንሳት ያሉ አተነፋፈስ ወይም የልብ ምት በከፍተኛ የሚጨምሩ ጠንካራ የስፖርት ፣ የአካል ብቃት ወይም የመዝናኛ እንቅስቃሴዎችን ያደርጋሉ?	0. አዎን ____ 1. አይደለም ____	
329	በተለመደው ሳምንት ውስጥ ጠንካራ ስፖርት ፣ የአካል ብቃት ወይም የመዝናኛ እንቅስቃሴዎችን ስንት ቀናት ያደርጋሉ?	____ ቀን	
330	በተለመደው ቀን ጠንካራ የስፖርት ፣ የአካል ብቃት እንቅስቃሴ ወይም የመዝናኛ እንቅስቃሴዎችን በማድረግ ምን ያህል ጊዜ ያሳልፋሉ?	____:____	
331	ቢያንስ ለ 10 ደቂቃዎች ያለማቋረጥ እንደ ብስክሌት መንዳት ፣ መዋኘት ፣ የእጅ (የመረብ) ኳስ ያሉ አተነፋፈስ ወይም የልብ ምት በትንሹ	0. አዎን ____ 1. አይደለም ____	

	የሚጨምሩ መጠነኛ የስፖርት ፣ የአካል ብቃት ወይም የመዝናኛ እንቅስቃሴዎችን ያደርጋሉ?		
332	በተለመደ ሳምንት ፣ መጠነኛ ስፖርቶችን ፣ የአካል ብቃት እንቅስቃሴን ወይም የመዝናኛ እንቅስቃሴዎችን ስንት ቀናት ያደርጋሉ?	_____ ቀን	
333	በተለመደ ቀን መጠነኛ-ስፖርቶችን ፣ የአካል ብቃት እንቅስቃሴን ወይም የመዝናኛ እንቅስቃሴዎችን በማከናወን ምን ያህል ጊዜ ያሳልፋሉ?	_____:	
የሚከተለው ጥያቄ በስራ ላይ ሆነው፣ በቤት ውስጥ፣ ከጓደኞች ጋር ፣ መኪና ውስጥ በመጓዝ ፣ በአውቶቡስ ፣ በባቡር ፣ በማንበብ ፣ ካርዶችን በመጫወት ወይም ቴሌቪዥን በመመለከት ተቀምጠው ስለሚያሳልፉ ጊዜ ነው። ነገር ግን የመተኛት ጊዜን አይጨምርም።			
334	በተለመደው ቀን ለመቀመጥ ወይም ለማረፍ ምን ያህል ጊዜ ያሳልፋሉ?	_____:	_____ ሰዓት፣ ደቂቃ
335	በ 24 ሰዓታት ውስጥ በአማካይ ምን ያህል ሰዓት ትክክለኛ እንቅልፍ ያገኛሉ?	_____:	_____ ሰዓት፣ ደቂቃ
ክፍል 4: ስለስኳር ህክምና ግቦች ያለዎት እውቀት			
401	ስለ አማካይ $\frac{3}{4}fe f^{-} \wedge f^{\frac{3}{4}e} "D" U^S^$ (HbA1c) ስምተው ያወቃሉ?	1. አዎን 0. የለም	407
402	ባለፈው አንድ አመት ውስጥ ይህን ምርመራ ስንት ጊዜ አሰሩ?	_____ ጊዜ	
403	የዚህን ምርመራ የቅርብ ጊዜ ውጤትዎን ያውቃሉ?	1. አዎን 0. የለም	
404	ካዎቁ ውጤቱ ስንት ነበር?	_____ %	

405	ጥሩ የስኳር ቁጥጥር የሚያስብለው የA1c መጠን ምን ያክል እንደሆነ ያውቃሉ?	1. አዎን 0. የለም	
406	ካዎቁ ጥሩ የስኳር ቁጥጥር የሚያስብለው የA1c መጠን ምን ያክል ነው?	_____ %	
407	ባለፈው አንድ አመት ውስጥ ምግብ ሳይወሰድ የሚደረገ የደም ስኳር መጠን ምርመራ ስንት ጊዜ አሰሩ?	_____ ጊዜ	
408	የዚህን ምርመራ የቅርብ ጊዜ ውጤትዎን ያውቃሉ?	1. አዎን 0. የለም	410
409	ካዎቁ ውጤቱ ስንት ነበር?	_____ ሚ.ግ/ደ.ሊ.	
410	ጥሩ የስኳር ቁጥጥር የሚያስብለው ምግብ ሳይወሰድ የሚደረገ የደም ስኳር መጠን ምን ያክል እንደሆነ ያውቃሉ?	1. አዎን 0. የለም	412
411	ካዎቁ ጥሩ የስኳር ቁጥጥር የሚያስብለው ምግብ ሳይወሰድ የሚደረገ የደም ስኳር መጠን ምን ያክል ነው?	_____ ሚ.ግ/ደ.ሊ.	
412	ባለፈው አንድ አመት ውስጥ የደም ግፊትዎን ስንት ጊዜ ተለኩ?	_____ ጊዜ	
413	የቅርብ ጊዜ የደም ግፊትዎን ያውቃሉ?	1. አዎን 0. የለም	415
414	ካዎቁ ውጤቱ ስንት ነበር?	_____ _____	

415	ጥሩ የደም ግፊት ቁጥጥር የሚያስብለው የደም ግፊት መጠን ምን ያክል እንደሆነ ያውቃሉ?	1. አዎን 0. የለም	417
416	ካዎቹ ጥሩ የደም ግፊት ቁጥጥር የሚያስብለው የደም ግፊት መጠን ምን ያክል ነው?	ስይስቶሊክ _____ ዲያስቶሊክ _____	
417	ባለፈው አንድ አመት ውስጥ ኤል ዲ ኤል በመባል የሚታወቅ ኮሌስትሮል ስንት ጊዜ ተለኩ?		
418	የቅርብ ጊዜ የ ኤል ዲ ኤል በመባል የሚታወቅ ኮሌስትሮል ውጤትዎን ያውቃሉ?	1. አዎን 0. የለም	420
419	ካዎቹ ውጤቱ ስንት ነበር?	_____	
420	ጥሩ የኮሌስትሮል ቁጥጥር የሚያስብለው የ ኤል ዲ ኤል መጠን ምን ያክል እንደሆነ ያውቃሉ?	1. አዎን 0. የለም	501
421	ካዎቹ ጥሩ የኮሌስትሮል ቁጥጥር የሚያስብለው የ ኤል ዲ ኤል መጠን ምን ያክል ነው?		
	ክፍል V: ልኬቶች		
501	ክብደት _____ ኪ.ግ.		✓
502	ቁመት _____ ሴ.ሜ		✓
503	የወገብ ስፋት _____ ሴ.ሜ		
504	የዳሌ ዙሪያ _____ ሴ.ሜ		
505	FBS 1_____ FBS 2_____ FBS 3_____ FBS4_____		✓

506	HA1C _____		✓
507	የደም ትራይግላይሰራይድ _____ mg / dl		✓
508	የደም ኮሌስትሮል _____ mg / dl		✓
509	የደም ኤች ዲ ኤል _____ mg / dl		✓
510	የደም LDL _____ mg / dl		✓
511	ክሬቲኖይን		
512	የሽንት አልቡሚን መጠን	1. የለም 2. 1+ 3. 2+ 4. 3+	✓
ክፍል 6 አሁን እየተጠቀሙት ያለ መድሃኒት (ስም፣ መጠንና የወሰዱት አመት)			
601	የስኳር መድሃኒት		✓
602	የደም ግፊት መድሃኒት		✓
603	የኮሌስትሮል መድሃኒት		
604	አስፕሪን		
605	ሌሎች		

መረጃውን የሰበሰበው ስም _____ ፊርማ _____ ቀን _____