

ADDIS ABABA UNIVERSITY
COLLEGE OF HEALTH SCIENCE
SCHOOL OF ALLIED HEALTH SCIENCES
DEPARTMENT OF MEDICAL LABORATORY SCIENCE



**Knowledge Attitude and Practice of Blood Glucose Monitoring among Diabetic's Patients
Attending at Tikur Anbesa Specialized Teaching and Referral Hospital**

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Acronyms/Abbreviations

DM	Diabetes mellitus
EPHI	Ethiopian Public Health Institute
GDM	Gestational diabetes mellitus
HGB	Hemoglobin
IDF	International diabetes federation
KAP	Knowledge attitude and practice
OPD	outpatient department
OGTT	oral glucose tolerance test
PI	Principal Investigator
SMBG	Self-monitoring of blood glucose
SD	Standard deviation
WHO	World health organization
LSM	Life Style Modification
TASTRH	Tikure Anbesa Specialized Teaching and Referral Hospital

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ABSTRACT

Back ground: Diabetes mellitus (DM) is a syndrome characterized by chronic hyperglycemia, due to absolute or relative deficiency or diminished effectiveness of circulating insulin. Diabetes is becoming a serious public health problem and it requires continuous medical care, patients' self-management to reduce the risk of long-term complications. The most important objective of monitoring is the assessment of overall glycemic control and initiation of appropriate steps in a timely manner to achieve optimum control.

Objective: To assess the knowledge attitude and practice of diabetic patients in blood glucose level monitoring at Tikur Anbesa Specialized Teaching and Referral hospital (TASTRH).

Methodology: Facility based cross- sectional study was conducted from June 2015 to October 2015 at the outpatient diabetic clinic, TASTRH. Medical records of the patients were retrospectively reviewed. A total of 422 diabetic patients were selected using convenient sampling techniques. Structured questionnaires including checklist have been used to collect data. On-the-spot assessment of HbA1-c was performed for 95 study participants by using systematic sampling techniques to confirm diabetic patient's practice. Statistical soft-ware SPSS version 20 had been used for data entry and analysis.

Results: Among study subjects the levels of knowledge were good in 61.8 % and poor in 38.2 % of diabetic patients. The levels of attitude were also described accordingly as positive for 80.6% and negative for 19.4 % of diabetic patients. The levels of practice of study subjects were found to be good in 47.6 % and poor in 52.4% of diabetic patients. Knowledge and practices had a significant association with educational level and duration of therapy but attitude had a significant association with age. Among 95 study subjects 15.8% of the participants had good glycemic control of HbA1-c value < 6.5% and 84.2% of participants had poor glycemic control of HbA1-c value $\geq 6.5\%$. There was no significant association between HbA1-c value with knowledge and attitude scores but association was found between HbA1-c value and practice score, similarly no significant association was found between HbA1-c with body mass index and hypertension but significant association was found between HbA1-c and complications of study participants.

Conclusion: In our study we found Good knowledge, positive attitude but poor practices towards blood glucose monitoring among diabetic patients and majority of the participants showed poor glycemic control with their HbA1-c test results. Improving the KAP of patients toward blood glucose monitoring is required by stake holders found around this area. Special attention should be given to the practices of the patients and further research should also be done on this topic.

1. Introduction

Diabetes mellitus (DM) is a syndrome characterized by chronic hyperglycemia, due to absolute or relative deficiency or diminished effectiveness of circulating insulin [1]. There are three main types of diabetes these are Type 1, Type 2 & Gestational diabetes. People with type 1 diabetes produce very little or no insulin at all and it is called insulin dependent. Type 2 diabetes used to be called non-insulin dependent diabetes or adult-onset diabetes, and accounts for at least 90% of all cases of diabetes. Gestational diabetes mellitus (GDM) is a form of diabetes consisting of high blood glucose levels during pregnancy [2].

Diabetes mellitus is a major and growing health problem affecting more than 171 million People and the number is expected to rise to 366 million by 2030. DM is the commonest of all metabolic diseases all over the world [3]. The burden of diabetes is increasing in the worldwide including developing countries like Ethiopia. International diabetic federation association reported Ethiopia to be ranked 3rd in Africa with 1.4 million DM and prevalence of 3.32 by year 2012[4].

One important goal of diabetes treatment is to keep the blood glucose levels near the normal range of 70 to 120 mg/dl before meals and under 140 mg/dl at 2 hours after eating. The American Diabetes Association recommends routine self- monitoring blood glucose (SMBG) for diabetic patients [5]. SMBG is an important component of modern therapy for diabetes mellitus. Self-monitoring of glycemic control is a cornerstone of diabetes care that can ensure patient participation in achieving and maintaining specific glycemic targets. The most important objective of monitoring is the assessment of overall glycemic control and initiation of appropriate steps in a timely manner to achieve optimum control [6]. Patient self-care behaviors include taking medication, following a meal plan, exercise regularly and testing blood glucose influence diabetes control [7].

The diagnosis of diabetes is established by identifying the presence of hyperglycemia. For many years the only method recommended for diagnosis was a direct demonstration of hyperglycemia by measuring increased glucose concentrations in the plasma. Laboratory tests are used both to screen for diabetes, and to monitor ongoing management in those with diabetes. Screening blood tests include random blood glucose, fasting blood glucose, OGTT, HbA1c and Urine testing (e.g. microalbuminuria) is used to look for signs of diabetes complications. Different laboratory tests are available for monitoring blood glucose control over the short, long and intermediate term to help evaluate the effectiveness of a management plan. Routine eye and foot exams, along with blood pressure, lipids, microalbumin and creatinine/GFR testing are recommended to detect the onset and monitor progression of these complications [8].

HbA1c is one of the Glycated hemoglobins, a subfraction formed by the attachment of various sugars to the Hb molecule. HbA1c is formed in two steps by the nonenzymatic reaction of glucose with the N-terminal amino group of the β -chain of normal adult Hb (HbA). The first step is reversible and yields labile HbA1c. This slowly rearranges in the second reaction step to yield stable HbA1c. In the erythrocytes, the relative amount of HbA converted to stable HbA1c increases with the average concentration of glucose in the blood. The conversion to stable HbA1c is limited by the erythrocyte's life span of approximately 100 to 120 days. As a result, HbA1c reflects the average blood glucose level during the preceding 2 to 3 months. HbA1c is thus suitable to monitor long-term blood glucose control in individuals with diabetes mellitus. More recent glucose levels have a greater influence on the HbA1c level [9].

Glycated hemoglobin (HgbA1C) test is one of an indicator of average blood glucose concentrations over the preceding three months. It is a well-established currently accepted gold standard biochemical indicator of long-term glycemic control in diabetic patients and approved by WHO, Higher HbA1C levels are associated with the development of diabetic complications [10].

Since Diabetes is becoming a serious public health problem it requires continuous medical care, patients' self-management, education, and adherence to prescribed medication to reduce the risk of long-term complications [11]. Due to the nature of the disease, health professionals alone

can't provide high quality care. Diabetes being a chronic illness requires sound knowledge of self-care by patients so that they can contribute meaningfully in the management of their lives. Control of the diabetic through a tight schedule of blood glucose and urine sugar monitoring, medication and adjustment to dietary condition need patient's regular attention and discipline [12].

The disease condition requires competent self-care, which can be developed from a thorough understanding of the disease process and the management challenges by the patient and family members. This study will help in identifying diabetic patient's knowledge attitude and practice gaps in monitoring of fasting blood glucose level and its complications. Therefore assessment of knowledge, attitude and practice of blood glucose monitoring and HbA1-c determination among diabetic patients is critical in the prevention and control of the diseases.

1.2. Statement of the problem

Despite the availability of different treatment modalities, diabetes has remained a major cause of death. Now a day's 3.8 million deaths are attributable to the diabetes in each year worldwide. It is the 4th leading cause of global death. In 2005 there were 246 million people worldwide were affected with diabetes and are expected to affect 380 million by 2025, over a seven fold increase just over 20 years[13].

Diabetes mellitus has become a cause of growing public health concern in developing countries [14]. WHO estimated the number of diabetics in Ethiopia is expected to increase to 1.8 million by 2030 [15]. Another study of IDF 2011 report that the number of adults living with diabetes in Ethiopia was 3.5 % [16]. There is remarkable prevalence of both acute and chronic complications in diabetic cases in Ethiopia. In addition to this, more than one-third, but only less than half of diabetic patients in Ethiopia receives standard diabetes care [17].

According to the latest American Heart Association's Heart Disease and Stroke Statistics, about 6 million people 18 years and older in the United States have type 2 diabetes and do not know it. Type 2 diabetes remains undiagnosed until symptoms become severe and hospitalization is required. Left untreated, diabetes can cause a number of health complications. That's why it's so important to both know what warning signs to look for and to see a health care provider regularly for routine wellness screenings. The U.S. Department of Health and Human Services recommends that the blood glucose should be tested if a person is overweight and over age 45, under age 45 and have one of more additional risk factors such as High blood pressure, High cholesterol, A family history of diabetes, A history of gestational diabetes (diabetes during pregnancy) If the blood glucose levels are in normal range, testing should be done about every three years. If it is pre diabetes, it should be checked for diabetes every one to two years after diagnosis. People with diabetes are at increased risk for a variety of health complication [18].

Hyperglycemia or raised blood sugar is a common effect of uncontrolled diabetes and over time Leads to serious damage to many of the body's systems, especially the nerves and blood vessels [19]. According to the American Diabetes Association the blood glucose levels for an adult

without diabetes are below 100 mg/dL before meals and fasting and are less than 140 mg/dL two hours after meals [20].

Patients come to the Hospital every three or six month interval for their medication. They check up their blood glucose only when they come according to their follow up appointment and contact the physician for less than five minutes for refill. Most of the time they asked only for adherence to medication and do not checked awareness for different tests and life style intervention.

These observations and the magnitude of diabetic problem raised this research concern about the knowledge, attitude and practice of blood glucose monitoring and determination of HbA1-c. Among diabetic patients at black lion teaching hospitals, which this study seeks to explore and document. Since there was no similar study in Addis Ababa at Tikure Anbesa Specialized Teaching and Referral Hospital about blood glucose monitoring among diabetic patients so we are interested in to fill this research gap.

2. Significance of the study

This study will be helpful to increase awareness of the seriousness of diabetes, and controlling actions of potential strategies for preventing diabetes and its complications. It provides information about current glycemic status, allowing for assessment of therapy and guiding adjustments in diet, exercise and medication in order to achieve optimal glycemic control.

Since Laboratory tests are used both to screen for diabetes, and to control blood glucose monitor ongoing management in those with diabetes to improve the practical behaviors, testing blood glucose levels at home or self-monitoring blood glucose is a valuable diabetes management tool. The study also facilitates regular testing and recording of blood glucose level that can help for diabetic patients to monitor the effects of healthy lifestyle choices.

This study provides evidence for evaluating how the diabetic patients control or monitor their blood glucose level activity depending on the laboratory tests. Due to these diabetic patients adjust their treatment plan and better control on management of diabetes. Finally, Tikur Anbesa Specialized Teaching and Referral Hospital can use this result for improving its services for diabetic patients. It also helps to encourage good services and expand its services especially laboratory facilities.

3. Literature Review

One hundred type 2 diabetics Patients were interviewed using a structured questionnaire in Pakistan. The data was collected using convenience sampling technique the patients, knowledge about the disease, their attitudes and practices were the main outcome measures. In this study, patients' awareness about diabetes was low. The mean of correct answers for glycemic control, risk factors and complications was 33.5%, 69% and 39% respectively. Sixty-one percent of the patients regularly checked blood sugar but only few knew target blood glucose values. The knowledge, attitude and practice scores were low in most areas of diabetic care centers [3].

One hundred and ninety eight diabetic patients (59 male and 139 female) attending the outpatient diabetes clinic at the Kenyatta National Hospital were interviewed on their level of knowledge and use of the HbA1C test, as well as their last HbA1C level. Of the 198 patients interviewed, 11 (5.6%) had type 1 diabetes mellitus (DM) while 187 (94.4%) had type 2 DM. One hundred and thirty four patients (67.7%) had heard of the HbA1C test while 64 patients (32.3%) had never heard of the test. Forty patients (20.2%) had at one point done the test while 158 (79.8%) had never done the test .The mean HbA1C level of the 40 patients who had at any one time done the test was $8.5 \pm 1.7\%$, with more than 90% having HbA1C > 8 [10].

Across-sectional study was conducted to assess knowledge, attitude and practice of type 2 diabetic patients towards LSM management of DM in Adama Medical College Hospital. Concerning knowledge of the patients towards LSM management of diabetic; majority of the patients were knowledgeable which accounts 90(77.59%) followed by 13(11.21%) patients fairly knowledgeable and the other 13(11.21%) patients were poorly knowledgeable. Regarding attitude of the patients 95(81.89%) patients had positive attitude and the other 21(18.11%) had fair attitude. In another way almost half of the patients 57(49.1%) had good practice. The other 39(33.62%) and 20(17.24%) have poor and average practice respectively [17].

A cross-sectional survey comprised 250 patients and conducted in the Endocrine Diabetes Clinic, Department of Medicine, Shaikh Zayed Hospital Lahore (Pakistan) from 1st June 2013 to 31st December 2013. Participants underwent a knowledge, attitude and practice (KAP) questionnaire

survey regarding assessing diabetes, socio-demographics, associated medical conditions & self care. Among the study participants, the levels of knowledge were low in 46%, medium in 39% and high in 63%. The levels of attitude were also described accordingly as low 8%, medium 32% and high 60%. The levels of practice of study subjects were found to be low in 78%, medium in 15% and high in 7% [22].

A cross sectional study was conducted at Adeoyo General Hospital, a secondary care setting located in Ibadan, southwestern Nigeria. 200 randomly selected type 2 diabetes patients were attended between 2nd March and 31st May, 2009. Of these, Only 18 (10.3%) knew the most probable cause of diabetes, more than three fourth (77.7%) were not aware that poor control of blood glucose levels could result in complications. Only 24.1% could mention at least a symptom to recognize hypoglycemic episode, while 75.9% were not aware of the self care approach to manage such crisis. Polyuria, 65 (37.4%) was the most commonly cited signal to recognize hyperglycemic episode. Only 3.4% practice self monitoring of blood glucose. Overall, 47 (26.9%) had a good knowledge and attitude about diabetes [24].

This cross-sectional study was carried out to evaluate the knowledge, attitude and practices regarding diabetes among 100 Iranian type 2 diabetics, attending the out-patient Diabetes Clinic at Golestan Hospital, Ahvaz, Iran. A face-to-face interview was done and a validated knowledge, attitude and practice (KAP) questionnaire was used to determine knowledge, attitude and practices of diabetes patients. Fifty three percent of patients had good glycemic control. The results showed that attitude related to diabetes was acceptable in the majority, while knowledge and self-care practices were insufficient. The overall mean ($\pm$ SD) score of the knowledge, attitude and practice of patients based on KAP questionnaire was in medium level. There was no significant association between the KAP scores and HbA1c level [29].

This was a cross sectional descriptive study for one year and conducted at out-patient clinics of three family health centers chosen randomly in Dakahlia Governorate (Egypt). The overall rate of adequate knowledge regarding diabetes was only 52.3% among participants. Insulin-treated patients had lowest knowledge, attitude, and practice toward diabetes. There is a gap between patients' level of knowledge and their practice [30].

There was a cross-sectional study aims to assess the Knowledge, Attitude and Practices (KAP) towards DM and the association between the patients' KAP and control of DM among patients with type 2 DM (T2DM) in Malaysia. Seventy five patients with was participated in this study. There was a strong association between knowledge and attitude as well as knowledge and practice ($P < 0.05$). However, there was no correlation between the KAP and blood glucose control, based on patients' fasting blood glucose and HbA1c results with 85.7% of the participants 'having a unsatisfactory HbA1C value of $\geq 6.5\%$ and 69% of participants' had fasting blood glucose of $> 7 \text{ mmol/l}$ [31].

The study was conducted to assess the general characteristics, knowledge, attitude and practices of type 2 diabetic patients attending the Out-Patient Department (OPD) of Baqai Institute of Diabetology and Endocrinology (Karachi, Pakistan) during the period from July to September 2000. from One hundred Type 2 diabetic patients Fifty-seven percent of the patients were overweight or obese. Only 10.7% had good glycemic control. Sixty seven percent did not do exercise of any kind. The overall awareness about the risk of complications was satisfactory but the misconceptions regarding diet, insulin and diabetes were quite common [32].

4, Objective of the study

General objective

- To assess the knowledge attitude and practice of blood glucose level monitoring among diabetic patients at Tikur Anbesa Specialized Teaching and referral Hospital.

Specific objective

- To determine level of knowledge regarding blood glucose monitoring status among diabetic patients.
- To determine attitude of diabetic patients on monitoring blood glucose level.
- To determine level of practice of diabetic patients on blood glucose level monitoring.
- To determine HbA1-C level for confirmation of diabetic patients practice level from randomly selected patients.

5. Materials and Methods

5.1. Study design

Facility based cross- sectional study was conducted from June 2015 to October 2015 at the outpatient diabetic clinic, Tikur Anbesa Specialized Teaching and referral Hospital. Medical records of the patients were retrospectively reviewed.

5.2. Study Area

This study was conducted at Tikur Anbesa Specialized Teaching and referral Hospital. The hospital is found in the capital city of Addis Ababa in the Lideta sub city. The hospital opened in 1972, and is a referral hospital. In 1998 it was transferred to the School of Medicine by the Federal Ministry of Health, and since then it has become a University teaching hospital. Black Lion is a very large referral hospital and sees approximately 370,000- 400,000 patients a year but the exact number is not known. It is also an institution where specialized clinical services, that are not available in other public or private institutions, are rendered to the whole nation. The outpatient diabetic clinic gives service for an average of 200 patients per week for fixed working day of Monday, Wednesday and Friday. Since Tikur Anbesa hospital is the largest referral hospital patients come from different places so it can represent the whole country.

5.3. Source population

All diabetic patients who were having follow up in outpatient diabetic clinic of Tikur Anbesa Specialized and Referral Hospital.

5.4. Study population

All diabetic patients who attained diabetic clinic at Tikur Anbesa Specialized and Referral hospital for follow up during the study period and involved in this study.

5.5. Sample size

The required sample size was calculated:

- 49 % Proportion (P) of knowledge prevalence from similar study conducted in Bahir Dare [12].
- Level of significance = 0.05

- Marginal of error (d) = 5%
- Non-response rate= 10%
- The formula for calculating the sample size (n) was:

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

Where:

- n= sample size
- $Z_{\alpha/2}$ = Z-score at 95% confidence interval = 1.96
- P (proportion 49%)
- $1-P=Q$
- d= marginal error=0.05 (5%)

Therefore n becomes:

- $n = (1.96)^2 \times (0.49 \times 0.51) / (0.05)^2$
- n=384

With the above assumptions, the sample size was calculated and the overall sample size was found to be= 384 + 38 (10 % non-response rate) = 422 (diabetic patients).

The study takes the maximum sample size with the highest number of study participants that is 422.

5.6. Sampling procedures

Convenient sampling technique was used to select the study participant among diabetic patients, based on the flow rate of patients during the study period. From 422 patients 95 patients samples were collected for HbA1-C test by systematic sampling technique. 6-7 blood samples were collected in every 4th patients for 15 days. (Only 95 patients were selection was due to the cost of the reagents).

5.7, Eligibility criteria

5.7.1, Inclusion criteria

All diabetic patients aged ≥ 18 years and have been diabetic for the last one year were included in the study.

5.7.2, Exclusion criteria

Patients who were severely ill, pregnant women and not able to communicate were excluded from the study.

5.8, Study Variable

Dependent variables: Knowledge, Attitude and practice of diabetic patients regarding monitoring of blood glucose level.

Independent variables: Include socio-demographic variables (age, sex, income, marital status, educational level, occupation, and duration of therapy) and health profile related variables of diabetics Patients (type of medication used, complications, co-morbidity, and type of diabetic and laboratory tests which is recommended for diabetic patients).

5.9, Data collection and processing

5.8.1 Data collection

The data collection was carried out using modified structured questionnaire and check list after getting a verbal informed consent from the participants. Questionnaire and check list were developed by reviewing different relevant literatures. The knowledge, attitude and practical studies part among diabetic patients had been pre tested on 10 diabetic patients. The data collectors were given two days training on data collection and sample collection techniques. A semi structured questionnaire was administered which consisted of the following parts. The first part contained socio- demographic variables such as age, sex, income, marital status, level of education, occupation and family history of diabetics, duration of diabetics and diabetic association membership. The second part consisted of knowledge, attitude and practice questions. Clinical data including blood pressure, type of diabetic, complications, current treatments, blood glucose and other laboratory tests were retrieved from medical records were included with the third part of check lists.

A scoring system was developed for each knowledge attitude and practice questions. The knowledge part of the questionnaire has 10 general questions on diabetes with the maximum of 30 correct responses. The attitude and practical part of the questionnaire have 11 and 10 questions based on blood glucose monitoring, with a maximum of 11 and 10 correct responses respectively. Each correct answer was given a score of one and each wrong answer was given a score of zero. Different categories were defined on the bases of obtained by each participant, Good (greater than or equal to the mean of knowledge or practice). Poor (less than the mean of knowledge and practice. Positive and negative for attitude.

On the spot assessments of KAP questionnaires, 95 blood samples were collected for HbA1-C test from patients after obtaining their consents. This HbA1-C test which was included in the practice part that confirms diabetic patient's practices. The test was done by using Cobas 400 A1C machine at EPHI clinical chemistry laboratory according to the standard procedures (see Annex 4). Two categories were used for HbA1-C value poor and good glycemic control. Samples with A1C level of 6.5 percent or higher level was considered diabetic, A1C value between 5.7 and 6.4 was considered prediabetes and A1C value less than 5.7 is considered normal this is according to American diabetic associations [21].

5.10. Data Management and analysis

The data entered and analyzed using statistical soft-ware SPSS version 20. Descriptive statistics including frequency, mean and standard deviation were applied to present subject's demographic information and KAP score also Bar-chart was used for HbA1-C tests results. Chi-square test was used see the association between KAP score with socio-demographic variables; HbA1-C tests with KAP score and HbA1C with Body mass, hypertension and complications. In addition, t-test was done to compare mean value of blood glucose, creatinine and urea tests. Statistical tests were considered significant at $p\text{-values} \leq 0.05$.

5.11. Data quality assurance

The questionnaire was pre-tested for their accuracy and consistency prior to actual data collection. Furthermore, the principal investigator will give feedback and corrections on daily

basis to the data collectors. Completion, accuracy, and clarity of the collected data was checked carefully on a regularly basis.

5.12. Ethical consideration

Before the research work, ethical clearance was obtained from Departmental Research and Ethics Review Committee (DRERC), Addis Ababa University. Data was collected after getting written permission from black lion teaching hospital. Information sheet and written consent forms was delivered along with each questionnaire and all the subjects was asked if they are willing to participants before conducting the interview and informed consent was obtained from each participants. Data was kept confidence throughout the study.

5. 13. Dissemination of result

This study on completion could serve as a reference material to researchers, experts or policy makers for intervention. To reach these bodies the finalized paper will be submitted to School of Allied health sciences and school of Medicine, Addis Ababa University and Black lion hospital, and Ethiopian Public Health Institute (EPHI). The result will also be disseminating through publication in peer reviewed local and international journals and through presenting it in relevant workshops and seminars.

5.14. Operational definition

Good knowledge: when patients respond the mean or above the mean score on knowledge questions.

Poor knowledge: when patients respond below the mean score on knowledge questions.

Positive attitude: when patients respond the mean or above the mean score on attitude questions.

Negative attitude: when patients respond below the mean score on attitude questions.

Good practice: when patients respond the mean or above the mean score on practice questions.

Poor practice: when patients respond below the mean score on practice questions.

Good glycemic control: when HbA1-c results become less than 6.5%.

Poor glycemic control: when HbA1-c results become greater than or equal to 6.5%.

Always: Monitoring blood glucose every day or 3 times per week.

Frequently: Monitoring blood glucose 2 days per week.

Some times: Monitoring blood glucose every 2 weeks.

Occasional: Monitoring blood glucose once or 3 times per month.

Not at all: Monitoring blood glucose not regularly.

Health study profile: it is a clinical study which was retrieved from patient medical records for the last one year before the commencement of the study.

Past fasting blood glucose, creatinine and urea laboratory tests referred the tests that were done before the last 6 months of the commencements of study.

Current fasting blood glucose, creatinine and urea laboratory tests referred the tests that were done at the last 6 months before the commencements of study.

6. Results

6.1. Socio-demographic information

Altogether 422 diabetic patients were enrolled in the study among these, female were 205(48.6%) and males were 217 (51.1%). Majority number of patients were in the age group of 51-60 [(115(27.3%)] years. Most of study participant 291(69%) were married. Above half of the participant 336(79.6%) were lived in Addis. Concerning the educational status of study 117(27.7%) were able to read and write whereas 172(40.8%) were college and above. 89(21.1%) were house wife and 79(18.7%) were government employee in occupation. About 118(28.1%) subject had $\leq$ 500 birr monthly income. About 307 %(72.7%) of diabetic patients have been treated and followed at least for 4 years and 271(64.2%) of diabetic patients had history of diabetic in their family. Majority of (76.8%) diabetic patients are not members of diabetic association. Most of the participants 347(82.2%) got information about diabetic from medical staff (Table 6.1).

6.2. Knowledge of diabetic patients toward blood glucose monitoring

The mean ($\pm$ SD) knowledge score of study was 20.41($\pm$ 6.83) with a maximum possible score of 30. Two hundred sixty-one (61.8%) of participant had Good knowledge, and one-hundred sixty one (38.2%) had Poor knowledge regarding on blood glucose monitoring of diabetic.

More than half (58.8%) of study subjects defined diabetes is a raised blood sugar. Majority of respondents 412(97.6%) knew that diabetic can be detected through blood examination or urine examination. About 151(38.5%) and 160(37.9%) of participants were explained diabetic patients should measure his/her blood glucose level within a day. the correct response on hyperglycemic conditions like Passing lots of urine, excess thirst, tiredness, weight loss and poor wound healing were (87.2%), (81.0%), (79.3%), (67.7%) and (61.2%) respectively, The correct response on complication of diabetic like Ophthalmologic, renal failure, neurologic and hypertension were (92.0%), (85.5%), (83.9%), and (75.1%) respectively. Four hundred forty (98.1%) study participant knew monitoring blood glucose level reduce complications of diabetics. three hundred fifty (82.9%) study participants didn't know about HbA1-c test (Table 6.2).

Table 6.1. Distributions of socio-demographic characteristics of participants at Tikur Anbesa specialized Teaching and referral teaching hospital (n-422) 2015.

Socio- demographic characteristics		Frequency	N (%)
Age	18-30	71	16.8
	31-40	65	15.4
	41-50	68	16.5
	51-60	115	27.3
	61-70	67	15.9
	>71	25	5.9
Sex	Male	217	51.4
	Female	205	48.6
Marital status	Single	85	20.1
	Married	291	69.0
	Divorced	22	5.2
	Widowed	24	5.7
Place of residence	Addis Ababa	336	79.6
	Out of Addis Ababa	86	20.4
Educational status	Unable to Read and write	36	8.5
	Read and write	117	27.7
	Grade 1-8	47	10.9
	Grade 9-12	49	11.6
	College and above	173	40.8
Work status	Students	26	6.2
	Government employee	79	18.2
	Private employee	92	21.8
	House wife	89	21.1
	retired	44	10.4
	No job	56	3.3
	others	32	7.5
Monthly income(in birr)	<500	118	28.0
	501-1000	106	25.1
	1001-5000	109	25.8
	>5000	13	3.1
Duration of therapy	2-3 years	54	12.8
	3-4 years	59	14.0
	>4 years	307	72.7
Family history of diabetic	yes	151	35.8
	no	271	64.2
Are you a member of diabetic association?	yes	98	23.2
	no	324	.8
Source of information about diabetic?	Medical staffs	347	82.2
	Media	52	12.3
	Relative and friends	10	2.4
	From association	13	3.1

Table 6. 2: Frequency distribution of participant's response on knowledge toward blood glucose monitoring at Tikur Anbesa specialized Teaching and referral teaching hospital, n-422, 2015.

Knowledge questions		Frequency(N)	Column N %
What is diabetes?	Diabetics Is Raised Blood Sugar	248	58.8
	Diabetics Is A Disease Which Affects Any Part Of The Body	111	26.3
	Do not Know	63	14.9
What are the risk factors of diabetes?	Obesity	253	60.0
	Sedentary life style	233	55.2
	family history	256	60.7
	eating too much fat and sugar	242	57.3
	Cigattet smoking	123	29.4
Diabetic can be detected through?	through blood examination or urine examination	412	97.6
	don't know	10	2.4
For how frequently should a diabetic patient measure her/his blood glucose level?	within a day	151	35.8
	within a week	160	37.9
	within a month	87	20.6
	within six month	24	5.7
What is hyperglycemic condition?	frequent urination	367	87.2
	frequent thirst	341	81.0
	tiredness	334	79.3
	weight loss	285	67.7
	poor wound healing	257	61.2
What is hypoglycemic condition?	Hunger	286	68.4
	nervousness shakiness	329	79.1
	dizziness, or light headedness	319	76.3
	sleepiness	215	51.4
	confusion	223	53.3
	difficulty speaking	188	45.5
	feeling anxious or week	228	54.5
Do you know the complications of diabetics, if not treated well?	Ophthalmologic	392	92.0
	renal failure	362	85.5
	neurologic	354	83.9
	hypertension	320	75.1
What type of life style modification do you think it helps for the control of diabetics?	Exercise	351	83.1
	dietary modification	356	84.8
	weight reduction	314	74.8
Is Monitoring of blood glucose level is important for reducing complication of diabetics?	true	414	98.1
	false	8	1.9
Do you know about hbA1-c?	yes	72	17.1
	no	350	82.9

Bivariate analysis showed significant associations between patient knowledge score with duration of therapy and educational status ($p < 0.05$). There were no significant association between patients knowledge with age, sex and marital status ($p > 0.05$) (Table 6.2.1).

Table 6.2.1. Association of demographic characteristics of diabetic patients with level of knowledge at Tikur Anbesa specialized Teaching and referral teaching hospital, n=422, 2015.

variables	variables	Level of knowledge		Chi-square	p-value
		Poor	Good		
Age	<30	22	49	9.508	0.090
	31-40	23	42		
	41-50	26	42		
	51-60	50	65		
	61-70	21	46		
	>71	15	10		
Sex	Male	84	133	0.059	0.808
	Female	77	128		
Marital Statues	Single	29	56	3.247	0.355
	Married	114	177		
	Divorced	6	16		
	Widowed	12	12		
Duration of therapy	2-3 years	24	30	16.194	0.001
	3-4 years	35	24		
	>4 years	100	207		
Educational level	Illiterate	24	12	19.428	0.001
	Reade and write	47	70		
	Grade 1-8	12	34		
	Grade 9-12	12	37		
	College and above	64	108		

6.3. Attitude of diabetic patients towards blood glucose monitoring.

The mean ($\pm$ SD) attitude score of study was 9.58($\pm$ 1.58) with a maximum possible score of 11. Three hundred forty (80.6%) of participant had positive attitude and eighty-two (19.4%) of participants had negative attitude regarding on blood glucose monitoring.

Table 6.3: Frequency distribution of participant's response on attitude toward blood glucose monitoring at Tikur Anbesa specialized Teaching and referral teaching hospital, n-422, 2015.

Attitude Variables		Frequency(N)	Percent (%)
Do you think that regular exercise can help to control blood glucose level?	strongly agree	308	73.0%
	agree	89	21.1%
	somewhat agree	23	5.5%
	disagree	2	0.5%
	strongly disagree	0	0.0%
Do you think planed diet or dietary modification can help to control blood glucose level?	strongly agree	332	78.7%
	agree	84	19.9%
	somewhat agree	6	1.4%
	disagree	0	0.0%
	strongly disagree	0	0.0%
Do you think keeping the blood sugar close to normal can help to prevent the complications of diabetes?	strongly agree	318	75.4%
	agree	84	19.9%
	somewhat agree	18	4.3%
	disagree	2	0.5%
	strongly disagree	0	0.0%
Do you think having a regular blood glucose test might bring a positive effect on diabetic patients	strongly agree	313	74.2%
	agree	77	18.2%
	somewhat agree	20	4.7%
	disagree	12	2.8%
	strongly disagree	0	0.0%
Do you think having HbA-1c test might bring a positive effect on diabetic patients?	strongly agree	200	47.4%
	agree	66	15.6%
	somewhat agree	48	11.4%
	disagree	92	21.8%
	strongly disagree	16	3.8%
Do you think every diabetic patients should do whatever it takes to keep their blood sugar close to normal	strongly agree	290	68.7%
	agree	79	18.7%
	somewhat agree	32	7.6%
	strongly disagree	21	5.0%
	disagree	0	0.0%
Do you think knowing about diabetic may help to control from the disease?	strongly agree	245	58.1%
	agree	86	20.4%
	somewhat agree	32	7.6%
	disagree	43	10.2%
	strongly disagree	16	3.8%
Is diabetic education important to diabetic patients?	strongly agree	341	80.8%
	agree	73	17.3%
	somewhat agree	2	0.5%
	disagree	6	1.4%
	strongly disagree	0	0.0%
do you think urine test will help to control diabetic complications	strongly agree	248	58.8%
	agree	91	21.6%
	somewhat agree	36	8.5%
	disagree	35	8.3%
	strongly disagree	12	2.8%
Do you think eye examination will help to control diabetic complications?	strongly agree	299	70.9%
	agree	81	19.2%
	somewhat agree	26	6.2%
	disagree	12	2.8%
	strongly disagree	4	0.9%
do you think the important decisions regarding daily diabetes care should be made by the person with diabetes	strongly agree	333	78.9%
	agree	79	18.7%
	somewhat agree	8	1.9%
	disagree	2	0.5%
	strongly disagree	0	0.0%

Among respondents (73%) and (78.7%) Were strongly agreed on regular exercise and planed diet or dietary modification can help to control blood glucose monitoring respectively. Three hundred eighteen 318 (75.4%) study participant were strongly agree on keeping the blood sugar close to normal can help to prevent the complications of diabetes. About two hundred (47.4%) of participants were strongly agree on checking HbA-1c test might bring a positive effect on diabetic patients. Three hundred forty one (80.8%) participants were strongly agreed on the importance of diabetic education. Among respondents (58.8%) and (70.9%) were strongly agree on urine test and eye examination help to control diabetic complications respectively (Table 6.3).

Bivariate analysis showed significant association between patient's attitude score and age ($p < 0.05$). There were no significant association between patient attitude score with sex, marital status, duration of therapy and educational statues ($p > 0.05$) (Table 6.3.1)

Table 6.3.1: Association of demographic characteristics of diabetic patients with level of Attitude at Tikur Anbesa Specialized Teaching and referral teaching hospital, n-422, 2015.

variables	variables	Level of Attitude		Chi-square	p-value
		Negative	positive		
Age	<30	20	51	18.102	0.003
	31-40	21	44		
	41-50	5	63		
	51-60	18	97		
	61-70	11	56		
	>71	5	20		
Sex	Male	42	175	0.002	0.967
	Female	40	165		
Marital Statues	Single	24	61	6.282*	0.090
	Married	52	239		
	Divorced	2	20		
	Widowed	5	20		
Duration of therapy	2-3 years	16	38	5.204	0.074
	3-4 years	8	51		
	>4 years	56	251		
Educational level	Illiterate	4	32	4.329*	0.363
	Reade and write	28	89		
	Grade 1-8	6	40		
	Grade 9-12	10	39		
	College and above	34	138		

*Fisher's exact rest

6.4. Practice of diabetic patients towards blood glucose monitoring

The mean ($\pm$ SD) practice score of study was 5.34($\pm$ 1.76) with a maximum possible score of 10. Two hundred one (47.6%) of participants had good practice and two hundred twenty one (52.4%) had poor practice regarding on blood glucose monitoring.

Among respondents 117 (27.7%) participants did exercise frequently to control blood glucose level. About 207(49.7%) of respondents adjust dietary modification to control their blood glucose level. Only 80 (19%) of participants were always perform blood glucose test. Regarding to urine test 201 (46.6%) respondents perform it occasionally. Concerning HbA1-c test 330(72.2) participants were never checked HbA1-c test. Among respondents 208(49.3%) were used self-blood glucose machine. About 171 (40.5%) participants were never attended a diabetes patients education program for their self-care monitoring (Table 6.4)

Table 6.4: Frequency distribution of participant's response on practice toward blood glucose monitoring at Tikur Anbesa specialized Teaching and referral teaching hospital, n-422, 2015.

Practice questions		Frequency(n)	Column N %
How frequently do you exercise for controlling your blood glucose level?	Always	99	23.5
	Frequently	117	27.7
	Some times	104	24.6
	Occasionally	100	23.7
	Not at all	2	.5
How frequently do you take drug for controlling your blood glucose level?	Always	390	92.4
	Frequently	14	3.3
	Some times	2	.5
	Occasionally	14	3.3
	Not at all	2	.5
How frequently do you adjust dietary modification for your blood glucose level?	always	207	49.1
	frequently	75	17.8
	Some times	65	15.4
	occasionally	64	15.2
	Not at all	11	2.6
how frequently do you perform your blood glucose level	always	80	19.0
	frequently	141	33.4
	Some times	98	23.2
	occasionally	103	24.4
	Not at all	0	0
How frequently do you perform urine test?	always	20	4.7
	frequently	29	6.9
	Some times	128	30.3
	occasionally	201	47.6
	Not at all	44	10.4
How often do you checked eye examination?	always	8	1.9
	frequently	26	6.2
	Some times	93	22
	occasionally	226	53.6
	Not at all	69	16.4
How often do you check your hbA1-c level?	always	4	.9
	frequently	33	7.8
	Some times	33	7.8
	occasionally	55	13.0
	Not at all	330	78.2
Did you miss blood glucose test on your checking time?	always	18	4.3
	frequently	2	.5
	Some times	35	8.3
	occasionally	37	8.8
	Not at all	330	78.2
Do you use self-blood glucose monitoring machine?	yes	208	49.3
	no	214	50.7
How often do you attend a diabetes patients education program for your self-care monitoring	always	22	5.2
	frequently	19	4.5
	Some times	65	15.4
	occasionally	143	33.9
	Not at all	171	40.5

Bivariate analysis showed significant association between patients practice score with duration of therapy and educational level ($p < 0.05$). There were no significant association between patient practice score with age, sex and marital status ($p > 0.05$) (Table 6.4.1).

Table 6.4.1. Association of demographic characteristics of diabetic patients with level of practice at Tikur Anbesa Specialized Teaching and referral teaching hospital, n-422, 2015.

variables	variables	Level of practice		Chi-square	p-value
		Poor	Good		
Age	<30	32	39	4.431	0.489
	31-40	35	30		
	41-50	38	30		
	51-60	65	50		
	61-70	37	30		
	>71	10	15		
Sex	Male	104	113	3.536	0.060
	Female	117	88		
Marital Statues	Single	43	42	1.522	0.677
	Married	153	138		
	Divorced	10	12		
	Widowed	15	9		
Duration of therapy	2-3 years	27	27	10.144	0.006
	3-4 years	20	39		
	>4 years	173	134		
Educational level	Illiterate	26	10	13.747	0.008
	Reade and write	64	53		
	Grade 1-8	28	18		
	Grade 9-12	28	21		
	College and above	74	98		

6.5. Hemoglobin A1-c (HbA1-c) Determination

On-the-spot of KAP questionnaire assessment HbA1-C was performed for 95 patients, assessment for the confirmation of diabetic patient's practices. The mean and st.deviation of HbA1C level was 8.03(± 1.82). Among 95 patients 15.8% of the respondent HbA1-c levels were lower than the recommended level of 6.5% and 84.2 % of the respondent HbA1-C levels were higher than the recommended level of 6.5%.

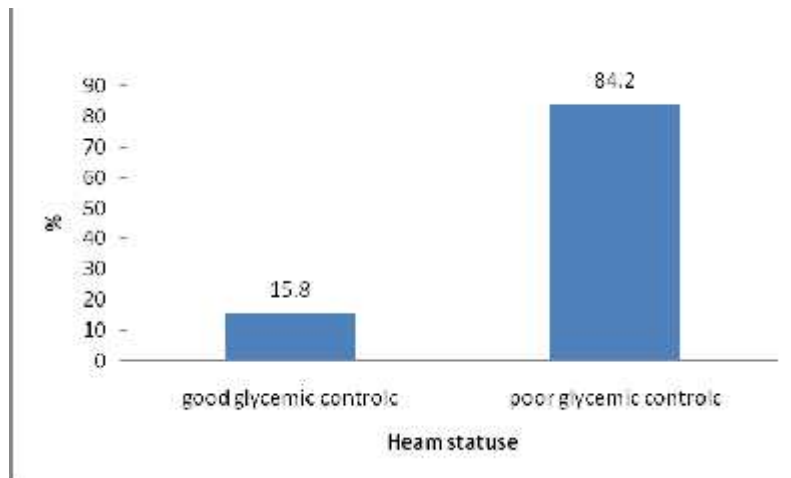


Figure 1. HbA1-c result for diabetic patients at Tikur Anbesa specialized Teaching and referral teaching hospital (n=95) (2015).

Bivariate analysis showed that no association was found between HbA1-C value with knowledge and attitude scores ($p > 0.05$). association was found between HgbA1-C value and practice score ($p < 0.05$) (Table 6.5).no significant association was found between HbA1-C value with body mass index and blood pressure of study participants ($p > 0.05$),(Table 6.5.1),(Table 6.5.2).There was a significant association between HbA1-C value and complications of study participants ($p < 0.05$)(Table 6.5.3).

Table 6.5. Association of KAP scores with HbA1-c value at Tikur Anbesa specialized Teaching and referral teaching hospital, n-422, 2015.

variables		HbA-1c value		Chi-square	p-value
		Good glycemic control <6.5	Poor glycemic control ≥ 6.5		
Level of Knowledge	Poor	4	38	0.165*	0.113
	Good	11	42		
level of Attitude	Negative	4	10	0.226*	0.152
	Positive	11	70		
Level of Practice	Poor	5	49	4.013	0.045
	Good	10	31		

*Fisher's exact rest

Table 6.5.1. Association of HbA1-c with Body mass index, hypertension and complications from health study subject profiles at Tikur Anbesa specialized Teaching and referral teaching hospital, n-95, 2015.

variables		HbA-1value		Chi-square	P-value
		HbA1-c < 6.5	HbA1-c ≥ 6.5		
Body mass index	Under weight	0	1	4.516*	0.334
	Normal weight	5	12		
	Over weight	2	20		
	Obesity	2	6		
Blood pressure	Hypertensive	3	29	1.166*	.368
	None-Hypertensive	11	51		
Complications	Have complication	7	61	0.02	0.020
	No-complication	8	19		

*Fisher's exact test

6.6. Health study profile of diabetic patients.

Clinical data such as blood pressure, type of diabetic, type of medical treatments, diabetes complications and laboratory tests (within one year before the commencement of the study) of participants were retrieved from medical records. One hundred thirty-two (31.3%) study subjects had type 1 diabetic and two hundred seventy six (65.4%) study subjects had type 2 diabetic. Concerning to the type of medication more than half 239(54.7%) and 125(29.8%) of the participants were taking insulin injection and oral agents respectively, Twenty three (5.5%) of participants were taking both insulin injection and oral agents. Regarding to diabetic complications 139(32.75%) of participants had cardiovascular disease which was the major one.

The average of every 6 month consecutive fasting blood sugar results from each participant medical records was taken and 10(2.4%) of participants were Hypoglycemic, 138(32.6%) of participants were Normoglycemic and 262(61.9%) of participant were Hyperglycemic. About 129(30.3%) of Study participants had associated co-morbidity of hypertension with systolic

blood pressure ≥ 140 or diastolic blood pressure ≥ 90 , according to WHO. The mean systolic and diastolic for all the patients were 142.8 ± 19.8 and 76.3 ± 9.8 mmHg, respectively. A minimum systolic blood pressure was 90 mmHg and a maximum diastolic blood pressure was 180 mmHg during the study period.

From medical records mean and st. deviation of Fasting blood glucose test was 171.4 ± 71.9 and 167.9 ± 85.0 for past and current results respectively. For Creatinine test mean and st. deviation was 97.18 ± 0.4790 and 1.24 ± 0.6391 for past and current results respectively. Mean and st. deviation for urea test was 24.76 ± 14.36 and 25.75 ± 21.02 at the past and current results respectively during data collection time. (Table 6.6.1).

Table 6.6. Past and current laboratory tests for Fasting blood Glucose, Creatinine and Urea at TikurAnbesa Specialized referral hospital 2015.

Laboratory tests	Duration of time	Minimum value	Maximum value	Test prescribed & analyzed (%)	Test not prescribed & analyzed (%)	Mean of test results	St.Deviation
Fasting blood glucose	Past	43mg/dl	452mg/dl	381(90.3%)	41(9.7%)	171.4	71.9
	current	47mg/dl	631mg/dl	381(90.3%)	17(4.0%)	167.9	85.0
creatinine	past	0.4mg/dl	4.90mg/dl	285(67.5%)	137(32.5%)	97.18	.4790
	current	0.5mg/dl	4.60mg/dl	151(35.8%)	271(64.2%)	1.24	0.6391
urea	past	5.00mg/dl	87.00mg/dl	271(64.2%)	151(35.8%)	24.76	14.36
	current	6.00mg/dl	169.00mg/dl	144(34.1%)	278(65.9%)	25.75	21.02

T-tests were done for past and current laboratory test results of fasting blood sugar, creatinine and urea. No significant association was found between the past and current means of fasting blood sugar test results ($p > 0.05$). There was a significant association between past and current means of creatinine and also significant association was found between past and current means of urea test results ($p < 0.05$), current mean results were higher than past mean results for both tests, this indicates there was high complication case among study participants at current time of the study period.

7. Discussion

A cross-sectional study has been done to evaluate knowledge, attitude and practices of blood glucose monitoring among diabetic patients. The study showed that the mean ($\pm$ SD).knowledge score of the study subjects was 20.41($\pm$ 6.83).Two hundred (61.6%) study participants had good knowledge regarding blood glucose monitoring. Similar study was conducted in Pakistan in 63.0%[22].This study demonstrated lower level of knowledge about blood glucose monitoring of diabetic, as compared to a study done in Adama Hospital (Ethiopia) (77.59%) and Saudi- Arabia (77%) [17,23]. And this study demonstrated higher level as compared to Nigeria (26.9%) and India(22.0%) [24,26]. This difference might be due to studies used different instruments and/or are carried out among different in religious or age group , differences in educational level of the diabetic patients. Less devoted time with the patients by physician, lack of organized diabetic education facilities and lack of accessibility of information by health educators or organizers.

This study showed respondents correctly stated that more than half (58.8%) of study subjects defined diabetes mellitus is a raised blood sugar. This study was supported by a study done in India which (57%) of participants knew that diabetics is a condition characterized by raised blood sugar. This finding was higher than the study conducted in Debre Tabor which was 41.2%. This may be due to studies used different instruments and there may be difference in education approached between the studies [26, 27].

In this study respondents correctly stated that Obesity (60%), family history (60%), sedentary life style (55.2%), were reported as risk factors for diabetes. Similarly increased body weight (66%), sedentary life style (76%) were consistent with the study conducted in Pakistan. The study participants might get adequate source of information and could have similar knowledge with Pakistan. This study was higher than the study conducted in Debre tabor which reported that obesity (35.9%), sedentary life (33.7%) and family history (32.6%) were taken as a risk factors for diabetics. There might be differences in educational level of the study participants and availability of information about diabetic [22, 27].

Most patients (97.6%) did know that diabetic can be detected through blood examination or urine examination. These findings was consistent with the study finding observed in India which

reported that 93.16% of respondents were explained diabetes can be diagnosed by blood sugar examination. The study participants may have good observation during their medication time and also in education program [28].

In this study 87.2% of respondents correctly stated frequent urination of hyperglycemic conditions. Similar study in Iran showed that Frequent urination was indicated as the most common symptom hyperglycemic conditions with (81%) of patients [29]. This study was higher than the study conducted in India that frequent urination was reported as the most common symptom of hyperglycemic conditions by 42.2% [25]. In this study respondents correctly stated hypoglycemic conditions on average of 61.1%. This study was higher than with the study conducted in Pakistan (43%) and Egypt (48.1%). This might be due to higher educated participants percentage and higher positive family history of diabetic patients. [22,30].

Another finding of this study was adequate knowledge on complication of diabetic. Which are Ophthalmologic 92.0%, renal failure 85.5%, this study was supported by similar study in India regarding to complications resulting from diabetes awareness on eye disorder was found to be 62.5% [26] and also similar study in Pakistan which reported that 60% of population knew about renal failure and paralysis cumulatively. However this study was higher than the study conducted in Pakistan which reported that 36% participants were aware of retinopathy & blindness as a result of poorly controlled diabetic. This difference may be due to the socio-demographic characteristic of study participants such as age group and duration of therapy [22].

Most patients on average 80.9% were had good knowledge on life style modification. Similarly study in Malaysia using the same questions found that (67%) of respondents were knew about lifestyle modifications. This could be due to since majority of study participants were chronic patients so they do have experience on how to manage diabetes with Life style modifications [31].

In this study three hundred fifty (82.9%) study participants didn't know about HbA1-c test. This study is supported by similar results conducted in Kenya, which indicates that inadequate knowledge of (67.7%) respondents had heard of the HbA1C test while (32.3%) had never heard

of the test. This might be due the fact that the test is not available and low level of awareness about HbA1C test during health education program but having knowledge on this test will help to diabetic patients to protect from diabetes complications [13].

The mean ($\pm$ SD) attitude score of the study subjects was 9.58 ($\pm$ 1.58).three hundred forty (80.6%) study participants had positive attitude and eighty-two (19.4%) had negative attitude regarding blood glucose monitoring. Similar study was conducted in Malaysia. In Malaysia it was reported that diabetic patients in a primary care centre had good knowledge and better attitude towards the care of their own disease. This could be due to the proper knowledge regarding on diabetes of health education program and this can improve the knowledge of patients and change their attitude [31].

Three hundred eight (73%) of respondents were strongly agreed on regular exercise can help to control blood glucose for diabetic patients. This finding was consistent with the study conducted in Pakistan that Importance of exercise for prevention and control of diabetes was recognized by 58.7 % .Among respondents (78.7%) Were strongly agree on planed diet or dietary modification can help to control blood glucose for diabetic patients. This finding was consistent with the study conducted in Pakistan 69.2%, Iran 74%, Egypt 93.2%.the similarities was due to long duration of therapy, during medication time patients advised by their doctors so they do have knowledge How to manage the diabetes beyond insulin or other medicines [22, 29, 30].

Three hundred eighteen 318 (75.4%) participant were strongly agree on keeping the blood sugar close to normal can help to prevent the complications of diabetes. Similar study was conducted in Pakistan that role of frequent blood sugar tests was realized by (85.5%) of the respondents This might be due to the educational levels of study participants which bring good understanding of the disease condition [32].

Three hundred forty one (80.8%) participants were strongly agreed on the importance of diabetic education. Studies in India showed that serious diabetes education can improve glycemic control and quality of life of diabetic patients. Education regarding diabetic is very important

to improve the life style of the patients which would be helpful in maintaining (controlling) blood glucose [34].

In this study 70.9% participants had strongly agreed on that eye examination helps to control diabetic complications. This study was supported by the study conducted in Pakistan that 58.8% of respondents was recognized role of eye examination can help to prevention and control of diabetic retinopathy [32].

The mean ($\pm$ SD) practice score of the study subjects was 5.34 ($\pm$ 1.76). Two hundred twenty one (52.4%) study participants had poor practice and Two hundred one (47.4%) had good practice regarding blood glucose monitoring. this finding was lowered compared to study conducted in India which reported that (83.8%) of all respondents had poor practices. This difference might be due to lack of health care access. Another explanation might be poor patient attendance at health clinics with this the patients missed their laboratory test diagnosis [26].

Among respondents (23.5%) participants did exercise regularly to control blood glucose level. similar study was conducted in Malaysia that less than 45% of participants did perform exercise regularly and in India which reported that (33.1%) of the patients were Performing physical activity regularly. This is due to similar life style modification concerning on exercise activity [31, 34].

In this study (19.0%) of participants were regular blood sugar checking and (33.4%) of participants were frequent blood sugar checking. This study demonstrated lower level practice of blood sugar checking compared to a study conducted in Pakistan (87.5%) and another study in India (36%). This difference might be due to majority of the patients were getting their blood sugar checked only during their scheduled consultation(follow-up) with the doctor at every three or six month intervals[32,34].

Majority of the respondents (53.6%) performed eye examination occasionally. This study was supported by the study conducted in Pakistan which reported (56.8%) diabetics were performing eye examination. This study was higher compared to study done in India only (20.2%) were getting their eyes examined every year. This is because in India Majority of study participants

were illiterate and had score poor knowledge and poor practice than the study done in Ethiopia [32, 33].

Another finding of this study was poor practice on HbA1-c test. Three hundred thirty (72.2) participants were never checked HbA1-c test. Similar study conducted in Kenya which reports that (79.8%) of respondents had never done the HbA1-c test. This is due to lack of awareness and expenses of the test [13].

In this study almost half 208(49.3%) of participants were used self-blood glucose machine. This study had similar result with the study conducted in Pakistan which reported that 50% of the patients had their own glucometer. Only half of the study participants were used their own glucometer in both studies this is due to the expenence of the machine which is not affordable to use for all study participants, this situation affects blood glucose monitoring practice of study participants [22].

In this study HgbA1-C test was performed for 95 patients. The mean and st.diviation of HbA1-C level was 8.03($\pm$ 1.82). Among 95 patients 15.8% of them had lower than the recommended level of 6.5%,which had good glycemic control and 84.2% of patient had higher than the recommended level of 6.5%, which had poor glycemic control. This study was supported by Similar study conducted in Pakistan which reported that 11% had good glycemic control and 76% had poor glycemic control for those who have done their blood tests (HbA1-c) [35].From this finding majority of patients had poor glycemic control with HbA1C level lower than 6.5%.This finding highlight that especially health care providers need to educate their patients on its role. Since this test measures average blood glucose for the past 2 to 3 months and it can be used for the diagnosis of both prediabetes and diabetes, awareness creation should be done that helps for diabetic patients to monitor their blood glucose.

Limitation of the Study

The study was conducted only among the outpatients clinics and private clinics didn't included these may not be generalized to the overall populations of diabetics regarding to knowledge attitude and practice of blood glucose monitoring. HbA1-c test was done only for 95 study participants.

Strength of the study

Since Tikur Anbesa Specialized and Referral Hospital has long year service established center for diabetic patients it is the best representative of diabetic patient's population. The data was collected by the department staff members so it gives advantage to keep the quality of data. This study determined HbA1-c test which is a recent technology method that helps for diabetic patients to aware about their blood glucose status.

Conclusion

In this study knowledge and attitude levels among study participants were high, but lower levels of patient's practices were observed on blood glucose monitoring among diabetic patients and poor glycemic control was also observed from the participants HbA1-C value results. There was a significant association between HbA1-c value with practice score and complications among study participants.

Recommendation

- ❖ Good knowledge didn't necessarily determine good practice so there should be laboratory based assessment like HbA1-c test.
- ❖ There should be periodic assessment of knowledge, attitude and practice on blood glucose monitoring among diabetic patients.
- ❖ Awareness creation on HbA1-c test should be done by Health professionals.
- ❖ Since this study has limitations further studies should be done like on identifying determinant factors and including studies on private clinics or hospitals.

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9. Annexes

Annexe1-English version of information sheet, consent and questionnaire

Structured questionnaire for assessing knowledge attitude and practice on blood glucose monitoring among diabetic patients at black lion teaching hospital.

Subject information sheet

Greetings:

My name is _____ I am working with kidist Yirsaw who is currently a post graduate student in Addis Ababa University, Department of medical laboratory science.

Objective of the study is to assess knowledge, attitude and practice on blood glucose monitoring among diabetic patients at black lion teaching hospital. This will help to improve our community health based on your answers to our questions. You will be asked to fill a questionnaire that will help in investigating the issues. And also if you are selected for Hgb test, we request your willingness for blood sample. Your co-operation is very helpful. Your name will not be written on the questionnaire and all the information you will provide will be kept strictly confidential. You will be facing no harm by participating and you are also not obliged to answer any question you don't wish to answer. To fill the questionnaire 25-30 minutes will be required.

Consent Form

Considering the information you get from the general information sheet, we would be Thankful if you spend some time with us solving questions related to the issues. Are you Comfortable to participate in this study?

1. If yes, continue to next page
2. If no, skip to other participant

Informed consent certified by

Questionnaire collector: Code_____ Name_____ Signature_____ Date_____

Checked by: Supervisor Signature_____

Questionnaire identification number _____

Address: city/Sub city _____ Woreda _____ Medical Card Number _____

Knowledge attitude and practice of diabetic patients' questionnaire

No	<i>I Socio demographic characteristics</i>	Response classification	Code
1	Sex of the respondents	Male Female	0 1
2	Age (years)		
3	What is your marital status?	Single Married Divorced Widowed Other specify -----	0 1 2 3 4
4	Where is your place of residence?	Addis Ababa Outside Addis Ababa	0 1
5	What is your last level of education?	Illiterate Read and write Grade 1-8 Grade 9-12 College and above	0 1 2 3 4
6	What is your current occupation?	Student Government employee Private enterprise employee Daily laborer Merchant Housewife No job Other specify.....	0 1 2 3 4 5 6 7
7	How much income you earn monthly? (Ethiopian Birr)	<500 500 – 1000 1001 – 5000 >5000	0 1 2 3
8	Do you have history of diabetic in your family?	Yes No	0 1
9	Duration of therapy for diabetic.	2-3 years 3-4years >4 years	1 2 3 4
10	Are you a member of diabetic association?	Yes No	0 1
11	Source of information about diabetics and therapy?	Medical staff Media Relatives and friend	1 2 3

		From association Others....	4 5
II. Knowledge question			
1.	What is diabetes?	Diabetes is a raised blood sugar. Diabetes is a disease which affects any part of the body Don't know	1 2 3
2.	What are the causes of Diabetics? One or more answers.	Obesity Sedentary life style Family history Eating too much fat and sugar Cigarette smoking	1 2 3 4 5 6
3.	Diabetic can be detected through...	Through blood examination or Through urine examination Do not know	1 2
5.	For how frequently should a diabetic patient measure her/ her blood glucose level?	Within a day Within a week Within a month Within Six months Within a year	1 2 3 4 5
6.	What is hyperglycemic condition? (one or more answers).	Passing lots of urine Excess thirst Tiredness Weight loss Poor wound healing (cuts, scrapes, etc...)	1 2 3 4 5
7.	What is hypoglycemic condition? (One or more answers).	Hunger Nervousness and shakiness Dizziness or light-headedness Sleepiness Confusion Difficulty speaking Feeling anxious or weak	1 2 3 4 5 6 7
8.	Do you know the complications of Diabetics, if not treated well? (One or more answers).	Ophthalmologic Renal failure Neurologic Hypertension Don't know	1 2 3 4 5
9.	What types of life style modification do you think it helps for the control of Diabetics? (One or more answers).	Exercise Dietary modification Weight reduction	1 2 3
10.	Monitoring of blood glucose levels is	True	0

	important for reducing Complication of diabetics?	False	1
11.	Do you know about HbA1c?	Yes No	0 1
III Attitude questions			
1	Do you think that regular exercise can help to control Blood Glucose Level?	Strongly agree Agree Somewhat agree Disagree Strongly disagree	1 2 3 4 5
2	Do you think planned diet or Dietary modification can help to control Blood Glucose Level?	Strongly agree Agree Somewhat agree Disagree Strongly disagree	1 2 3 4 5
3	Do you think keeping the blood sugar close to normal can help to prevent the complications of diabetes?	Strongly agree Agree Somewhat agree Disagree Strongly disagree	1 2 3 4 5
4.	Do you think having a regular Blood Glucose Test might bring a positive effect on diabetic patients?	Strongly agree Agree Somewhat agree Disagree Strongly disagree	1 2 3 4 5
5.	Do you think having HbA1c Test might bring a positive effect on diabetic patients?	Strongly agree Agree Somewhat agree Disagree Strongly disagree	1 2 3 4 5
6.	Do you think every diabetic patient should do whatever it takes to keep their blood sugar close to normal?	Strongly agree Agree Somewhat agree Disagree Strongly disagree	1 2 3 4 5
7.	Do you think knowing about diabetic may help to control from the disease?	Strongly agree Agree Somewhat agree Disagree Strongly disagree	1 2 3 4 5
8.	Is Diabetic education important to diabetic patients?	Strongly agree Agree Somewhat agree Disagree	1 2 3 4

		Strongly disagree	5
9.	Do you think urine test will help to control diabetic complications?	Strongly agree Agree Somewhat agree Disagree Strongly disagree	1 2 3 4 5
10	Do you think eye examination will help to control diabetic complications?	Strongly agree Agree Somewhat agree Disagree Strongly disagree	1 2 3 4 5
11.	Do you think the important decisions regarding daily diabetes care should be made by the person with diabetes?	Strongly agree Agree Somewhat agree Disagree Strongly disagree	1 2 3 4 5
IV Practice questions			
1.	How frequently do you exercise for controlling your blood glucose level?	Always Some times Occasionally Not at all	1 2 3 4
2.	How frequently do you take a drug for controlling your blood glucose level?	Always Some times Occasionally Not at all	1 2 3 4
3.	How frequently do you adjust dietary modification for your blood glucose level?	Always Some times Occasionally Not at all	1 2 3 4
4.	How frequently do you perform your blood glucose level?	Always Some times Occasionally Not at all	1 2 3 4
5.	How frequently do you perform urine test?	Always Some times Occasionally Not at all	1 2 3 4
6.	How often do you perform eye examination?	Always Some times Occasionally Not at all	1 2 3 4
7.	How often do you check your HbA1c level?	Always Some times Occasionally Not at all	1 2 3 4

8.	Did you miss your blood glucose test on your checking time?	Always Some times Occasionally Not at all	1 2 3 4
9.	Do you use self- blood glucose monitoring machine?	Yes, No,	0 1
11.	How often did you attendee a diabetes patient education program for your self – care monitoring?	Always Some times Occasionally Not done at all	1 2 3 4

Name of data collector _____ Signature _____

Name of Supervisor _____ Signature _____

Annexe2: Amharic version of information sheet, consent and questionnaire

የፈቃደኝነት መጠየቂያ ቅጽ

ጤና ይስጥልኝ

ስሜ -----ይባላል በአሁኑ ሰዓት በአዲስ አበባ ዩንቨርሲቲ የድህረ ምረቃ ተማሪ ከሆነችው ቅድስት ይርሳው ጋር አብራ እሰራለሁ።

የዚህ ጥናት ዋና አላማ በጥቁር አንበሳ ሆስፒታል የስኳር ሕመም ክትትል የሚያደርጉ ታካሚዎች ስለህመሙ ያላቸውን እውቀት ግንዛቤና ተሞክሮ የሚዳስስ ሲሆን በመቀጠል ለ HbA1-c የደም ምርመራ የደም ናሙና እንዲሰጡ ፍቃደኝነትዎን እንጠይቃለን ወጤቱም ለሀኪምዎት ይገለጻል እርስዎ የሚሰጡት መልስ የህበረተሰቡን ጤና ለማሻሻል ጠቀሜታ ይኖረዋል።

ይህ መጠይቅ ጥናቱን ለማከናወን ጠቃሚ ስለሆነ እንዲሞሉ በትህትና ይጠየቃሉ ስምዎም በመጠይቁ ላይ አይጻፍም የሚሰጡትን መልስም ሙሉ በሙሉ ሚስጠራዊነቱ ተጠብቆ ለጥናቱ ብቻ የሚውል ሲሆን በሂደቱ ላይ እንደአስፈላጊነቱ በሙሉ ነጻነት ይሙሉት ምንም ሊያስፈራዎት አይገባም ከዚህ በላይ ደግሞ እርስዎ መሙላት የማይፈልጉት ጥያቄ ቢኖር ለመሙላት አይገደዱም ይህን መጠይቅ ማቆም በሚፈልጉ ሰዓት ማቆም ይችላሉ ማቆሞት በህክምናው ላይ ምንም ተጽእኖ አያመጣም ለጥያቄው 25-30 ደቂቃ በቂ ነው ።

የፈቃደኝነት ቀፅ

ከላይ ባገኙት የመረጃ ምንጭ መሰረት ይህንን የምርምር ጥናት ጥያቄዎች ለመመለስ ፍቃደኝነትዎን እንጠይቃለን

በጥናቱ ለመሳተፍ ፍቃደኛ ነዎት

1. አዎ ለመሳተፍ ፍቃደኛ ሲሆኑ ወደሚቀጥለው ገጽ ይለፉ
2. አይደለሁም ወደሚቀጥለው ተሳታፊ ይሂዱ
3. የፈቃደኝነት ቅጽ ያረጋገጠው

መጠይቁን ያስሞላው ኮድ----- ስም----- ፊርማ-----ቀን-----

ያረጋገጠው----- ፊርማ-----

የእውቀት የአመለካከትና የተሞክሮ መጠይቅ

ተ.ቁ	የአጠቃላይ ሁኔታ ጥያቄ	መልስ ሊሆን የሚችሉ ዝርዝሮች	ኮድ
1	ፆታ	ወንድ ሴት	0 1
2	እድሜ		
3	ባለትዳር ነህ/ሽ	ያላገባ ያገባ የተፋታ ባል ወይም ሚስት የሞተበት	0 1 2 3
4	የመኞሪያ አድራሻ	አዲስ አበባ ከአዲስ አበባ ወጪ	0 1
5	የትምህርት ደረጃ	ያልተማረ ማብብና ነጻፍ የሚችል 1-8 ክፍል 9-12 ክፍል ኮሌጅና ከዚያ በላይ	0 1 2 3 4
6	የስራ ሁኔታ	ተማሪ የመንግሥት ሰራተኛ የግል ተቀጣሪ የቀን ሰራተኛ ነጋዴ የቤት አመቤት ስራ የለኝም -----	0 1 2 3 4 5 6 7
7	የወር ገቢዎ ምን ያህል ነው ?	<500 ከ 500-1000 ከ1001-5000 >5000,	0 1 2 3
8	ከቤተሰቡ ውስጥ የስኳር ሕመም የነበረበት ሰው አለ ?	አዎ የለም	0 1
9	የስኳር ሕመም ክትትል ማድረግ ከጀመሩ ስንት ጊዜ ሆኖዎት ?	ከ2-3 ዓመት ከ3-4 ዓመት >4 ዓመት	1 2 3
10	የስኳር ሕመም ማህበር አባልነት ነዎት ?	አዎ አይደለሁም	0 1
11	ስለስኳር ሕመም ሕክምና መረጃ ከየት ያገኛሉ?	ከሕክምና ባለሙያ ከመገናኛ ብዙሃን ከዘመድ ወይም ከጓደኛ ከማህበራት	1 2 3 4
የእውቀት ጥያቄ			
1.	የስኳር ሕመም ምንድን ነው?	በደም ውስጥ የስኳር መጠን ከፍ ማለት የስኳር ሕመም ማንኛውንም የሰውነታችንን ክፍል የሚያጠቃ ሕመም ነው አላውቀውም	1 2 3
2.	የስኳር ሕመም አጋላጭ ሁኔታዎች ምን ምን ናቸው? (አንድና ከአንድ በላይ መልስ መስጠት ይችላሉ)	ውፍረት ብዙ አንቅስቃሴ አለማድረግ በዘር ስብ የበዛበትና ጣፋች ምግብ ማብዛት	1 2 3 4

		ሲጋራ ማጫስ	5
3.	የስኳር ሕመም በሽታ የሚታወቀው በምን ምርመራ ነው?	በደም ወይም በሽንት ምርመራ አላውቀውም	1 2
4.	የስኳር ሕመም ታካሚ በስንት ጊዜ ልዩነት ምርመራ ማድረግ ይጠበቅበታል?	በሳምንት አንዴ በወር አንዴ በስድተኛው ወር አንዴ በዓመት አንዴ	1 2 3 4
5.	የስኳር ሕመም ታካሚ በስንት ጊዜ ልዩነት በደም ውስጥ ያለውን የስኳር መጠን መለካት ይኖርበታል ?	በቀን አንዴ በሳምንት አንዴ በወር አንዴ በስድተኛው ወር አንዴ በዓመት አንዴ	1 2 3 4 5
6.	በጣም ከፍተኛ የሆነ በደም ውስጥ ያለ የስኳር መጠን ምን አይነት ምልክቶች ይኖሩታል ?(አንድና ከአንድ በላይ መልስ መስጠት ይችላሉ)	ቶሎ ቶሎ መሸናት ድካም ውኃ መጥማት ክብደት መቀነስ ቁስል ቶሎ አለመዳን	1 2 3 4 5
7.	በጣም በጣም ዝቅተኛ በደም ውስጥ ያለ የስኳር መጠን ምን አይነት ምልክቶች ይኖሩታል?(አንድና ከአንድ በላይ መልስ መስጠት ይችላሉ)	የርሀብ ስሜት አለመረጋጋት እና ማንቀጥቀጥ ድካም እና የማዞር ስሜት እንቅልፍ እንቅልፍ ማለት ሃሳብን መሰብሰብ አለመቻል መናገር አለመቻል መጨነቅ እና አቅም ማጣት	1 2 3 4 5 6 7
8.	የስኳር ሕመም በአግባቡ ካልታከመ በጤና ላይ ምን ያስከትላል ?(አንድና ከአንድ በላይ መልስ መስጠት ይችላሉ)	የአይን ችግር ያመጣል የኩላሊት ችግር ያመጣ የነርቭ ችግር ያመጣል የደም ብዛት ችግር ያመጣል	1 2 3 4
9.	ምን አይነት የአኗኗር ዘይቤ የስኳር ሕመምን ለመቆጣጠር ይረዳል ብለው ያስባሉ?(አንድና ከአንድ በላይ መልስ መስጠት ይችላሉ)	እንቅስቃሴ ምድረግ የተስተካከለ የምግብ አወሳሰድ ክብደት መቀነስ	1 2 3
10.	በደም ውስጥ ያለውን የስኳር መጠን መቆጣጠር የስኳር ሕመም የሚያስከትለውን ጉዳቶች ይቀንሳል?	እውነት ሐሰት	0 1
11.	ስለ HgbA1-c ሰምተዋል ያውቃሉ?	አዎ አላውቅም	0 1
	የአመለካከት ጥያቄ		
1	ተከታታይ የሆነ የአካል ብቃት እንቅስቃሴ መድረግ የደም የስኳር መጠንን ለማስተካከል ይረዳል?	በጣም እስማማለሁ አስማማለሁ በመጠኑ እስማማለሁ አልስማማም በጣም አልስማማም	1 2 3 4 5
2	የአመጋገብ ስርዓትን በእቅድ ማድረግ ወይም በአግባቡ ማስተካከል የደም የስኳር መጠንን ለመቆጣጠር ይረዳል?	በጣም እስማማለሁ አስማማለሁ በመጠኑ እስማማለሁ አልስማማም በጣም አልስማማም	1 2 3 4 5
3	የደም የስኳር መጠንን በተገቢ ሁሌታ	በጣም እስማማለሁ	1

	መቆጣጠር የስኳር ሕመም ከሚያስከትላቸው ጉዳቶች ይከላከላል ብለው ያስባ?	እስማማለሁ በመጠኑ እስማማለሁ አልስማማም በጣም አልስማማም	2 3 4 5
4.	ዘወትር የደም ስኳር መጣንን መለካት ለታካሚ በጎ የሆነ አስተዋጽኦ ይኖረዋል ብለው የስባሉ?	በጣም እስማማለሁ እስማማለሁ በመጠኑ እስማማለሁ አልስማማም በጣም አልስማማም	1 2 3 4 5
5.	የስኳር ሕመም ታካሚ በማንኛውም መንገድ ቢሆን የደም የስኳር መጠኑን ወደ ተገቢው መጠን (Normal)ማምጣት ይኖርበታል ብለው ያስባሉ?	በጣም እስማማለሁ እስማማለሁ በመጠኑ እስማማለሁ አልስማማም በጣም አልስማማም	1 2 3 4 5
6.	HgbA1-c ን መለካት ለታካሚው በጎ የሆነ አስተዋጽኦ ይኖረዋል ብለው ያስባሉ ?	በጣም እስማማለሁ እስማማለሁ በመጠኑ እስማማለሁ አልስማማም በጣም አልስማማም	1 2 3 4 5
7.	ስለስኳር ሕመም ማወቅ የስኳር ሕመም እንዳይዘን ይረዳል ?	በጣም እስማማለሁ እስማማለሁ በመጠኑ እስማማለሁ አልስማማም በጣም አልስማማም	1 2 3 4 5
8.	ለስኳር ሕመምን ስለ ስኳር ሕመም ማስተማር ይጠቅማል ?	በጣም እስማማለሁ እስማማለሁ በመጠኑ እስማማለሁ አልስማማም በጣም አልስማማም	1 2 3 4 5
9.	የሽንት ምርመራ ማድረግ የስኳር ሕመም ከሚያስከትላቸው ጉዳቶች ይከላከላል ብለው ያስባሉ?	በጣም እስማማለሁ እስማማለሁ በመጠኑ እስማማለሁ አልስማማም በጣም አልስማማም	1 2 3 4 5
10.	የዐይን ምርመራ ማድረግ የስኳር ሕመም ከሚያስከትላቸው ጉዳቶች ይከላከላል ብለው ያስባሉ ?	በጣም እስማማለሁ እስማማለሁ በመጠኑ እስማማለሁ አልስማማም በጣም አልስማማም	1 2 3 4 5
11.	የስኳር ሕመምን ጥንቃቄ በተመለከተ ህመምተኛው እራሱ ለራሱ አስፈላጊውን የቀን በቀን እንክብካቤ ማድረግ አለበት ብለው ያስባሉ?	በጣም እስማማለሁ እስማማለሁ በመጠኑ እስማማለሁ አልስማማም በጣም አልስማማም	1 2 3 4 5
	የተሞክሮ ጥያቄ		
1.	በየስንት ጊዜው በደም ውስት ያለውን የኳር መጠን ይቆጣጠራሉ ?	ሁልጊዜ በተደጋጋሚ እንዳንድ ጊዜ አልፎ አልፎ በጭራሽ	1 2 3 4 5

2.	በደምዎት ውስት ያለውን የስኳር መጠን ለመቆጣጠር በየስንት ጊዜ መድኃኒት ይወስዳሉ?	ሁልጊዜ በተደጋጋሚ አንዳንድ ጊዜ አልፎ አልፎ በጭራሽ	1 2 3 4 5
3.	በደም ውስጭ ያለውን የስኳር መጠን ለመቆጣጠር በየስንት ጊዜው የምግብ አወሳሰድዎት እንዲስተካከል ያደርጋሉ ?	ሁልጊዜ በተደጋጋሚ አንዳንድ ጊዜ አልፎ አልፎ በጭራሽ	1 2 3 4 5
4.	በደም ውስጥ ያለው የስኳር መጠን በየስንት ጊዜው እየተመረመሩ ይቆጣጠራሉ?	ሁልጊዜ በተደጋጋሚ አንዳንድ ጊዜ አልፎ አልፎ በጭራሽ	1 2 3 4 5
5.	የሽንት ምርመራ በየስንት ጊዜው ምርመራ ያደርጋሉ ?	ሁልጊዜ በተደጋጋሚ አንዳንድ ጊዜ አልፎ አልፎ በጭራሽ	1 2 3 4 5
6.	የዓይን ምርመራ በየስንት ጊዜው ምርመራ ያደርጋሉ ?	ሁልጊዜ በተደጋጋሚ አንዳንድ ጊዜ አልፎ አልፎ በጭራሽ	1 2 3 4 5
7.	HgbA1-c በየስንት ጊዜው ምርመራ ያደርጋሉ?	ሁልጊዜ በተደጋጋሚ አንዳንድ ጊዜ አልፎ አልፎ በጭራሽ	1 2 3 4 5
8.	በቀጠሮ ቀን የስኳር ምርመራ አምልጦት ያውቃል?	ሁልጊዜ በተደጋጋሚ አንዳንድ ጊዜ አልፎ አልፎ በጭራሽ	1 2 3 4 5
9.	በግልዎት የስኳር መመርመሪያ መሳሪያ ይጠቀማሉ?	አዎ አልጠቀምም	0 1
10.	የስኳር ሕመም ቁጥጥርን በተመለከተ በየስንት ጊዜው ትምህርት ይሳተፋሉ?	ሁልጊዜ በተደጋጋሚ አንዳንድ ጊዜ አልፎ አልፎ በጭራሽ	1 2 3 4 5

Annex 3 Checklist

Checklist for the retrospective data collection of Diabetic patients for the last one year

S N	Variables	Value	
1	Blood pressure		
2	weight		
3	height		
4	Type of Diabetes		
5	Current treatment		
6	Complications		
		past	current
	• Diabetic retinopathy		
	• Diabetic neuropathy		
	• Diabetic nephropathy		
	• Cardiovascular diseases		
	• Foot complication		
	• Diabetic ketoacidosis		
	• Hyperglycemia		
	• Hypoglycemia		
	• Hyperosmolar state		
	• Diabetic coma		
	• Periodontal disease		
	• Respiratory infection		
7	Laboratory tests		
		past	current
	Blood tests		
	• Fasting blood glucose		
	• Random blood glucose		
	• HbA1c		
	• Urea		
	• Creatinine		

Name of data collector _____ Signature _____

Name of Supervisor _____ Signature _____

Annexe 4: HbA-1c test procedure

Laboratory procedure of Cobas® Tina-quant Hemoglobin A1C Gen.2 Whole blood Application - Standardized according to IFCC transferable to DCCT/NGSP

Test principle

The anticoagulated whole blood specimen is hemolyzed automatically on the COBAS INTEGRA 400/400 plus/800 analyzers with COBAS INTEGRA Hemolyzing Reagent Gen.2. This method uses TTAB (Tetradecyltrimethylammonium bromide) as the detergent in the hemolyzing reagent to eliminate interference from leukocytes (TTAB does not lyse leukocytes). Sample pretreatment to remove labile HbA1c is not necessary.

All hemoglobin variants which are glycosylated at the β -chain N-terminus and which have antibody-recognizable regions identical to that of HbA1c are determined by this assay. Consequently, the metabolic state of diabetic patients having uremia or the most frequent hemoglobinopathies (HbAS, HbAC, and HbAE) can be determined by this assay.

Protocol 1 (mmol/mol HbA1c acc. to IFCC): $\text{HbA1c (mmol/mol)} = (\text{HbA1c/Hb}) \times 1000$

Protocol 2 (% HbA1c acc. to DCCT/NGSP): $\text{HbA1c (\%)} = (\text{HbA1c/Hb}) \times 91.5 + 2.15$

Specimen collection and preparation

Blood sample was collected by K3-EDTA and stored at 2- 8 °C not more than five days before the analysis done.

Test procedure

1. Bring all reagent and samples to room temperature.
2. Put reagent and samples accordingly to their position on the COBAS INTEGRA systems analyzer.
3. Calibration was made by COBAS HbA1c calibrator (Cat. No. 04528328 190, system-ID 07 6851 0) & quality control was done along with the sample whenever the testing done in the same way as samples. HbA1c controls carry a declaration for mmol/mol HbA1c (IFCC) and % HbA1c (DCCT/NGSP) only. No declarations for Hb and HbA1c concentrations are provided. As a consequence, HbA1c controls are handled like samples and cannot be included in the COBAS INTEGRA systems Quality Control Program.
4. COBAS INTEGRA systems automatically calculate both Hb & HbA1c concentration of each sample.
5. Calculation was made by according to Protocol No. 2 : (% HbA1c acc. to DCCT/NGSP): $\text{HbA1c (\%)} = (\text{HbA1c/Hb}) \times 91.5 + 2.15$

Declaration

I, the undersigned, declare that this is my original work has not been presented for a degree in Addis Ababa university or any other universities. I also declare that all sources of materials used for the proposal have been duly acknowledged.

Name of candidate: kidist Yirsaw

Signature: _____

Place: Addis Ababa University School of Medical laboratory science Ethiopia.

Date of submission: _____

This work has been submitted with my approval as university advisor,

Name of advisor: Dr.Tedla Kebede

Signature_____

Place: Addis Ababa University School of Medicine

Name of advisor: Kassu Desta

Signature_____

Place: Departement of Medical Laboratory science

Name of advisor: Fatuma Hassen

Signature:_____

Place: Departement of Medical Laboratory science