ADDIS ABABA UNIVERSITY
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DIABETIC HEALTH LITERACY AND BLOOD GLUCOSE CONTROL AMONG PATIENTS WITH DIABETES AT PUBLIC HEALTH FACILITIES IN BISHOFTU TOWN, OROMIA, ETHIOPIA 2023/2024: CASE-CONTROL STUDY

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APPROVAL SHEET

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As thesis research advisor, We hereby certify that I read and evaluated this thesis prepared under my guidance by Lidya Asmelash, entitled: "Examining the Association between diabetic health literacy and blood glucose control among Patients with Diabetes at Public Health Facilities in Bishoftu Town, Oromia, Ethiopia 2023/2024: UNMATCHED CASE-CONTROL STUDY" in partial fulfillment of the requirements for the Degree of Master of Public Health "specialty in Epidemiology and Biostatistics" is recommended to be submitted as fulfilling the thesis requirement and regulations of the University and meets the accepted standards to originality and quality.

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LIST OF ABBREVIATIONS AND ACRONYMS

BGH…………………... Bishoftu general hospital

BHC…………………… Bishoftu health center

BMI …………………... Body mass index

CI………….....……… Co-investigator

DM …………………… Diabetes mellites

FBS …………………... Fasting blood sugar

HbA1c ………………. Hemoglobin A1c

HC ……………………. Health center

HL …………………… Health literacy

HF ……………………. Health facility

IDF …………………. International diabetes federation

KHC …………………. Keta health center

NCD ……………. …. Non-communicable disease

ODK ……………. …. Open Data Kit

OR …………………... Odds ratio

PI……………………. Principal investigator

RBS ………………… Random blood sugar

SDG………………… Sustainable development goal

WHO ………………. World health organization

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Abstract

Background: Uncontrolled blood glucose levels in most diabetes patients result from poor diabetes health literacy and are linked with significant mortality and morbidity. Diabetes patients with poor diabetic health literacy may have inadequate glycemic control likely to experience complications from the disease. However, insufficient studies support such a hypothesis in most low-income countries. Therefore, the main goal of this study is to investigate the link between diabetic health literacy and blood glucose levels in diabetic patients.

Methods: A health facility-based case-control study was carried out in Bishoftu town, involving all individuals diagnosed with DM who began follow-up. Cases included diabetic patients with uncontrolled blood glucose, while controls consisted of diabetic patients with controlled blood glucose. The sample size was determined using Epi-Info, comprising 94 cases and 276 controls. A structured, interview-administered questionnaire was utilized to gather data. The data analysis was conducted using STATA version 17. Descriptive analysis was conducted using simple frequencies and cross-tabulations to examine sociodemographic characteristics and other independent variables. Bivariate data analysis checked the correlation between diabetic health literacy and other independent variables against blood glucose level. Moreover, a multivariable analysis using binary logistic regression was conducted to identify independent predictors of blood glucose levels.

Results: In this study, average age (SD) to the cases and the controls were 48 (17.2) and 47 (17.3), respectively. Diabetic patients with uncontrolled blood glucose levels were 4.7 times more likely to have an impact on low health literacy than patients with controlled blood glucose levels (AOR = 4.7, 95%CI: 2.16, 10.24) and 2.9 times more likely to have an impact on moderate health literacy than patients with controlled blood glucose levels (AOR = 2.9, 95%CI: 1.37, 6.02), Patients who exercised physically (AOR= 0.41, 95%CI: 0.21, 0.78), good treatment adherence (AOR= 0.44, 95%CI: 0.22, 0.87) were statistically significant factor with uncontrolled blood glucose level.

Conclusion: The study conducted on the link among health literacy of diabetes and blood glucose control levels among diabetic patients was identified several factors such as low and moderate diabetic health literacy older age, engagement in physical activities and good adherence to treatment were associated with achieving the target of blood glucose level control.

Keywords: Diabetes, diabetic health literacy, blood glucose control, Ethiopia

1. Introduction

1.1 Background

Worldwide, diabetes is a severe public health concern. More than half a billion people worldwide are estimated to have diabetes, which affects men, women, and children of all ages in every nation (1). IDF Africa is a region of the (IDF) comprising 48 different sub-Saharan nations and territories. In 2021, 24 million adults in Africa, aged 20 to 79, were estimated by IDF to have diabetes. (IDF) determined that 1,920,000 Ethiopians, or 5.3% of the country's adult population between 20 and 79, have diabetes in 2021 (2).

Diabetes mellitus is a metabolic disorder that can lead to high levels of sugar in the blood. It is caused by insufficient production of insulin by the pancreas or by improper insulin cellular response. Although there are three varieties of diabetes mellitus, type 1 and type 2 are the most common. The most common symptoms include increased thirst and dry mouth, increased hunger, frequent urination, fatigue, and unintentional weight loss (3). Type 1 diabetes affects 9.5% of the global population, and by 2030, type 2 diabetes is projected to impact 7079 individuals per 100,000.While type 2 diabetes has a vital genetic component and a high association with obesity and a lack of physical activity, type 1 diabetes frequently develops during childhood (4,5).

A person's blood glucose level varies according to health and food intake. When fasting, an average blood glucose level falls between 70 and 99 mg/dl; values outside this range may suggest prediabetes or diabetes. Blood glucose levels are categorized as follows: below 100 mg/dl is considered normal or healthy; between 100 and 125 mg/dl is considered prediabetes, which indicates a risk of developing diabetes; and beyond 126 mg/dl is considered diabetes mellitus, which indicates a risk of acquiring comorbidities (6). The Centers for Disease Control and Prevention (CDC) recommends monitoring blood pressure to help individuals stay within their target ranges. Maintaining a healthy blood pressure range can help prevent long-term complications associated with diabetes, such as kidney, heart, and vision problems (7).

Blood glucose levels can be measured in two different ways. The HbA1c test measures mean blood glucose level through the past two to three months, while the blood sugar test indicates the current glucose level in the blood (6). Therefore, the study desires to investigate the link between health literacy in diabetic patients and their blood glucose control.

1.2 Statement of the problem

Diabetes mellitus poses a significant public health challenge, leading to complications, disabilities, and fatalities worldwide. Around 422 million people worldwide have diabetes, leading to 1.5 million deaths in 2023 (1). In 2023, Ethiopia recorded 26,448.3 deaths and ranked among the top five sub-Saharan African countries with the highest number of people affected by diabetes. The impact of diabetes is not limited by age group, family history, sex, educational status, religion, race, place of residence, and so forth (8,9).

Glycemic control remains a significant public health challenge, as most patients struggle to achieve optimal blood sugar levels. Globally, approximately 40.0–60.0% of diabetes patients have poorly managed blood glucose (10). A study conducted in Sub-Saharan Africa revealed that 74.0% of diabetes patients had poor glycemic control. Specifically in Ethiopia, a significant proportion of diabetes patients, ranging from 33.2% to 80%, were unable to achieve reasonable glycemic control (11). It is influenced by factors such as age, gender, education level, body mass index (BMI), dietary habits, home blood glucose monitoring, diabetes duration, family history, medications, and numerous other factors (12,13). Poorly controlled diabetes is linked to a significant risk of mortality and cardiovascular disease (14). Sub-Saharan Africa has been shown to have a higher rate of morbidity and mortality from diabetes than any other region worldwide, according to reports (9). Diabetes patients in Ethiopia who have inadequate glycemic control are more likely to experience complications from the disease. Poor glycemic control and long-term diabetes raise the risk of complications from the disease, and uncontrolled diabetes can degrade the quality of life and cause several acute and chronic problems. Several investigations conducted in Ethiopia have revealed a huge prevalence of inadequate glycemic control between diabetes clients. Additional researches required to infer the levels of glycemic control and their predictors at the national level.

Ethiopia has also committed to the Sustainable Development Goals (SDG) with the aim of reducing premature deaths caused by non-communicable diseases (NCD) through strategies developed within the country. As of our knowledge, the study mentioned here is a case-control study, and no research has been carried out at Bishoftu General Hospital (BGH), Bishoftu Health Center (BHC), or Keta Health Center (KHC) to investigate the link between diabetic health literacy and blood glucose levels among diabetic patients. Whole former studies conducted for assess determinants of glycemic control in Ethiopia were cross-sectional (12,15).

1.3 Rationale and significance of the study

There appears to be a lack of evidence regarding the connection between health literacy and blood glucose control in Ethiopia. This emphasizes the necessity for thorough research to fill this evidence gap. By comprehending the public health burden and reasons for uncontrolled blood glucose levels in our community, we can raise awareness and work towards preventing and managing this issue.

This study could help develop customized strategies and programs to lower uncontrolled blood glucose levels and enhance the health outcomes of Diabetes patients.

It could serve as fundamental information for future researchers interested in studying related topics. This data will also assist health policymakers in developing suitable policies, strategies, and interventions.

Health professionals can also use the study results to determine the best ways to increase health literacy about diabetes mellitus. This research project will also contribute to advancing public health research knowledge.

2. Literature review

After thoroughly reviewing various sources related to the issue at hand, the literature review was divided into three main parts: the impact of glucose level disorders, factors influencing changes in glucose levels, and the conceptual framework. To ensure that all relevant publications were included, We conducted searches on databases such as PubMed, Google Scholar, and Web of Science Journals, looking for papers published up to 2023 using titles, keywords, and abstracts. I then used Zotero citation manager to import the citations into my documents.

2.1 Magnitude of poor glycemic control

Various studies have indicated that less than 50% of diabetic patients achieve reasonable glycemic control. The causes of this are intricate and multifaceted, with patient with diabetes and healthcare-provider-related aspects potentially donating to inadequate glycemic control. Nevertheless, identifying the specific elements directing to glycemic control loss can be formidable. Several explorations with this section have found connection within inadequate glycemic management also elements like socio-demographic features, poor adherence to insulin regimen, self-care, exercise, and dietary plan, as well as inadequate interaction between the patient and healthcare providers among diabetic patients.

The cross-sectional survey done in southwest Ethiopia showed that 18.3% reached reasonable glycemic control (FBS<126 mg/dL) (16). Another cross-sectional study in southwest Ethiopia showed more than two-thirds (70.9%) of the clients had inadequate blood glycemic management. (17). A recent cross-sectional study was conducted at a hospital in Northeast Ethiopia, involving randomly selected type 1 and type 2 diabetic adults. Research found that 70.8% of the participants had poor glycemic management, which outlined for having mean fasting blood glucose concentration above 130 mg/dL (18). Systematic review and meta-analysis performed in Ethiopia discovered that the prevalence of acceptable glycemic control was 33.2% (95% CI: 21.8%-44.6%, p<0.001). (12). A prospective observational study in Ethiopia revealed that 72.7% diabetic clients included had inadequate glycemic concentration. (13). A recent investigation conducted in central Ethiopia found that approximately 80% of participants own uncontrolled fasting blood glucose levels (15). Another cross-sectional survey in East Ethiopia showed that 64.1% of participants had poor glycemic control (19).

2.2 Factors related to blood glucose level

2.2.1 Health literacy-related factors

"Health literacy refers to the capability to comprehend and apply health information to enhance overall well-being and effectively manage diabetes. It is especially crucial for individuals with diabetes, as effectively managing the condition involves a combination of knowledge, skills, and lifestyle choices. People with diabetes need to grasp fundamental physiological concepts, understand the impact of their behavior on blood glucose levels, and make informed choices about their lifestyle. Health literacy is also vital for preventing diabetes and effectively managing the condition." (20).

The level of understanding and skill of diabetic individuals to identify, comprehend, measure ,communicate and process the information regarding diabetic related issues independently for their health benefit is known as diabetic related health literacy (21).

It's essential for people with diabetes to understand health information and communicate effectively with healthcare providers in order to manage their condition. Research on health literacy and diabetes management has been inconsistent. A study conducted in Dane demonstrated that higher health literacy scores were linked to lower HbA1c levels across eight health literacy domains. (22). Another study done in the Dutch general population testing the association of health literacy with self-reported health status has shown that those with higher health literacy skills had better self-reported general health ($B = 0.002$, $SE = 0.0006$, $p < .001$), physical health ($B = 0.017$, $SE = 0.006$, $p = .005$) as well as mental health ($B = 0.012$, $SE = 0.004$, $p = .007$) than those with lower health literacy skills (23). The study was conducted in India, and secondary data from the Special Diabetes Program for Indians Healthy Heart Project was examined. The study confirmed that individuals with higher health literacy (HL) dexterities had better glycemic control and tested whether diabetes-related behaviors accounted for this relationship. The results showed that self-monitoring of blood glucose greatly interceded the HL-HbA1c relationship. Additionally, the study examined the function of diabetes details and found that it reconciled the correlation among dietary demeanor and HL. Behavior was not anymore a significant intermediary, recommending that information was the primary force for the connection within HL and HbA1c (24). Managing for illness burden, age, and number of primary care visits, the composite effect of patient activation and serviceable health literacy on glycemic control stayed significant (odds ratio 1.05 (95%

confidence interval 1.01–1.09), P=0.02) (25). Again, with those who had finished tertiary education, responders who had fulfilled upper secondary education demonstrated lower health literacy proficiency (B = –17.6, SE = 1.20, p < .001), followed by respondents who had completed lower secondary education (B = –31.7, SE = 1.09, p < .001) and preprimary/primary education (B = –60.5, SE = 2.15, p < .001) (23).

A study done in Southwest Ethiopia among diabetes patients measuring glycemic control using fasting blood sugar revealed that a knowledge deficit about signs and symptoms of hyperglycemia (AOR=3.60; P=0.004) becomes a significant predictor of poor glycemic control. A cross-sectional study done in Ethiopia showed that poor knowledge about diabetes (p = 0.012) has become a significant predictor of glycemic control. Another cross-sectional survey done in Ethiopia showed that illiterate Patients (AOR = 3.46, 95 % CI 1.01–11.91) and farmers (AOR = 2.47, 95 % CI 1.13–5.39) had great odds of inadequate glycemic management (17). A cross-sectional survey in northeast Ethiopia showed that low schooling levels (AOR= 7.10, 95% CI 2.94–17.17) were independent predictors to inadequate glycemic control (18). However, a study conducted in the USA found that neither patient activation nor functional health literacy was independently linked to glycemic control in the unadjusted primary effects model. However, the contact within the two was significantly allied with glycemic management (odds ratio 1.05 [95% confidence interval 1.01–1.09], P=0.02). Even after adjusting for illness burden, age, and number of primary care visits, the combined effect of these measures on glycemic control continued significant (odds ratio 1.05 [95% confidence interval 1.01–1.09], P=0.02) (25).

2.2.2 Socio-demographic related factors

According to a study conducted in Ethiopia, patients aged over 30–45 years had a 74% lower risk of poor glycemic control (OR = 0.26, 95 % CI 0.04–1.58) compared to patients aged 15–30 years (26). A long-term research managed in Ethiopia found that age significantly affects fasting blood sugar (FBS).This suggests that average FBS levels rise as age increases. The study also revealed that older patients have poorer glycemic control compared to younger patients (27).

Another cross-sectional study revealed a significant association between inadequate glycemic management (AOR = 3.12, 95% CI [1.53-6.35]) and lack of formal education (28). In a study conducted in Debre Tabor, it was found that diabetic patients who had completed college or higher

education were 5.7 times more likely to have good glycemic control compared to those who were unable to read and write (AOR = 5.7, 95% CI 2.9, 11.2) (29).

Sex has been identified as a factor that can predict glycemic control in various studies. Thus, the study conducted at Adama Medical College revealed that being male was associated with good glycemic control (AOR = 2.28, 95% CI [1.24-4.21]). (28). The study conducted in West Shewa indicated that being female (AOR = 2.4; 95%CI: 0.31, 0.816) was associated with poor glycemic control (30). From the AOR, being woman gender (AOR = 1.59, 95% CI 1.20–2.38, p = 0.041) was positively associated with poor glycemic control, as demonstrated study practiced in central Ethiopia (19). A family history of diabetes mellitus identified like significant predictor of inadequate glycemic management (29). Additionally, a patient's income level has also been found to be a significant predictor of poor glycemic control, with a monthly income of less than 136 USD (AOR = 2.14, 95% CI [1.17-3.91]) (28).

A study performed in Ethiopia showed the duration for diabetes (years) (B=0.133, standard error 0.050, p=0.012) is mainly associated with glycemic management. (12). A particular study conducted in Ethiopia, it was found that enclosing diabetes for more than seven years (AOR = 3.08, 95%CI = 1.33–7.16) significantly contributed to poor glycemic control (31). In a cross-sectional survey conducted in the Southwest, it was shown that individuals taking a combination of oral medication and insulin (AOR = 4.59, 95% CI 1.05–20.14) for those with inadequate medication adherence (AOR = 5.08, 95% CI 2.02–12.79) are statistically associated with inadequate glycemic management (17). Another cross-sectional survey conducted in central Ethiopia showed that a longer duration of diabetes was significantly linked to poor glycemic control (AOR = 2.72, 95%CI: 1.16–6.32). (15). Consistent with this research, the investigate conducted in northern regions of Ethiopia indicated that the average FBS levels of the patients were high at the beginning of the study. After the treatment began, the fasting FBS decreased gradually over time. This result indicates that patients who consistently follow their treatment can effectively monitor their blood sugar levels and increase their life expectancy (16). However, another study contradicted this result. It found that over time, patients experienced increasing difficulty in controlling their blood sugar levels, leading to hyperglycemia. (32).

Moreover, case-control investigation in southwestern Ethiopia demonstrated diabetes period of more year around seven [AOR = 3.08, 95%CI = 1.33–7.16] independently predicted poor glycemic control (31). Cross-sectional survey in Ethiopia revealed that a prolonged time of diabetes (AOR = 2.20, 95% CI 1.18–4.08) was significantly related with an higher likelihood of poor glycemic management (18). Again, the prolonged duration of diabetes is a significant diviner to poor glycemic management, as shown by a research conducted at central Ethiopia (15). Patients' place of residence significantly connected to glycemic control. A cross-sectional survey in northeast Ethiopia displayed that living in the countryside area (AOR = 2.61, 95% CI 1.37–4.96) is a important predictor of inadequate glycemic management (18).

Family record about diabetes mellitus became crucial factor to FBS. The average FBS was higher for patients with a family history of diabetes mellitus compared to those without (27).

In a longitudinal study conducted in northern Ethiopia, it was found that the average fasting blood sugar (FBS) levels evolved differently between patients with comorbidity and those without comorbidity. This indicates that patients with other comorbidities had poorly controlled blood sugar compared to patients without comorbidities. Patients with comorbid conditions found it challenging to achieve optimal glycemic goals (16). Another case-control investigation conducted in southwestern Ethiopia revealed that one of the primary factors contributing to inadequate glycemic control was multimorbidity (Adjusted odds ratio (AOR) = 2.56, 95% CI = 1.10–5.96) (31).

2.2.3 Nutritional-related factors

Patients with BMI > 30 were 0.56 times less likely to have poor glycemic control (AOR = 0.56, 95% CI 0.08–3.85) compared to those with BMI < 18.5 (26). Other investigation directed in Ethiopia consistently found waist-to-hip scale of 0.9 or higher for men and 0.85 or higher to females was associated with an adjusted odds ratio (AOR) of 3.52, with a 95% confidence interval (CI) of 1.23–10.11.) (31). Another study conducted in Ethiopia using hemoglobin levels indicated that HbA1 levels were significantly and positively associated with a lower body mass index (33). A pilot survey conducted in Malaysia among type 2 diabetes patients found that the likelihood of having poor glycemic control was 3.235 times higher (with a confidence interval of 1.043-10.397 and $P < 0.05$) among those with high-density lipoprotein cholesterol levels below the normal range.

Those individuals taking one or two types of oral anti-diabetic drugs had 19.9 (2.959-87.391) (P < 0.01) and 14.3 (2.647-77.500) (P < 0.01) higher odds of poor glycemic control, respectively, compared to those who were being treated with diet alone (34). A cross-sectional review performed in Ethiopia revealed being overweight (AOR = 2.60, 95% CI [1.32–5.1]) and obese (AOR = 3.5, 95% CI [1.44–8.21]), as well as chewing khat (AOR = 2.78, 95% CI [1.04–7.33]), were associated with increased odds of certain health conditions (28). A recent observational survey conducted in Ethiopia found that being overweight was allied through an adjusted odds ratio (AOR) 4.07 (95% confidence interval [CI] 1.60, 10.36; p = 0.003), while obesity was associated with an AOR of 4.39 (95% CI 1.59, 12.14; p = 0.004). Additionally, a greater assessed glomerular filtration rate (eGFR) was associated with an AOR of 2.34 (95% CI 1.23, 4.44; p = 0.010), and poor diet adherence was associated with an AOR of 6.95 (95% CI 3.63, 13.32; p < 0.001) (13).

2.2.4 Medication-related factors

Case-control research performed in southwestern Ethiopia demonstrated taking metformin and insulin [AOR = 9.22, 95%CI = 2.90–29.35] also insulin taking [AOR = 4.48, 95%CI = 1.52–13.16] were noteworthy predictors to poor glycemic control (31). Furthermore, one survey conducted in southwestern Ethiopia revealed that the composite of insulin medication and oral medication (AOR = 4.59, 95% CI 1.05–20.14) and poor medication adherence (AOR = 5.08, 95% CI 2.02–12.79) were exactly linked to inadequate glycemic control. (17). A study in northeastern Ethiopia found that patients along with diabetes taking oral anti-diabetics medication (AOR = 5.12, 95% CI 2.10–12.52) either insulin (AOR= 3.26, 95% CI 1.26–8.48) were more probably to have poor control. (18). Likewise, a cross-sectional survey executed in central parts of Ethiopia revealed that become on insulin therapy (AOR=3.01, 95% CI: 1.5–5.9) was a significant predictor to inadequate glucose management in Ethiopia. (15). A study piloted in Ethiopia found that not attaching for medications (AOR 5.82; 95% CI 2.77, 12.26; p < 0.001) was independently associated with poor glycemic control (13).

2.3 Conceptual framework

The conceptual framework was developed by analyzing various literature. A dashed line represents an indirect relationship between independent variables, while solid lines indicate independent variables directly influencing the outcome.

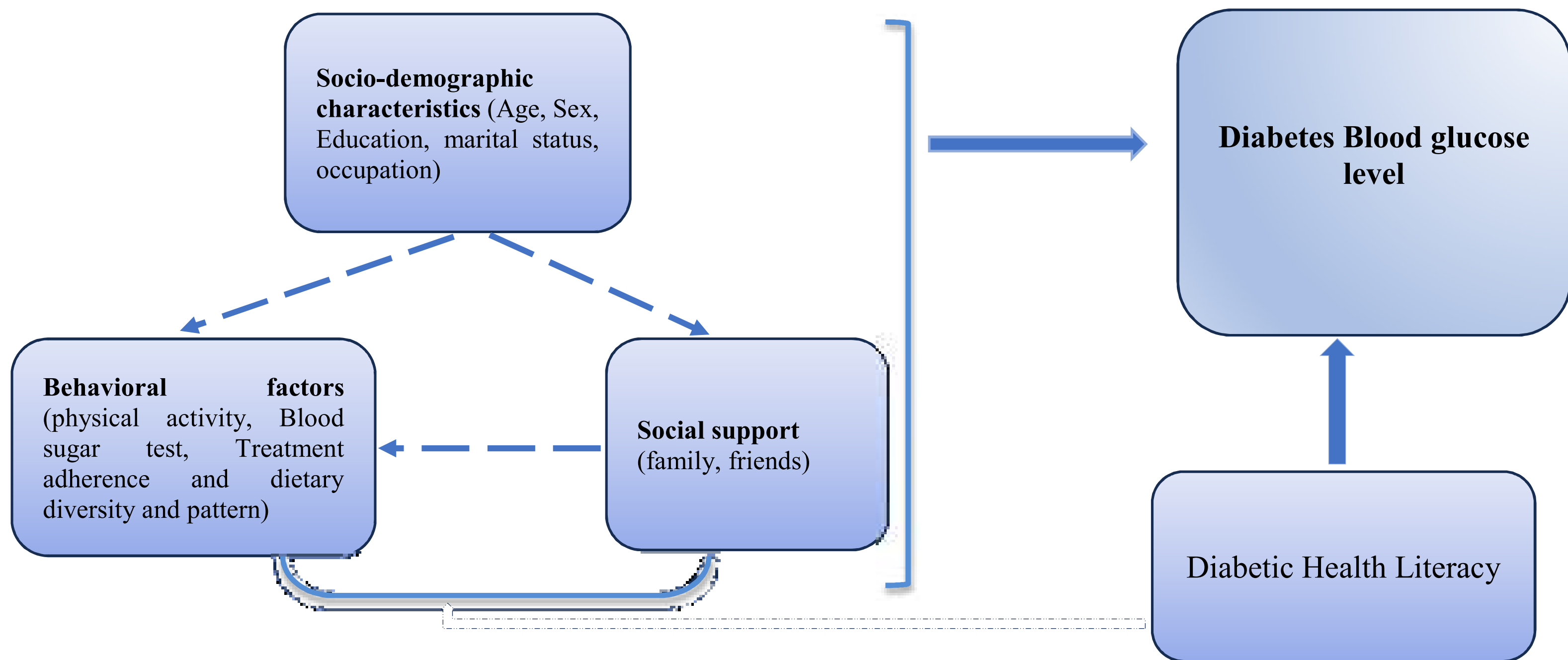

Figure 1. Association Between Health Literacy of Diabetes and Blood Glucose Control Among Patients with Diabetes at Public Health Facilities in Bishoftu, Ethiopia 2023/2024

Research questions

- ✔ Does Diabetes Health Literacy affect blood glucose control between patients with diabetes?

Research hypothesis

HO: There is no difference in Diabetes Health Literacy among patients with controlled and uncontrolled blood glucose level.

HA: There is difference in Diabetes Health Literacy among patients with controlled and uncontrolled blood glucose level.

3. Study objective

3.1 General objective

To assess the association between diabetes health literacy and blood glucose control, identify other socio-behavioral determinants of blood glucose levels among patients with diabetes at public health facilities in Bishoftu town, Oromia region, Ethiopia 2023/2024

3.2 Specific objective

- To assess the association between health literacy of diabetes and blood glucose control between patients with diabetes at public health facilities.
- To identify other socio-behavioral determinants affecting blood glucose levels among patients with diabetes at public health facilities at Bishoftu town, Oromia region, Ethiopia.

4. Methods and materials

4.1 Study setting and study period

Study took place at public health facilities in Bishoftu town, which is situated in the Oromia regional state, about 47.9 kilometers southeast of Addis Ababa. According to a household survey conducted by the city administration last year, the projected population size of the city was 245,544, with 125,673 males and 119,871 females. The town has six health centers and one hospital, and the study was carried out in two health centers (Bishoftu Health Center and Keta Health Center) and one hospital (Bishoftu General Hospital) (35).

Bishoftu General Hospital is one of the top-performing hospitals in Ethiopia. It provides comprehensive health services to three towns and five Woredas, serving around 2.4 million people in a catchment area of 3,600 square kilometers. The hospital sees a daily patient load of approximately 800 to 900. It has a total of 203 functional patient beds and more than 24 service delivery departments. The hospital provides diabetic chronic care to about 800 patients each month. Additionally, each health center, which has recently started offering chronic care services, attends to 30 diabetic patients month (36). The study was accomplished between January and February 2024.

4.2 Study design

We employed an unmatched case-control study to investigate the link within health literacy of diabetes level and blood glucose control. It also identified other socio-behavioral determinants of blood glucose levels among diabetes patients at public health facilities at Bishoftu town, Oromia region, Ethiopia.

4.3 Population

4.3.1 Source populations

All diabetes patients in Bishoftu town were source population.

4.3.2 Study population

All individual diabetic patients undergoing follow-up at Bishoftu General Hospital, Bishoftu, and Keta Health Centers throughout the data collection period.

4.4 Eligibility criteria

The study encompassed all adult individuals diagnosed with diabetes mellitus (DM) and with recorded blood glucose levels throughout the study period. Conversely, this study excluded diabetic patients by unknown diagnosis time, those who were severely ill and unable to communicate, and those who had never visited the health facility for three consecutive visits.

4.5 Sample size determination and sampling procedure

Sample size was calculated through online open-epi software (Open-Epi - Sample Size for Unmatched Case-Control Studies) taking the following assumptions, with CI - 95%, power 80%, ratio of control to case 1:3, and an effect size with OR = 2.21 (the odds of DHL between diabetic clients with controlled glycemic to odds of health literacy among diabetic patients with uncontrolled glycemic), proportion of DHL between diabetic patients with controlled blood glucose level was 23.67% and assuming the proportion of DHL between diabetic patients with uncontrolled blood glucose level will increase to 40.66% (21).

$$n_1 = \left(\frac{r+1}{r}\right)\frac{(p)(1-p)(z_\beta + z_{\alpha/2})^2}{(p_1-p_2)^2} \qquad p = \frac{p_1+rp_2}{1+r}$$

Were,

n_1 = number of cases required (i.e. $n_2 = rn_1$)

n_2 = number of controls required

r = ratio of controls to cases

z_α = 1.96 for 95% confidence level

z_β = 0.84 for 80% power

p_1 = proportion of exposure among cases

p_2 = proportion of exposure among controls

$p_1 - p_2$ = Meaningful difference (Minimum) in proportions among case and control groups

So,

The sample size will have 86 cases and 250 controls, and bearing in mind a 10% non-response rate, the latest calculated sample size was (94 cases and 276 controls).

4.6 Sampling methods

There are seven health facilities in Bishoftu town (one hospital and six health centers). Health facilities having chronic care were included. Thus, the study included three HF, one General hospital, and two HC providing chronic health care. The calculated cases and controls were proportionally allocated for three selected health facilities proportionally on one month of patient flow load.

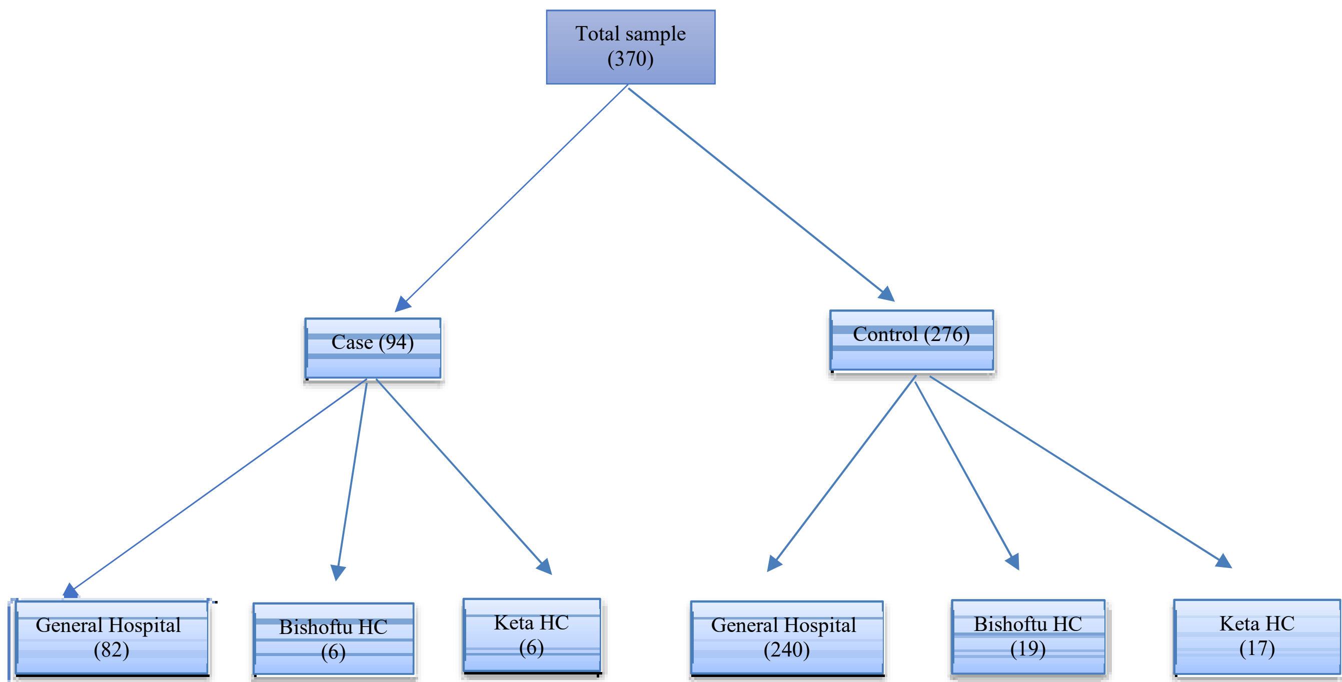

Figure 2. Proportional allocation of sample to each facility according to one month of patient flow load.

Diabetic patients with controlled and uncontrolled blood glucose were obtained from the patient chart. Cases were selected from diabetic patients with uncontrolled blood glucose using consecutive sampling techniques until the predetermined sample size was obtained. Controls were selected from diabetic patients with controlled blood glucose using systematic random sampling and selected by every 4th patient after cases were identified. The parameter K is obtained by dividing 772 by 276, which equals 2.79, approximately 3. If the recruited patient was not a control, then the next individual after that was selected.

4.6 Variables of the study

4.6.1 Outcome variables

- Blood glucose level control [Case/ Control]

4.6.2 Independent variable

- Diabetes health literacy

4.6.3 Covariates

- **Socio-demographic characteristics** (Age, Sex, marital status, Education, occupation)
- **Social support** (family, friends)
- **Nutritional factors** (dietary diversity and pattern)
- **Behavioral factors** (physical activity, Treatment adherence)

4.7 Data Collection Tools and Procedures

An interviewer-administered structured questionnaire and record review were conducted with both the cases and controls, and their medical records were also reviewed. The data collection tool was developed after an extensive review of relevant literature and was tailored to our specific context. The questionnaire consisted of five parts: socio-demographic information, diabetes health literacy, clinical information related to diabetes, patients' diet and physical activity, and treatment adherence. The questionnaire was originally prepared in English, translated into Amharic and Afan Oromo, and then translated back into English to ensure consistency. Two experienced data collectors, with at least a diploma in nursing or midwifery and not affiliated with any hospitals or health centers, were responsible for data collection. Cases and controls were identified based on their average blood glucose levels over three months, and were then interviewed using the standard questionnaire. Data was collected using the Kobo electronic data collection system, which was designed for the structured interview questionnaire and data extraction tool. The two data collectors, who were also supervisors, received one-day training on using Kobo with smartphones or tablets.

4.8 Quality Assurance

The checklist was tested on 5% of the study participants at Bishoftu General Hospital to ensure data quality. Modifications and corrections were made to standardize and ensure its validity. The data collectors and supervisor received one-day training on the purpose of the study, the data collection tool, data collection methods, and ethical concerns during data collection. The

supervisor, along with the principal investigator, monitored the data collection process. The principal investigator worked with the data collectors and supervisor to thoroughly review the electronic data at the end of each day. The data collected daily was sent to the server.

4.9 Data Processing and analysis

After entering, cleaning, coding, and analyzing the data using STATA version 17, the analysis was conducted in three stages. The first stage involved descriptive analysis with simple frequencies and cross-tabulations to examine the socio-demographic characteristics and independent variables between cases and controls. Bivariate analysis was then performed to assess the assosation between the significant independent variable (diabetic health literacy level) and the outcome variable. Subsequently, a binary logistic regression was used to analyze the data, including the independent variables (factors) and the dependent variable (Blood glucose level).

Finally, a multivariable binary logistic regression was fitted for the independent factors with a p-value < 0.25. The analysis findings were then interpreted using significant associations to explain the dependent variable ($p < 0.05$) with a 95% confidence interval. Multicollinearity were assessed using Variance Inflation Factor (VIF), which was found to be < 5.

4.10 Operational definitions

Blood glucose level: - Controlled blood glucose level: Between 70 mg/dl and 125mg/dl before meals and < 200 mg/dl after meals else they were considered as u**ncontrolled blood glucose level** (3)**.**

Diabetes health literacy: - 14-item FCCHL questions with 5-point Likert scales measured diabetic health literacy. Average score was calculated and changed to percentage (5 points as 100%) to decide the level of health literacy of diabetes in which based on the mean score, study subjects were classified for those who scored 75% and above into **High Health Literacy of Diabetes**, for those between 60–74% **Moderate Health Literacy of Diabetes**, and for those who scored less than 59% **Low Health Literacy of Diabetes** (21).

Treatment adherence: - The MMAS consists of four items with a scoring scheme of “YES” = 1 and “NO” =0. The items are summed to give a range of scores from 0-4 and finally, based on the scores, study subjects were categorized into **Good adherence** for those who scored 0 points,

Moderate Adherence to Medication for those who scored 1–2 points, and **Poor adherence** for those who scored 3–4 points (21).

Physical activity: - Participants who participated in at least 30 minutes of physical activity like walking, running, swimming, and yoga for three or more days or participated in specific exercise sessions during the last seven days were categorized as having adequate exercise. Otherwise, they were classified as having inadequate exercise habits (37).

Social support: -There are 3 items and each items consist 4,5 and 5 options. Whole score was calculated by add the raw scores for every item and sum of the raw scores then ranges from 3 to 14. Study subjects were classified into having **Strong support** for those who scored ≥12 points, **Moderate support** for those who scored 9–11 points, and **Poor support** for those who scored 3–8 points (38).

Nutritional factors (dietary diversity and pattern): - Study participants who followed the dietary plan on average three or more days in the last seven days were grouped as having adequate dietary diversity , and those who followed for < 3 days were classified as having inadequate dietary diversity plan (37).

Blood sugar test: - Participants who had regular blood sugar tests for three or more days in the last seven days were categorized as adequate blood sugar tests, and < 3 days were classified as inadequate blood sugar tests (37).

4.11 Ethical considerations

Ethical clearance was obtained from CHS, SPH's research and ethical review board. Formal letter of cooperation from the University was submitted to the hospital administrative body for data collection and Oromia RHB. Permission was obtained from all relevant bodies in the hospital and health centers. The data collector adequately informed the hospital's data clerks about the study's purpose, method, and anticipated benefits. Confidentiality was maintained by omitting their names and personal identification from the data collection format.

4.12 Dissemination of the results

The findings will be submitted to the School of Public Health at Addis Ababa University and Bishoftu Public Health Facilities. Additionally, the results will be published in local and international journals

5. Results

5.1 Socio-demographic characteristics of patients with diabetes

The average age (SD) to the cases and the controls were 48 (17.2) and 47 (17.3), respectively. Further assessment of age, older (age 50-49 years) people were available among cases than among controls (51.1% vs. 32.9%), (with a P-value of 0.002). 52 (55.3%) cases and 162(58.7%) controls were females. 58(61.7%) cases and 176 (63.8%) controls were married. Eighty-five (90.4%) cases and 247(89.5%) controls had urban residences. 45 (47.9%) cases and 93(48.2%) of the control's monthly income had 5000-50000 Ethiopian Birr (ETB). In this cross-tabulation there was no much difference in proportion of most of the socio-demographic and other factors between cases and controls except for age difference (Table 1).

Table 1. Descriptive statistics of socio-demographic characteristics of patients with diabetes at public health facilities in Bishoftu town, Oromia, Ethiopia 2023/2024

Variables		**Cases (n=94) n (%)**	**Controls (n=276) n (%)**	**P-value**
Sex	Female	52 (55.3)	162 (58.7)	0.567
	Male	42 (44.7)	114 (41.3)	
Age in years	18-49	46 (48.9)	185 (67.03)	0.002
	50-94	48 (51.1)	91 (32.9)	
Marital status	Married	58 (61.7)	176 (63.8)	0.720
	Single or Divorced, or Widowed	36 (38.3)	100 (36.2)	
Educational level	No education	20 (21.3)	53 (19.2)	0.859
	Primary school (Able to read and write)	28 (29.8)	76 (27.5)	
	Secondary school	26 (27.7)	77 (27.9)	
	Higher education	20 (21.3)	70 (25.4)	
Place of residence	Urban	85 (90.4)	247 (89.5)	0.797
	Rural	9 (9.6)	29 (10.5)	
Occupation	Student	7 (7.5)	31 (11.2)	0.400
	Self-employed or employed	46 (48.9)	136 (49.3)	
	Unemployed	6 (6.4)	12 (4.4)	
	Housewife	26 (27.7)	58 (21.01)	
	Retired	9 (9.6)	39 (14.1)	
Monthly income	1000-2000 ETB	18 (19.2)	42 (15.2)	0.629
	2001–5000 ETB	31 (32.9)	101 (36.6)	
	5000-50000 ETB	45 (47.9)	133 (48.2)	
DM information source	Health professionals	67 (71.3)	211 (76.5)	0.590
	Social media	25 (26.6)	61 (22.10)	
	others	2 (2.13)	4 (1.5)	
Internet use to find solutions to your disease	Yes	34 (36.2)	116 (42.03)	0.318
	No	60 (63.8)	160 (57.9)	

5.2 Health Literacy of Diabetes patients with diabetes

The study found that 43 (45.7%) cases and 109 (39.5%) controls had moderate diabetic health literacy, and 39 (41.5%) of cases and 85 (30.8%) controls had low diabetic health literacy (Figure 3).

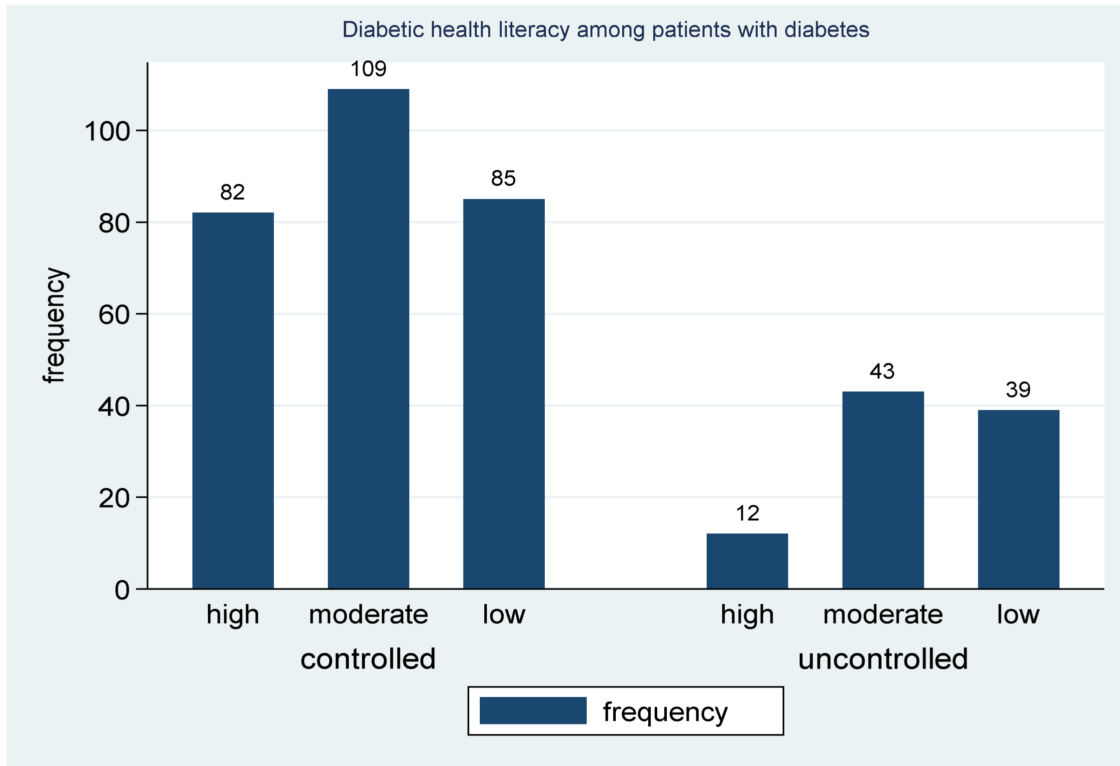

Figure 3. Bar graph on Health literacy of diabetes patients at public health facilities in Bishoftu town, Oromia, Ethiopia 2023/2024

5.3 Clinical information, treatment adherence, and social support level of patients with diabetes

Fifty-eight (61.7%) of cases and 167 (60.5%) controls had Type II diabetes. More than three fourth (93.6%) of cases and 261 (94.6%) of controls had regular followed up to the diabetic clinic. Regarding the treatment regimen, 48(50.1%) of cases and 141 (51.09) of controls were used as Oral hypoglycemic agents. Forty-five (47.9%) cases and 107 (38.8%) controls had no family history of diabetic patients. More than a third-fourth of the 86(91.5%) cases and 243(88.1%) of the controls had no drunk any alcohol. More than half, 50 (53.2%) of cases and 141(51.1%) of

controls had no received diabetic health education. It was found that an overwhelming majority of 244 (88.4%) of controls and 72 (76.6) of cases had good Treatment adherence. 64 cases (31.9%) and 105 controls (38.1%) of patients had blood sugar test more than three days per week (Table 2).

Table 2. Diabetes-related clinical information and treatment adherence of social support of patients with diabetes at public health facilities in Bishoftu town, Oromia, Ethiopia 2023/2024

Variables		**Cases (n=94) n (%)**	**Controls (n=276) n (%)**	**P-value**
Type of DM	T1 DM	36 (38.3)	109 (39.5)	0.838
	T2 DM	58 (61.7)	167 (60.5)	
Duration of diabetes	Short term 1–5 years	39 (41.5)	125 (45.3)	0.351
	Medium-term 6–10 years	26 (27.7)	64 (23.2)	
	Long term 10 years and more	29 (30.9)	87 (31.5)	
Had regular follow to the diabetic clinic	Yes	88 (93.6)	261 (94.6)	0.731
	No	6 (6.4)	15 (5.4)	
Comorbidity	Yes	28 (29.8)	98 (35.6)	0.302
	No	66 (70.2)	177 (64.4)	
Treatment regimen	Insulin injection	38 (40.4)	120 (43.5)	0.312
	Oral hypoglycemic agent	48 (51.06)	141 (51.09)	
	Both insulin & Oral hypoglycemic agent	7 (7.45)	15 (5.4)	
	Diet and exercise only	1 (1.06)	0	
Family history	Yes	30 (31.9)	106 (38.4)	0.296
	No	45 (47.9)	107 (38.8)	
	Not sure	19 (20.2)	63 (22.8)	
Diabetic health education received	Yes	44 (46.8)	135 (48.9)	0.724
	No	50 (53.2)	141 (51.1)	
Member of the Diabetic association	Yes	5 (5.3)	33 (11.9)	0.093
	No	54 (57.5)	164 (59.4)	
	Don't know about it	35 (37.2)	79 (28.6)	
Drunk Alcohol	Yes	8 (8.5)	33 (11.9)	0.358
	No	86 (91.5)	243 (88.1	
Smoke Cigarettes currently	Yes	1 (1.06)	0	0.086
	No	93 (98.4)	270 (100)	
BMI	Underweight <18.5	2 (2.1)	6 (2.2)	0.889
	Normal weight 18.5-24	55 (58.5)	151 (54.7)	
	Overweight 25-29	32 (34.1)	99 (35.9	
	Obese ≥30	5 (5.3)	20 (7.3)	
Treatment adherence	Good adherence	72 (76.6)	244 (88.4)	0.005
	Moderate Adherence	22 (23.4)	32 (11.6)	
	Poor adherence	0	0	
Blood sugar test (last seven days)	< 3 days	64 (68.1)	171 (61.9)	0.286
	≥ 3 days	30 (31.9)	105 (38.1)	

5.4 Behavioral factors of patients with diabetes

The majority of participants, 79 (84.1%) cases and 184 (66.7%) control patients engaged in physical exercise less than three days per month. Most cases (57.5%) and 174 controls (63.1%) of patients had a diet plan more than three days per week. Most of the respondents, 58 (61.7%) of the cases and 158 (57.3%) controls had moderate social support, and 17 of the cases and 64 controls had strong social support level. (Table 3).

Table 3. Diet, Physical activity, social support of patients at public health facilities in Bishoftu town, Oromia, Ethiopia 2023/2024

Variables		Cases (n=94) n (%)	Controls (n=276) n (%)	P-value
Dietary diversity and pattern (last seven days)	< 3 days	40 (42.6)	102 (36.9)	0.335
	≥ 3 days	54 (57.5)	174 (63.1)	
Physical activity (last seven days)	< 3 days	79 (84.1)	184 (66.7)	0.001
	≥ 3 days	15 (15.9)	92 (33.3)	
Social support	Strong support	17 (18.1)	64 (23.2)	0.581
	Moderate support	58 (61.7)	158 (57.3)	
	Poor support	19 (20.2)	54 (19.6)	

5.5 Association between Health Literacy of Diabetes and blood glucose control of patients with diabetes

This study on the link among health literacy of diabetes and glycemic control identified several factors associated with uncontrolled blood glucose in DM patients. In the bivariable binary logistic regression, the factors such as: diabetic health literacy, age, receipt of diabetic health education, source of DM information, dietary diversity, blood glucose testing, physical activity, and treatment adherence were nominees for the multivariable binary logistic regression. Three models were also fitted in this study, model one, after including only the eligible sociodemographic variables in the model, model two, which included all the factors mentioned in model 1 plus the eligible clinical factors, and model three, which included model 1 plus model II plus diet, physical activity, and social support. Finally, diabetic health literacy, age, physical activity and treatment adherence were statistically significant factors in the multivariable logistic analysis.

Diabetic patients with uncontrolled blood glucose levels were 4.7 times more likely to have an impact on low health literacy than patients with controlled blood glucose levels (AOR = 4.7, 95%CI: 2.16, 10.24) and 2.9 times more likely to have an impact on moderate health literacy than patients with controlled blood glucose levels (AOR = 2.9, 95%CI: 1.37, 6.02). In patients with

uncontrolled blood glucose, participants aged 50-94 years were 2.2 times more likely to be affected (AOR= 2.2, 95%CI: 1.28, 3.90) than patients with controlled blood glucose. Patients with uncontrolled blood glucose levels were 51% less likely to be physically active (AOR= 0.41, 95%CI: 0.21, 0.78). The likelihood of blood glucose levels being uncontrolled in DM patients decreased by 56% (AOR= 0.44, 95%CI: 0.22, 0.87) in patients who adhered well to their medication compared to the other patients (Table 4).

Table 4. Bivariable and Multivariable logistic regression analysis of the association between Health Literacy of Diabetes and blood glucose control among patients with diabetes at public health facilities in Bishoftu town, Oromia, Ethiopia 2023/2024

Variables	Glucose level		Crude OR (95%CI)	AOR (95%CI)	P-value
	Case	Control			
Diabetic health literacy					
Low	39	82	3.1 (1.53, 6.41)	4.7 (2.16, 10.24) *	0.000
Moderate	43	109	2.7 (1.34, 5.43)	2.9 (1.37, 6.02) *	0.005
High	12	82	**1**	**1**	
Age					
18-49	46	185	**1**	**1**	
50-94	48	91	2.1 (1.28, 3.90)	2.2 (1.28, 3.90) *	0.005
Source of DM information					
Social media	25	61	0.82 (0.14, 4.76)	0.96 (0.12, 7.35)	0.966
Health professionals	67	211	0.64 (0.11, 3.54)	0.42 (0.06, 3.09)	0.392
Others	2	4	**1**	**1**	
Diabetic health education					
Yes	44	135	0.92 (0.58, 1.47)	0.8 (0.47, 1.37)	0.424
No	50	141	**1**	**1**	
Social support level					
Poor	19	54	1.3 (0.63, 2.80)	1.1 (0.49, 2.54)	0.782
Moderate	58	158	1.4 (0.75, 2.55)	1.4 (0.74, 2.78)	0.286
Strong	17	64	**1**	**1**	
Dietary diversity/pattern					
< 3 days	40	102	**1**	**1**	
≥ 3 days	54	174	0.79 (0.49, 1.27)	0.82 (0.48, 1.39)	0.468
Physical activity					
< 3 days	79	184	**1**	**1**	
≥ 3 days	15	92	0.39 (0.21, 0.69)	0.41 (0.21, 0.78) *	0.007
Blood sugar test					
< 3 days	64	184	**1**	**1**	
≥ 3 days	30	92	0.76 (0.46, 1.25)	0.8 (0.46, 1.41)	0.443
Treatment adherence					
Moderate	22	32	**1**	**1**	
Good	72	244	0.43 (0.23, 0.78)	0.44 (0.22, 0.87) *	0.018

List variables on

Model i: diabetic health literacy, age, source of dm information.
Model ii: model i + diabetic health education, blood sugar test, treatment adherence
Model iii: model ii + social support level, dietary diversity/pattern, physical activity

6. Discussion

The aim of this research was to assess the Association between diabetes health literacy and blood glucose control level among diabetic patients. The study identified low and moderate diabetic health literacy, Age, physical exercise and treatment adherence as independent determinants of uncontrolled blood glucose level among diabetic individuals.

Diabetic patients who obtain low and moderate health literacy of diabetes were significantly associated with uncontrolled blood glucose level. The odds of diabetic patients with uncontrolled blood glucose levels were 4.7 times higher among low diabetic health literacy than those with high diabetic health literacy. Similarly, diabetic patient who had moderate DHL were about 2.9 times higher odds of impacting uncontrolled blood glucose level when compared with DHL. This is consistent with previous studies conducted in Ethiopia (21), Bangladesh (39), Iran (40) and Lebanon (41). Several key factors may explain the link between low health literacy in diabetics and uncontrolled blood glucose levels. Individuals with low health literacy may have limited knowledge and understanding of diabetes, including the importance of monitoring blood glucose levels, adherence to medication regimens, dietary changes, and exercise. In other respects, patients with low health literacy may find it difficult to understand medical instructions, interpret health care information, and communicate their concerns or questions effectively.

This study also identified age is a significant factor to influence uncontrolled blood glucose level. The odds of a higher age group (50–94) were 2.2 times higher risk of uncontrolled blood glucose level. This finding aligns with the study done in Ethiopia (42,43), Kigali (44) and Lebanon (41). This could be due to the fact that older patients have weaker self-management compared to younger patients, such as regular exercise, glucose testing, adherence to medication, and dietary changes. In contrast, similar study conducted in North West Ethiopia (45) and in Thailand (46) demonstrated that compared to the younger age group, older patients had better glycemic control. The discrepancy could be the result of variations in the study setting's cultural and social context, sociodemographic features, and sample size.

Another important factor identified as impacted on uncontrolled blood glucose level is physical activities. In this study diabetes patients with three or more days of physical activity had a 59% lower risk of having uncontrolled blood glucose level than those who did not practice frequently the finding aligns with the study conducted in Southern Ethiopia (21,31,43,45,47) and in Libya

(48). This might be because muscles that are in a state of activity use more glucose than muscles that are at rest, and increased blood flow to these muscles increases the number of insulin receptors in these muscles, which in turn increases insulin sensitivity. Exercise also reduces plasma norepinephrine, bad cholesterol, and central obesity, which all contribute to a drop in serum glucose levels. During follow-up, effective instruction on the importances of exercise programs and adherence to exercise regimens should be given (45).

Treatment adherence is a critical aspect of diabetes management that significantly impacts the effectiveness of therapy, disease progression, and overall health outcomes for individuals with diabetes. In the current study, patients who have good adherence were 56 % decreased uncontrolled blood glucose level than those with low treatment adherence. The finding is supported by a previous study in Ethiopia (45,49). This could be because the patient is at risk of excessive blood glucose levels if anti-diabetes medicine is not taken as prescribed. This could happen because the liver produces more glucose, beta cells secrete less insulin, or the skeletal muscles absorb less glucose. The implementation of effective educational and behavioral intervention programs on medication adherence is necessary to address medication adherence hurdles and achieve adequate glycemic control (50).

7. Strengths and Limitations

This study used ODK tools for data collection technique so that these tools ensure the validity and accuracy of the data collected. The use of a case-control study is also an advantage of the study over a cross-sectional study. The study's use of specific public health facilities in Bishoftu town for participant recruitment may introduce sampling bias. Case Control design limits the ability to establish causal relationships between diabetic health literacy and blood glucose control. Reliance on self-reported data for variables such as health literacy, medication adherence, and physical activity may introduce recall bias and social desirability bias. Participants may provide responses that they perceive as socially acceptable or that align with their healthcare providers' expectations, potentially affecting the accuracy of the data. The study's focus on a specific geographic location and healthcare setting may limit the generalizability of the findings to other populations or settings.

8. Conclusion

The study conducted on the link among health literacy of diabetes and blood glucose control levels among diabetic patients was identified several factors such as low and moderate diabetic health literacy, good adherence to treatment, engagement in physical activities and older age, were associated in achieving the target of blood glucose level control. The study results can contribute to capacity building efforts among healthcare professionals through enhancing knowledge of health literacy in diabetes care. Training programs can be developed to enhance healthcare providers' knowledge and skills in addressing health literacy issues and supporting patients in achieving optimal blood glucose control.

9. Recommendation

Ministry of health to prioritize diabetes care, promote health literacy initiatives, and support comprehensive diabetes management programs. The Ministry of Health can work towards integrating diabetes prevention, screening, treatment, and education into national healthcare policies and strategies.

For health facilities to improve diabetic health literacy and encourage better blood glucose control among diabetic patients perform regular assessments of patients health literacy levels using validated tools to identify gaps and modify educational interventions accordingly. Create educational materials in multiple languages and formats to provide to diverse patient populations and set up structured diabetes education programs led by healthcare professionals. Establish a system for regular follow-up appointments to assess patients progress, reinforce learning, and address any barriers to adherence.

For future researcher interested in further exploring link among health literacy of diabetes and blood glucose control between patients with diabetes, especially in the context of public health facilities in Ethiopia, the following recommendations can be considered:

Conduct longitudinal studies to examine the long-term impact of diabetic health literacy on blood glucose control among patients with diabetes. Longitudinal research can provide insights into the causal relationships between health literacy, self-management behaviors, and glycemic outcomes over time.

Supplement quantitative studies with qualitative research methods to gain a deeper understanding of the lived experiences, perceptions, and challenges faced by individuals with diabetes in managing their health literacy and blood glucose levels. Qualitative research can uncover nuanced factors influencing diabetes care.

Design and implement intervention studies that evaluate the effectiveness of health literacy interventions, educational programs, and behavioral interventions on improving blood glucose control among patients with diabetes. Intervention research can inform evidence-based strategies for diabetes management.

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Appendixes

ANNEX I**:** Consent form and information sheet

Good morning/Good afternoon

My name is ______________________ member of this research and I will tell you about the research briefly.

Purpose of the research project: This research will help us to assess the association between diabetic health literacy and blood glucose control among patients with diabetes based on your answer to this question.

Procedures: You are randomly selected to participate in this study because you are currently on diabetes follow-up in this facility. If you agree to participate in this study, you will be asked to answer some questions about yourself and the knowledge you have about diabetes and its association factors.

Benefits: There might not be a direct benefit to you, or you will not be given any incentives or payments to take part in this study, but the result of this study will help us as an input to identify factors that predispose to poor glycemic control.

Risk: By participating in this study, there are no anticipated social and physical risks, but it might take 10-15 minutes for the interview.

Confidentiality: The information collected for this research project will be kept confidential and stored in a file without your name. But a code number will be assigned to it. In addition, it will not be exposed to anyone except the investigator.

The right to refusal: Your participation is voluntary, and if you feel discomfort in the interview, please feel free to drop it any time you want. You are willing to refuse or decide to withdraw later, you will not be subjected to any ill-treatment.

Contacts and questions: If you have any questions about the study, please ask me now**.** If you have questions or complaints later or want additional information, contact the investigator based on the address provided below.

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ANNEX II: Extraction tool on association of diabetes health literacy and blood glucose level

As I have told you, your answers to the questions will not be shared with anyone else, and no reports of this study ever identify you in any way. Therefore, I am asking for your willingness to participate.

Are you volunteering to participate in this study?

1. Yes 2. No

Thank you!!

If the study subject agrees to participate, start the interview.

Respondent's signature ____________Date ________________

If she/ he doesn't agree, thank her/him and go to the next respondent by writing the reason why not volunteer.

Checked by:

Supervisor's name _______________________ Signature ____________

The ID of the Patient ___________________

Date _______ ______ ________ E.C

Interviewer; Code, ____ Name ______________ Signature _____________

Date of interview ___________ time started _________Time completed __________

1. English version

Instruction: Extract the blood glucose level from the chart

Average FBS level of the last three consecutive months	FBS ________________mg/dl

Part I: - Sociodemographic-related information on patients

Instruction: These are questions regarding the socio-demographic information of participants

No	Variable	Response	Skip to
1	Age	____ yrs.	
2	Sex	1.Male 2.Female	
3	Marital status	1.Single 2.Married 3.Divorced 4.Widowed	
4	What is the highest educational level you completed?	1.Unable to read and write 2.Able to read and write 3.elementary school 4.secondary school 5.college and above	
5	What is your current occupation?	1. Student 2. Self-employed 3. Employed 4. Unemployed 5. Housewife 6. Other specify…	
6	Place of residence	1. Urban 2. Rural	
7	How much is your monthly Income?	____ ETB	
8	From which source do you get diabetic-related health information?	1. Family or friends 2. Social media 3. Mass media 4. Health professionals 5. Diabetes patients 5. Newsletters or leaflets 6. Books 7. Others specify____	
9	Do you use the internet to find solutions to your disease?	1. Yes 2. No	

Part II: Questions concerning diabetic health literacy of patients

Instruction: These are questions regarding diabetic health literacy of diabetic patients

No	Questions	Response				
		1.Strongly disagree	2.Disagree	3.Not sure	4.Agree	5.Strongly agree
1.When reading instructions or leaflets from hospitals or pharmacies, how do you agree or disagree about the following?						
1.	You find characters that you cannot read	1	2	3	4	5
2.	You find that the print was too small to read (even if you wear glass)	1	2	3	4	5
3.	You feel the content was too difficult for you to understand	1	2	3	4	5
4.	It takes you a long time to read them	1	2	3	4	5
5.	You need someone to help you to read them	1	2	3	4	5
2.Since you are diagnosed as having diabetes Mellitus, have you had the following experiences in seeking information related to diabetes (e.g., diagnosis, treatment, self-care issues, alternative therapy, etc.)?						
6	You collect information from various sources	1	2	3	4	5
7	You extract the information you wanted	1	2	3	4	5
8	You understand the information that you obtained	1	2	3	4	5
9	You tell your opinion about your illness to your doctors, families or friends	1	2	3	4	5
10	You apply the obtained information to your daily life	1	2	3	4	5
3.Since you are diagnosed as having Diabetes Mellitus, you can obtain information about diabetes and its treatment, how do you agree or disagree about the following?						
11	You consider whether the information applies to you or not	1	2	3	4	5
12	You consider whether the information is credible	1	2	3	4	5
13	You checked whether the information is valid and reliable	1	2	3	4	5
14	You collect information to make your health care decisions	1	2	3	4	5

Part III: Diabetic related clinical information of patients

Instruction: These are questions regarding diabetic related clinical information of patients, please encircle the answer they responded to space provided.

No	**Variable**	**Response**	**Skip to**
1	Type of diabetes Mellitus	1.Type 1 DM 2.Type 2 DM	
2	How long it had been since you were diagnosed with diabetes?	__ years	
3	Does the participant had regular follow to the diabetic clinic as per schedule within the previous 6 months?	1.Yes 2.No	
4	Do you have Comorbidities?	1.Yes 2.No	If No go to Q6
5	If yes, what type of comorbidity do you have?	1.Hypertension 2.Nerve problem 3.kidney disease 4.Heart problem 5.Other(specify)______	
6	What treatment regimen currently you are using?	1.Diet and exercise only 2.Oral hypoglycemic agent 3.Insulin 4.Insulin+ oral hypoglycemic agent	
7	Do you have family member having Diabetes Mellitus?	1.Yes 2.No 3.Not sure	
8	Have you received diabetic education?	1.Yes 2.No	
9	How many people are so close to you that you can count on them if you have great personal problems?	1.‘none’ 2.‘1–2’ 3.‘3–5’ 4.‘5+	
10	How much interest and concern do people show in what you do?	1.‘none’ 2.‘little’ 3.‘uncertain’ 4.‘some’ 5.’a lot’	
11	How easy is it to get practical help from neighbors if you should need it?	1.‘very difficult’ 2.‘difficult’ 3.‘possible’ 4.‘easy’ 5.’very easy’	
12	Do you have drink alcohol in the past one year?	1. Yes 2.No	If No go to Q14
13	How many times do you consume alcohol?	1.Up to 4 times per month ‘ 2.More than 4 times per week	
14	Do you smoke cigarettes currently	1.Yes How many cigarettes did you smoke on an average day? Number of cigarettes: ____ 2.No	
15	Weight and height	1.weight_____________kg 2.height_____________cm 3. BMI ____________kg/m^2	

Part IV: Questions concerning diabetic Self-care practice

Instruction: The questions below ask you about your diabetes self-care activities during the past seven days.

No	Variable	Response							
		Days							
1	How many of the last SEVEN DAYS have you followed a healthful eating plan?	0	1	2	3	4	5	6	7
2	How many of the last SEVEN DAYS did you eat fruits and vegetables?	0	1	2	3	4	5	6	7
3	How many of the last SEVEN DAYS did you eat high fat foods such as red meat or full fat dairy products?	0	1	2	3	4	5	6	7
4	On how many of the last seven days did you participate in at least 30 minutes of physical activity?	0	1	2	3	4	5	6	7
5	On how many of the last seven days did you participate in a specific exercise session (such as swimming, walking, and biking) other than what you do around the house or as part of your work?	0	1	2	3	4	5	6	7
6	On how many of the last SEVEN DAYS did you test your blood sugar?	0	1	2	3	4	5	6	7

Part V: Questions concerning treatment adherence of patients

Instruction: The questions below ask you about your treatment adherence

No	Variable	Response
1	Do you ever forget to take your (name of health condition) medicine?	1.Yes 2.No
2	Do you ever have problems remembering to take your (name of health condition) medication?	1.Yes 2.No
3	When you feel better, do you sometimes stop taking your (name of health condition) medicine?	1.Yes 2.No
4	Sometimes if you feel worse when you take your (name of health condition) medicine, do you stop taking it?	1.Yes 2.No

2. Amharic version

ተ.ቁ	**ጥያቄ**	ምላሽ	
1	እድሜ	_____	
2	ፆታ	1.ውንድ 2.ሴት	
3	የትዳር ሁኔታ	1 ያላገባ 2 ያገባ 3 የተፈታ 4 ባል/ሚስት የሞተባቸው	
4	የትምህርት ደረጃ ምን ያህል ነው	1.ማንበድ መፃፍ የማይችል 2.ማንበብ መፃፍ ይሚችል 3.የመጀመሪያ ደረጃ ትምህርት ቤት 4.ሁለተኛ ደረጃ ትምህርት ቤት 5.ኮሌጅ እና ከዚያ በላይ	
5	አሁን ላይ ምን የሚሰሩት	1 ተማሪ 2 የግል ስራ 3 ሰራተኛ 4 ስራ ይሌለው 5 የቤት እመቤት 6 የተለየ	
6	መኖሪያ ቤቶት	1 ከተማ 2 ገጠር	
7	የውር ገቢዎ ምን ያህል ነው	---ብር	
8	ስለስኮር በሽታ መረጃ ከይት ነው ይሚያገኙት	1 ከቤተሰብ ውይም ከጎደኛ 2 የተለያዩ ማህበራዊ ትስስር ገፅ 3 ከህክምና በለሞያዎች 4 ከስኮር ታማሚዎች 5 ከጋዜጣና ከበራሪ ወረቀቶች 6 መፀሀፍ 7 የተለየ	
9	ስለበሽታዎ ለማወቅ ኢንተርኔት ይጠቀማሉ	1 አዎ 2 አይደለም	

ክፍል አንድ፡ የተሳታፊ የማህበራዊ እና ኢኮኖሚያዊ ሁኔታ

ክፍል ሁለት: - ከዚህ በታች ያሉ ጥያቄዎች ስለ ስኳር ህመም የጤና እውቀት ይጠይቁዎታል

እነዚህ የታካሚዎችን የስኳር በሽታ ጤና እውቀትን የሚመለከቱ ጥያቄዎች ናቸው

ተ. ቁ	ጥያቄ	መልስ				
1.	1.ከጤና ተቋማት ወይም ከፋርማሲዎች መመሪያዎችን ወይም በራሪ ፅሁፎችን በሚያነቡበት ጊዜ በሚከተሉት ላይ እንዴት ይስማማሉ ወይም አይስማሙም(1. በፅኑ አልስማማም, 2. አልስማማም, 3. እርግጠኛ አይደለሁም, 4. እስማማለሁ, 5. በፅኑ እስማማለሁ)					
1	ማንበብ የማይችሏቸውን ፅሁፎች ያገኛሉ?	1	2	3	4	5
2	ህትመቱን ለማንበብ በጣም ትንሽ ሆኖ አግኝተውታል (መነፅር አድርገውም እንኳን)	1	2	3	4	5
3	ይዘቱን ለመረዳት ለእርስዎ በጣም ከባድ እንደሆነ ይሰማዎታል	1	2	3	4	5
4	እነሱን ለማንበብ ረጅም ጊዜ ይወስድብዎታል	1	2	3	4	5
5	እነሱን ለማንበብ የሚረዳዎት ሰው ያስፈልግዎታል	1	2	3	4	5
2.	የስኳር በሽታ እንዳለብዎ ስለሚታወቅ ከስኳር በሽታ ጋር የተያያዙ መረጃዎችን(ለምሳሌ ምርመራ፣ሕክምና፣ራስን መንከባከብ፣አማራጭ ህክምና ወዘተ በመፈለግ ረገድ የሚከተሉት ተሞክሮዎች አጋጥምዎታል(1. በፅኑ አልስማማም, 2. አልስማማም, 3. እርግጠኛ አይደለሁም, 4. እስማማለሁ, 5. በፅኑ እስማማለሁ)					
6	ከተለያዩ ምንጮች መረጃዎችን ይሰበስባሉ?	1	2	3	4	5
7	የሚፈልጉትን መረጃ በሚገባ ይመርጣሉ?	1	2	3	4	5
8	ያገኙትን መረጃ ተረድተዋል?	1	2	3	4	5
9	ስለህመምዎ ያለዎትን አስተያየት ለሀኪምዎ፣ቤተሰብዎ ወይም ጓደኛዎ ይናገራሉ?	1	2	3	4	5
10	ያገኙትን መረጃ ለዕለት ተዕለት ሕይወትዎ ተግባራዊ ያደርጋሉ?	1	2	3	4	5
3.	የስኳር በሽታ እንዳለብዎ ስለሚታወቅ ስለ ስኳር በሽታ እና ስለ ህክምናው መረጃ ማግኘት ይችላሉ? በሚከተሉት ላይ እንዴት ይስማማሉ ወይም አይስማሙም(1. በፅኑ አልስማማም, 2. አልስማማም, 3. እርግጠኛ አይደለሁም, 4. እስማማለሁ,5.በፅኑ እስማማለሁ)					
11	መረጃው ለእርስዎ ተፈፃሚ መሆኑን ያስባሉ?	1	2	3	4	5
12	መረጃው ታማኝ እንደሆነ ግምት ውስጥ ያስገባሉ?	1	2	3	4	5
13	መረጃው ትክክለኛ እና አስተማማኝ ነው የሚለውን አረጋግጠዋል?	1	2	3	4	5
14	የጤና እንክብካቤ ውሳኔዎች ለማድረግ መረጃ ይሰበስባሉ?	1	2	3	4	5

ክፍል ሶስት:- የታካሚዎች የስኳር በሽታ ክሊኒካዊ መረጃ

ተ.ቁ		ምላሽ	
1	ምን አይነት የስኳር በሽታ ዓይነት አለቦኽ?	1 አይነት አንድ 2 አይነት ሁለት	
2	የስኮርበሽታ እነዳለቦት ከታወቀ በኃላ ምን ያህል ቆይተዋል	------አመት	
3	ተጎዳኝ በሽታ አለቦት	1 አዎ 2 አይደለም	
4	ዘዎ ከሆነ ምን አይነት በሽታ	1 የደም ግፊት 2 የነረትብ በሽታ 3የኩላሊት 4 የልብ እግር 5 ሌሎች	
5	በአሁኑ ግዜ ምን አይነት ህክምና እየተጠቀሙ ነው	1 የአመጋገብና የአካል ብቃት እምቅስቃሴ 2 የአፍ ውስጥ hypoglycemic መድሃኒት 3ኢንሱሊን 4 ኢንሱሊን እና የአፍ ውስጥ hypoglycemic መድሃኒት	
6	የስኮር በሽታ ያለበት የቤተሰብ አባል አለ	1 አው 2 አይደለም 3 እርግጠኛ አይደለሁም	
7	የስኮር በሽታ ትምህርት አግኝተዋል	1 አው 2 አይደለም	
8	የስኮር በሽታ ማህበር አባል ኖት	1 አው 2 አይደለም 3 ምንም አላውቅም	
9	ችግር ባገጠሞት ሰዓት ምን ያህል ሰዎች ይደርስሎታል	1 ይለም 2 1-2 3 3-5 4 5+	
10	ሰዎእ ለርሶ ምን ያህል ፍላጎት እና አሳቢነት ያሳያሉ	1 የለም 2 በጥቂ 3 እርግጠኛ ያልሆነ 4 አንዳንድ 5 ብዙ	
11	ካስፈለገ ከጎረቤት ተግባራዊ እረዳታ ማግኛት ምን ያህል ቀላል ነው	1 በጣም ከባድ 2ከባድ 3 ይቻላል 4 ቀላል 5 በጣም ቀላል	
12	ባለፉት አንደ አመታት አልኮል ጠጥተዋል	1 አዎ 2 አይደለም	

13	ምን ያህል ግዜ አልኮል ጠጥተዋል	1 2	
14	ባለፉት 7 ቀናት ውስጥ ሲጋራ አጭሰሀል	1 አዎ 2 አይደለም	
15	ክብደት እና ቁመት	ክብደት ቁመት BMI	

ክፍል አራት:- የታካሚዎችን አመጋገብ እና አካላዊ እንቅስቃሴን የሚመለከቱ ጥያቄዎች

4.1 **አመጋገብ**									
1	ባለፉት ሰባት ቀናት ዉስጥ ለምን ያህል ቀን የአመጋገብ እቅድዎን ተገበሩት?	0	1	2	3	4	5	6	7
2	ባለፉት ሰባት ቀናት ዉስጥ ለምን ያህል ቀን ፍራፍሬና አትክልቶችን ተመግበዋል?	0	1	2	3	4	5	6	7
3	ባለፉት ሰባት ቀናት ዉስጥ ለምን ያህል ቀን ቀይ ስጋ ወይም የወተት ተዋፅዖዎችን ተመገቡ?	0	1	2	3	4	5	6	7
4	ባለፉት ሰባት ቀናት ዉስጥ ለምን ያህል ቀን አካላዊ እንቅስቃሴ አድርገዋል (የእግር ጉዞን ጨምሮ)	0	1	2	3	4	5	6	7
5	ከመደበኛ ስራዎ ውጪ ባለፉት ሰባት ቀናት ዉስጥ ለምን ያህል ቀን ውሃ ዋና ወይም ብስክሌት ነዱ	0	1	2	3	4	5	6	7
6	ባለፉት ሰባት ቀናት ውስጥ በደምህ ውስጥ ያለውን ስኳር ምን ያህል ተለ?	0	1	2	3	4	5	6	7

ክፍል አምስት :- የታካሚዎችን መድሃኒት አያያዝ በተመለከተ ጥያቄዎች

ተ.ቁ		ምላሽ
1	መዳኒትህን መውሰድ ረስተህ ታውቃለህ	1 አዎ 2 አይደለም
2	መዳኒትህን አስታውሰህ ለማስሳድ ምን አይነት ችግር አለ	1 አዎ 2 አይደለም
3	ሲሻልህ ውይም ሳያምክ ሲቀር መዳኒትህን ማውሰድ ታቆማለህ	1 አዎ 2 አይደለም
4	መዳኒቱን እየወሰድክ ህመሙ ከበዛብህ መዳኒቱን ተቆማለህ	1 አዎ 2 አይደለም

3. Oromic language

Gaaffii Afaan Oromoo

Kutaa Tokko: Gaaffii Namumaa ilalatu

Qajeelfama 1. Gaafiileen kun waa'ee haawaasumaa ilaallata. maaloo tokko tokkoon waanin isiniif dubiisu sirnaan na caqasaa, sanaan booda deebii ykn yaada sirrii naaff kennaa.

T.Lakk	Gaffii	Deebbii	Darbi
1	Umuriin kee meqaa?	……….	
2	Saala	1. Dhiira 2. Dhalaa	
3	Ga'illi kee akkam?	1.Heerumera/ Fudhera 2.hin heerumine/ fuune 3. kan irraa du'ee 4. adda baaneera 5. Wal hikneera	
4	Sadarkaan barumsa kee hangam?	1.Baruumsa hin baranne 2.kan dubbisuu fi barreesuu danda'u 3.Sadarkaa tokkoffaa 4.Sadarkaa lamaffaa 5.Sadarkaa kolleejii fi isaa ol	
5	Hojjiin kee maalii?	1. Barataa 2. Hojii dhunfaa 3. hojjataa mootummaa 4. hin qacaramne 5. giiftii manaa 6.Kan biraa (ibsi)	
6	Iddoo jireenyaa	1 .Magaalaa 2. Baadiyyaa	
7	Galii Giddu-galeessa maatii qarshiidhaan	qarshii	
8	Odeefannoo fayyaa essa arkattu?	1. maatii ykn hiriyoottan irraa 2. maas miidiyaa 3. oogeysoota fayyaa irraa 4. dhukkubsattoota dhibee sukaaraa irrraa 5. xalayaalee odeefannoo ykn xalayaa dadeebituu 6. kitaaboota 7. kan biraa(ibsi)…………….	

9	Dhibee keessaniif furmaata arkachuu intarneetii ni fayyadamtuu?	1. eyyee 2. hin fayyadamuu	

Kuutaa lamaf፦ odeefannoo dandeetti dubbisu, barufii barsiisu wa'ee dhibee sukkaaraa

Qajeelfama 2-gaafin kun dandeetti dubbisu, barufii barsiisuu wa'ee dhibee sukkaaraa, dhukubsattoota dhibee sukkaaraatin deebifamudha! Maaloo akkaata tartiba lakkofsa armaan gadii irratii hundaa'uudhaan, waan an isiniif dubbisu xiyyeefannoon dhageefachuudhaan akkaataa barbaachisummaa isaatiin deebii sirrii ta'ee naaf deebistu.

	Gaafii	Deebii filannoo				
1. Qajeelfamoota ykn xalayaa barartuu hoospitaalootaa ykn dukaanoota qorichaa yeroo duubistan kan armaan gadii kana irratii akkamitti wali-galtu ykn wali-hin galee?						
		1.Cimsee walii hin galu	2.Wali hin galu	3.Mirkanaa'aa miti	4.Walii galuu	5.Cimsee walii gala
	Jechoota ykn quubeewan duubisuhin dandeenyee ni Arkituu					
	Maxansi maxansamee bayyee xixiqqaa ta'ee dubisuuf isiin rakiisee beekaa (fullee ijaa fayyadamtan illee)					
	Yaadoonii maxansa keessa jiru hubachuuf bayyee ulfaata ta'e akka jiru isinitti dhagahaamaa					
	Isaan sana dubisudhaaf yeroo dheeraa isinitti fudhataa					
	Isaan kana dubisuuf nama isiin gargaaruu ni barbaaduu					
2.Dhibee sukkaaraa akka qabdan erga qoratamtanii beektan booda, Odeefannoo dhibee sukkaaraa wajiin wal qabatee barbaaduuf kan armaan gadii rawattanii beektuu?(						
	Madda addaa addaa irraa ni Sasaabduu					
	Kan sasaabdaan keessa kan barbaaddan ni baastuu					
	Odeefannoo argattan Hubattanirtuu					
	Waa'ee dhibee keessanii Dooktaroota, maatiifii hiriyoota keessaniif yaada keessan ni Qodduufii					
	Odeefannoo arkattan jireenya guyyaa guyyaa keessan irratti hojittii ni hiktuu					
3. dhuukubsattoonni dhibee suukkaaraa dibicha akka qaban,wa'ee dhibee sukkaaraa fi waa'ee odeefannoo yaalichaa akka argachuu danda'aan akkaataa armaan gadii kana akkamitti wali- galtu ykn wali-hin galee?						
	Jechoota ykn quubeewan duubisuhin dandeenyee ni Arkituu					
	Maxansi maxansamee bayyee xixiqqaa ta'ee dubisuuf isiin rakiisee beekaa (fullee ijaa fayyadamtan illee)					
	Yaadoonii maxansa keessa jiru hin qabnee ta'uu isaa nimirkaneessituu					
	Kunuunsa fayyaa kessan murtee goodhachuuf odeefannoo ni Sasaabduu					

Kutaa **saddi**: Gaaffilee Fayyaa ilaallatu

Qajeelfama 3. Gaafiileen kun haala dhibe sukkaaraa dhibamtoota dhibee sukkaaraa ilaallata. maaloo tokko tokkoon waanin isiniif dubiisu sirnaan na caqasaa, sanaan booda deebii ykn filannoo sirrii naa`ff kennaa.

T.Lakk	Gaaffi	Deebbi	
201	Gosa Dhukkuba Sukkara	1. Gosa tokkoffaa 2. Gosa lamaffaa 3. hin beeku	
202	Dhibichii waggaa meeqaaf isinirra ture?	Waggaa_____________________	
203	Dhokkuba dabalata	1.Yes Eeyyee 2.No lakki 3. don't know Hin beeku	
204	Gaafii lakk. 204 tiif Yoo deebiin kessan Eeyyeen ta'e dhibee kam qabdu?	1.dhibaa dhigaa olka'aa 2.rakkoo narvii 3.dhukkuba kalee 4.rakkoo onnee 5. kan biraa(ibsi) __________________________________.	
205	Yeroo amma koricha fayyadamittu	1. marfeedha 2. kan liqimifamu 3. lamanuu isa 4. koricha hin fudhadhu	
206	Maatii kee kessa kan dhibee sukkaaraa dhukubsatte beeku jira	1.Eeyyee 2.Lakki 3. Hin beeku	
207	Barumsa dhukkuba sukara barate bekta?	1. Gonkuma 2. Eeyyee darbee darbee 3. Eeyyee yeroo hunda	
208	Miseensa Waldaa dhibee sukkaaraa kessa qabda?	1. Eeyyee 2. Lakki 3. Waldaan dhibee sukkaaraa jirachu hin beeku	
209	Osoo atii rakkoo cimaa keessa seente namoota hagamiitu siiti dhihoo fi na gargaara jeette itti of abdachuu dandeessaa?	1. Hin jiru 2. 1-2 3. 3-5 4. 5 ol	
210	Naamootni waan ati hojjeettu irratti feedhii fi hubannoon isaan qaban hagami?	1. Hin jiru 2. Xiqqaadha 3. Murtaa'aa miti 4. Murtaa'adha 5. Baay'eedha	
211	Gargaarsa qabatamaa ta'ee yoo barbaaddee olla irraa argachuun hagam salphaadha jette yaaddaa?	1. Baay'ee ulfaatadha 2. Ullfaatadha 3. Ni danda'ama 4. Salphaadhaa 5. Baay'ee salphaadha	

212	Waggaa tokko darbe kesssatti dhugaatii alkoolii dhugdee beektaa?	1. Eeyye 2. Lakkii	Yoo deebiin kee lakkii ta'eera ta'e gara gaafii 217 tti darbi.
213	Yeroo hagamiitiif dhugaatii alkoolii dhugdee ?	1. Ji'a keessaatti hanga yeroo afuriif (4) 2. Torbee keessatti yeroo afurii (4) ol	
214	Guyyoota turban darbee keessatti yeroo tokkoofillee yoo ta'e tamboo xuuxxee beektaa?	1. Eeyyee , guyyaa tokko keessatti taboo meeqa xuuxxa(aarsita)?__________________ 2. Lakkkii	

Qajeelfama 4. Gaaffiiwwan Nyaata fi sochii qaamaa dhukkubsattootaa ilaallatan

T.Lakk	Gaffii	Deebbii							
1	GUYYAA TORBA darban keessaa meeqa karoora nyaata fayya qabeessa hordofte?	0	1	2	3	4	5	6	7
2	Ji'a darbe keessa giddu galeessaan torbanitti guyyoota meeqa karoora nyaata fayya qabeessa hordofte	0	1	2	3	4	5	6	7
3	GUYYAA TORBA darban keessaa meeqa kuduraa fi muduraa nyaatte?	0	1	2	3	4	5	6	7
4	GUYYAA TORBA darban keessaa nyaata cooma baay'ee qabu kan akka foon diimaa ykn oomishaalee aannani cooma guutuu qaban meeqa nyaattan?	0	1	2	3	4	5	6	7
5	Guyyoota torba darban keessaa meeqa irratti yoo xiqqaate daqiiqaa 30 sochii qaamaa irratti hirmaatte?	0	1	2	3	4	5	6	7
6	Guyyoota torba darban keessaa meeqa irratti waan naannoo manaa ykn akka qaama hojii keetii hojjettu malee sochii qaamaa murtaa'e (kan akka dambalii, deemsa fi biskileetii) irratti hirmaatte?	0	1	2	3	4	5	6	7

Part V: Questions concerning treatment adherence of patients

T.Lakk	Gaffii	Deebbii	Darrrbi
1	Qoricha kee (maqaa haala fayyaa) fudhachuu dagattee beektaa?	1. Eeyyee 2. Lakki	
2	Qoricha kee (maqaa haala fayyaa) fudhachuu yaadachuu irratti rakkoon si mudatee beekaa?	1. Eeyyee 2. Lakki	
3	Yeroo miira gaarii sitti dhagahamu, yeroo tokko tokko qoricha kee (maqaa haala fayyaa) fudhachuu ni dhiistaa?	1. Eeyyee 2. Lakki	
4	Yeroo tokko tokko yeroo qoricha kee (maqaa haala fayyaa) fudhattu yoo sitti hammaate, fudhachuu ni dhiiftaa?	1. Eeyyee 2. Lakki	