LEVELS AND PREDICTORS OF ADHERENCE TO SELF-CARE BEHAVIOUR AND GLYCAEMIC CONTROL AMONG ADULT TYPE 2 DIABETICS AT ARBA MINCH GENERAL HOSPITAL, SOUTHERN ETHIOPIA

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ABSTRACT

Background*:* Diabetes self-care behaviour adherence is considered to be the cornerstone in diabetes care. Hence, the success of long-term maintenance therapy for diabetes depends largely on the patients' adherence with self-care behaviour.

Objective*:* To assess Levels and Predictors of Adherence to self-Care Behaviour and Glycaemic Control among Adult Type 2 Diabetics at Arba Minch General Hospital, Southern Ethiopia.

Method*:* An institutional based cross sectional study was conducted from [15th-February to 15th-March, 2015] and data were collected by using interviewer administered questionnaires. The data were entered into EPI-DATA version 3.1, and analysed by Statistical Package for Social Science (SPSS) version 20.0. Descriptive statistics were used for most variables; a bivariate analysis was employed to determine the presence of the association between glycaemic control and self-care behaviour with other variables at P-value less than 0.05. Multi-variable logistic regression was performed to identify independent predictors of glycaemic control and self-care behaviour adherence.

Results*:* A total of 194 type 2 diabetic patients were participated in this study. Mean age of participants was $50.3(\pm13.2)$ years, 44.8% had good glycaemic control and 41.2% had good self-care behaviour adherence. Age 35-44 years [AOR=7.025, 95%CI=2.521, 19.578]; diabetes onset at 35-44 years [AOR=7.324, 95%CI=2.587, 20.732]; poor risk reduction [AOR=0.10, 95%CI 0.0012, 0.828]; poor physical activity [AOR=0.20, 95% CI= 0.002, 0.242] and poor self-care behaviour adherence [AOR=0.129, 95% CI=0.03, 0.552] were independent predictors of good glycaemic control. Age 35-44 years [AOR=13.4, 95% CI=1.582, 113.56], Monthly income <750.00 birr [AOR=0.340, 95% CI=0.119, 0.976] and age at diabetes onset 15-24 years [AOR=11.3, 95% CI=2.621, 49.065] were independent predictors of self-care behaviour adherence.

Conclusion*:* In our study area adherence to self-care behaviour and glycaemic control of the study subjects were low. So strategies that can improve these discrepancies like provision of diabetes self-care education and counselling especially on importance of self-monitoring of blood glucose, physical activity and problem solving and provision of training on up-dates of diabetes for professionals caring for patients in the hospital should be considered by responsible bodies.

Key words*:* Diabetes, Glycemic control, Self-care behaviour adherence, Ethiopia.

ACKNOWLEDGMENTS

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ACRONYMS

AADEs: American association of diabetes educators

ACEIS: Angiotensin converting enzyme inhibitors

ADA: American diabetes association

BMI: Body mass index

BP: Blood pressure

DKT: Diabetes knowledge test

DM: Diabetes mellitus

EAG: Estimated average glucose

FBS: Fasting blood glucose

HbA1C: Haemoglobin glycated/glycoslated

IDF: International diabetes federation

JUSH: Jimma University Specialized hospital

MMAS: Morisky medication adherence scale

NCDs: Non-communicable disease

 OHAs: Oral hypoglycaemic agents

OPD: Outpatient department

RBS: Random blood glucose

SDSCA: Summary of diabetes self-care activities

SMBG: Self-monitoring of blood glucose

TB: Tuberculosis

USD: united States dollar

WHO: World health organization

1. INTRODUCTION

1.1. Background

Type 2 diabetes is a chronic disorder, which is characterized by hyperglycaemia and glycosuria. It affects 90 to 95% of sufferers, with onset usually after the age of 40 and responsible for most of the current rise in diabetes and is increasingly affecting the young or middle aged, with more than half of diabetics in developing countries aged between 40 and 59[1, 2]. High concentration of blood glucose can cause structural damages including macrovascular events in the heart and blood vessels as well as microvascular complications including retinopathy, nephropathy, and neuropathy, which can finally lead to blindness, kidney failure, foot ulcers, gangrene, and erectile dysfunction[3].

Type 2 diabetes usually occurs in adults, but is increasingly seen in children and adolescents; although the reasons for developing type 2 diabetes are still not known; there are several important risk factors. These include: obesity, poor diet, physical inactivity, advancing age, family history of diabetes, ethnicity and high blood glucose during pregnancy affecting the unborn child[4]. Despite the great advancements that have been made in the treatment of diabetes in recent years, diabetes is one of the major causes of morbidity and mortality. It has a significant impact on the patients 'quality of life, productivity and involves enormous health costs for virtually every society[5, 6].

IDF Atlas 6th edition 2013 showed that 382 million people worldwide, or 8.3% of adults, are estimated to have diabetes. About 80% lives in low- and middle-income countries. If this trend continues without concerted action to prevent diabetes, by 2035, some 592 million people, or one adult in 10, will have diabetes. The largest increases will take place in the regions where developing economies are predominant. This Atlas also stated that at the end of 2013, diabetes have caused 5.1 million deaths (i.e. every six seconds a person dies from diabetes) and cost USD 548 billion in healthcare spending. Most of those cases would be preventable[7]. Over the next 20 years, the developed world will see an increase of 20% in the number of adults living with diabetes and developing countries will see an increase of 69%[8].

The burden of diabetes has an impact not only on the quality of life of affected individuals and their families, but also on the country's socioeconomic structure because of in low and middle income countries, 29% of diabetes deaths occurs among people under the age of 50, compared to 13% in high income countries which are the active work forces. In the western world, DM is the leading cause of blindness, non-traumatic amputation and chronic renal failure which are on very much increase. The situation in the developing world, particularly in Africa, is even worse due to late diagnosis and poor access to diabetic care[9].

Type 2 diabetes prevalence among 20–79-year-olds in African region is 4.9% with the majority of people with diabetes <60 years old; this figure is projected to increase with the numbers rising from 19.8 million in 2013 to 41.5 million in 2035, representing a 110% absolute increase[10]. There is an apparent increase in diabetes prevalence with economic development in African Region with rates of 4.4% in low-income, 5.0% in lower-middle income and 7.0% in upper-middle income countries[10, 11]. Hence Sub-Saharan Africa faces a double burden of providing adequate care for both infectious diseases like malaria, tuberculosis (TB) and non-communicable diseases (NCDs) like diabetes and hypertension[12].

The cost of management of diabetes mellitus is complex and multidisciplinary therefore expensive in poor resource countries where majority of the population live below a dollar per day[13]. The cost for patient attendance rates and medical admissions in most hospitals of Ethiopia are rising for diabetic management. Access to diabetes care in the country does not however meet the increments in the incidences and complications of the disease. A conditions where diabetic patients visiting clinics regularly and their blood glucose levels still remain high despite the treatment they receive is a problem that calls for attention and self-care is the patient responsibility to preserve his/her quality of life[14, 15].

Ethiopia experiences a heavy burden of disease mainly attributed to communicable infectious diseases and nutritional deficiencies. However currently, Ethiopia is also challenged by the growing magnitude of chronic non communicable diseases. The national estimate made based on neighbouring countries with similar socio-economic situations shows; about 2%-3% of the population is estimated to live with diabetes in Ethiopia and also WHO estimated the number of diabetic cases in Ethiopia to be 800,000 by the year 2000, and the number is expected to increase to 1.8 million by 2030[16, 17].

Standards of medical care published by American Diabetes Association (ADA) and American Association of Diabetes Educators (AADEs) yearly states optimal glycaemic control is achieved; when glycosylated haemoglobin (HbA1c) is less than 7%. This requires comprehensive self-care behaviours including; being active, self-monitoring, taking medication, problem solving, healthy coping and reducing risks. Self-care involves not only completing these activities but also considering the inter-relationships amongst them and implementing appropriate changes in the daily plan when necessary[18, 19].

Self-care care is a critical option for care, especially considering the growing cost of health care in general, the cost of diabetes care in particular, and the implications for disabilities from the long term effects of T2DM or uncontrolled type 2 diabetes [20, 21]. Successful diabetes care requires a systematic approach to supporting patients' behaviour change efforts, including 1) healthy lifestyle changes (physical activity, healthy eating, tobacco cessation, weight management, and effective coping), 2) disease self-management (taking and managing medication and, when clinically appropriate, self-monitoring of glucose), and 3) prevention of diabetes complications (self-monitoring of foot health; active participation in screening for eye, foot, and renal complications; and immunizations)[22].

1.2. Statement of the problem

Worldwide the prevalence of type-2 diabetes is increasing due to population aging, population growth, urbanization and high prevalence of obesity and sedentary lifestyle[8]. The long-term complications of diabetes, such as micro- and macro-vascular disease and neuropathy, can be delayed or prevented with appropriate intervention, including lifestyle changes. Lifestyle change strategies that combine diet, physical activity and behaviour modification are effective treatments for improving diabetic outcomes[23].

Diabetes is a complex, chronic illness requiring continuous medical care with multifactorial risk-reduction strategies beyond glycaemic control[24]. It requires lifelong self-care behaviour; successful treatment of diabetes mellitus is closely associated with patient's actions; education of both Patients and their relatives; so that self-care behaviour adherence and patient education are the first steps in helping patients to better care and manage their disease[25, 26].

World Health Organization stated that, diabetes reduces both quality of life and life expectancy and imposes large economic burdens on individuals and on national health care systems directly or indirectly[27]. Diabetes is the reason of 9% of all deaths worldwide and causes direct costs about 15 % of total health budget and indirect costs being several times more than this value[28].

IDF estimated that 23 million years of life are lost due to disability and reduced quality of life as a result of complications associated with diabetes and $232 billion U.S. dollars were spent worldwide in 2007 to treat and prevent diabetes. This figure is expected to climb to a minimum of over $ 300 billion in 2025[29]. Similarly Diabetes in sub-Saharan Africa greatly increased the risk of serious, costly complications including emotional distress, heart attack, stroke, kidney damage, blindness, neural damage leading to amputation, and reduced life expectancy[13, 30].

Regardless of the type of diabetes; 95% of diabetes treatment relies on self-care behaviours and 95% of the self-care is usually provided by the patients or their families[31], hence diabetic patients must adjust their behaviour like making lifestyle changes to diet & physical activity levels and follow prescribed treatments to prevent diabetic complications, which may be potentially fatal, particularly for older individuals[32, 33].

Improving adherence to self-care behaviours is the first step towards helping patients to manage their disease better. This can be developed from a thorough understanding of the disease process and the management challenges by the patient and family members. It is important to examine and understand factors affecting self-management behaviours of diabetic patients[34]. Unfortunately, about a third of the people suffering from diabetes may not be aware of it early considering the insidious onset and development [17, 35].

Despite scientific support for glucose control as a therapeutic strategy in diabetes, many diabetics do not care enough of their disease, and this causes imperfect control of glucose [36, 37]. Several studies which have assessed and managed diabetes in different countries, all indicate that diabetes management in different societies, even in developed countries is not appropriate[26].

This study addressed level of adherence to self-care behaviour based on new criteria developed by American association of diabetes educators which was not used in previous studies conducted in different parts of Ethiopia and factors predicting adherence self-care behaviour and glycaemic control among adult type 2 diabetics. This will help to inform and strengthen interventions designed to improve adherence to self-care behaviours in diabetic patients. It will also help health care professionals to manage the disease better and reduce the risk of disease-related complications.

2. LITERATURE REVIEW

2.1. Glycaemic Control and Diabetes management

Study conducted on 256 Mexican American patients aged 18 years and older, regarding continuity of diabetes self-care behaviors and glycaemic control in type 2 diabetic patients, observed patients who had progressed by several times of regimen change and continuity of self-care had lower HbA1c levels[38].

Study conducted in India among 117 patients with type 2 diabetes in a tertiary care center found a high level of knowledge on diabetes. These patients demonstrated good practice of diet, physical activity and medication taking and these self-care practices were significantly associated with good glycaemic control which was a fasting blood glucose level less than 110mg/dl[39].

Study conducted in Jimma university specialized hospital on 343 adults with diabetes showed that only 17.1% of the respondents were able to control their Fasting Blood Sugar (FBS) to level below 126mg/dL. This study also showed that patients taking oral hypoglycaemic agents appeared to have better glycaemic control than those taking insulin or a combination of oral glycaemic agents[40].

2.2. Self-care behaviours and diabetes management

Study conducted in western Ethiopia showed that 45% the respondents had poor diabetes self-care practice. Only 47.6% of the respondents knew the importance of physical exercise, of which; 32.3% reported the importance as lowering blood glucose level; and 24.2% did exercise after meal. Majority of respondents, (60.2%), knew the complications of diabetes, of which, 23.6% reported nephropathy. Majority of (73.2%), the respondents were knowledgeable about the signs and symptoms of hypoglycemia[9]. In similar study conducted in Tikur Anbessa Specialized Hospital revealed that 55.6% respondents were adhered to diabetes Self-Management practices of which 53% respondents' adhered to physical activities that meet the recommended guidelines and (67%) of all respondents adhered to the recommended diabetic foot care practices[41].

Study conducted in Dilla university referral Hospital, showed that male diabetic patients are two times more likely to have diet adjustment than females, and diabetic patients with very high income were 2.5 times more likely to have diet adjustment than with less income. In addition individuals who had 3-5 years of duration of DM were 0.5 times less likely to have diet adjustment than those who had less than one year's duration of DM[25].

Self-monitoring of blood glucose (SMBG) is a tool that guides glycaemic management strategies and has the potential to improve problem-solving and decision-making skills for persons with diabetes and their health care providers[42]. There is no specific evidence base regarding optimal SMBG regimens in non-insulin-treated T2DM. Generally testing blood glucose before and after each meal and at bedtime over the course of 2-3 days per week is recommended. However Short-term focused daily SMBG may be beneficial in the following situations; having symptoms of hypoglycaemia; infections; travelling or are under stress; undergoing adjustments in medication, nutrition and/or physical activity; experiencing worsening HbA_{1c} value, or are pregnant or planning to become pregnant[43].

The systematic review of six RCTs within the Metabolic and Endocrine Disorders to evaluate the effects of SMBG in patients with type 2 diabetes that are not using insulin, that the overall effect of SMBG was a statistically significant decrease of 0.39% in HbA1c compared with the control groups[44]. Study conducted in Dilla university referral Hospital, showed that 62 (20%) of patients reported that they performed self-measuring for blood glucose. Almost 35 (55.5%) of the patients did not control their blood glucose regularly, According to this study, individuals with high income levels were 5.8 times more likely to perform self-blood glucose monitoring than less income levels[25].

Regular exercise has been shown to improve blood glucose control, reduce cardiovascular risk factors, contribute to weight loss and improve wellbeing. ADA recommends at least 150 minutes per week of moderate intensity aerobic physical activity that achieves 50 -70% of maximal heart rate. Structured exercise interventions of at least 8 weeks duration have been shown to lower A1C by an average of 0.66% in people with type 2 diabetes even with no significant change in Body Mass Index[18]. Higher levels of exercise intensity are associated with greater improvements in A1C and fitness[45].

The adoption of physically inactive lifestyles in African region is high[46] and increasing, and can be ascribed to rapid urbanization and socio-economic transitions[11]. According to the WHO, insufficient physical activity, defined as less than 150 minutes of moderate physical activity per week [or equivalent], was present in about a quarter of men and a third of women in African region[47]. A similar study done in Harari, Ethiopia, showed that only 31.1% had exercise for thirty minutes per day; 41.9% measured their blood glucose level once in three days; and 78.4% had taken the prescribed drugs appropriately. Educational status, age and income were significantly associated with self-care practice[48].

The WHO has reported that as many as 50% of the patients with chronic diseases do not take their medications as prescribed[49]. Low adherence to prescribed diabetes medications accounts for 30% to 50% of treatment failures, leading to worse treatment outcomes and which cause damages to vital organs. Hence Effective and successful glucose control requires appropriate and timely use of medication over the entire period of treatment, which is often lifelong[50].

The study conducted in Netherland on refill adherence and poly-pharmacy among patients with type-2 diabetes in general practice show that mean adherence with oral glucose lowering drugs is between 61 and 85%. According to this study it has become apparent an increase in the number of co-medications tends to decrease the adherence of patient with type-2 diabetes to their treatment regimens[51]. Similar study conducted in North West Ethiopia showed that Self-reported adherence to medication measure by MMAS-8 scale was low for 25.4% medium for 28.7% and high for 45.9% of the study subjects[49].

Study conducted on type 2 diabetes in south western Nigeria showed that Mean number of prescribed medications was 4.6±1.4. Almost two thirds 103 (60.6%) were placed on >4 medications. Adherence was better among patients on >4 medications compared to those on ≤4 medications (p=0.05). There was a significant difference in mean FBG among patients on >4 medications (172.1 ±61.1mg/dL) versus (198.8 ±83.8mg/dL) among those on ≤4 medications (p=0.02)[52].

Study conducted in Kenyata National Hospital on 171 type 2 diabetes patients; showed that Most patients, 127 (74.3%) had the right knowledge on the frequency of self-feet examination and 114(66.7%) knew why it was important to do so. Ninety patients (56.1%) were aware of the frequency and importance of eye examination in patients with diabetes[53]. In another study conducted in Kenya, only 41% had good practices in relation to diabetes prevention; 75% had poor dietary practices; 72% did not participate in regular exercise and over 80% did not monitor their body weights[54].

A person with diabetes must keep their problem-solving skills sharp because on any given day, a high or low blood glucose episode or a sick day will require them to make rapid, informed decisions about food, activity, and medications[19]. A systematic review of the literature on coping, negative emotions, and diabetes management by Fisher and colleagues identified a number of well-controlled studies that evaluated cognitive-behavioral treatment of depression, coping/problem-solving interventions, support groups, and cognitive analytical therapy[55].

2.3. Diabetes knowledge, attitude and social support

Positive family behaviors and parents encouraging and supporting youth in completing their own self-management may exert positive effects on diabetes outcomes by providing opportunities to gain experience of coping with and solving diabetes-related challenges, there by supporting adolescents' emerging autonomy[56]. Friends and families of individuals with diabetes play an important role in their well-being, successful self-management, and achievement of in-range glycaemic control[57]. Optimistic, positive family communication about diabetes and its complications has been linked with better glycaemic control[56] and there was an indirect association between social support and HgbA1c, through promotion of glucose monitoring [58]. Social support, quality of life, and self-care behaviors among African Americans with type 2 diabetes; showed that social support plays a role in diabetes-specific quality of life and self-management practices[59].

In a study conducted in Thailand, 66.7% of the study subjects reported that they had people around to encourage them for controlling DM. In this study, 88.6% had good knowledge about diabetes and its selected self-care activities; 14.2% had negative attitude towards diabetes self-care; and 87% had good self-care practice. Age, current occupation, years of suffering from DM, having family members suffering from the illness and knowledge about the illness were significantly related with the level of self-care behaviors[60]. Study conducted in the United Arab Emirates showed that 31% of patients had poor knowledge of diabetes and 57% of patients had HbA1c levels reflecting poor glycaemic control[61].

In study conducted in Nigeria to evaluate the level of knowledge among 100 patients with diabetes; 96% having type 2 diabetes by using the 14 item Diabetes Knowledge Test and found it to be low with a mean of 39% ± 16.7%[62]. Similar study in Uganda; found that less than 40% knew the signs and symptoms of hypoglycemia[63]. In a South African primary care setting, using the Modified Diabetes Knowledge Test found the African population to have significantly lower levels of diabetes knowledge with an average of 52.2% compared to their Indian counterparts with an average of 75.9% [63, 64].

Study conducted in Mekelle in adults with diabetes mellitus, showed that 132 (44.0%) respondents had good knowledge about diabetes[65] and study conducted in Felege Hiwot Hospital in adults with diabetes, showed that Half (49.8%) of them had good knowledge and 144(36.8%) participants had good practice on diabetes. Age group between 18-32yrs was 6 times more likely to have good practice. Higher educational status was also associated with good knowledge and practice. Participants in grade 1-8, grade 9-12 and higher education and above were 3.5, 4.3 and 5.4 times respectively to have good practice[66].

Another study conducted in western Ethiopia showed that only 54.3% of participants had diabetic related knowledge, and 47.6% of the respondents knew the importance of physical exercise, of which; 32.3% reported the importance as lowering blood glucose level; and 24.2% did exercise after meal. More than half, (53.9%), knew those food items which are not recommended for diabetic patients. Indeed, majority of respondents, (60.2%), knew the complications of diabetes, of which, 23.6% reported nephropathy. Majority, (73.2%), of the respondents were knowledgeable about the signs and symptoms of hypoglycemia and 74.4%, knew what care should be taken in the event of hypoglycemia[40].

Study conducted in Dilla University Referral Hospital, South Ethiopia showed that 76.8% of diabetic patients have adhered to self-care practices. Among the recommended self-care behaviours, drug adherence 93.2%, dietary intake 49.7% and regular exercise 138 were the most practiced self-care. This study also showed that Self-blood glucose monitoring was the least practiced which accounted 20% and approximately 78% of diabetic patients were developed positive perception towards DM and has a significant effect for patients with diabetes to provide own self-care practice[25].

2.4. Significance of the Study

Inadequate diabetic self-management remains a significant problem facing health care providers and populations in all settings. It impacts on the patient's morbidity and mortality as well as on an increasing the costs of medication and laboratory tests and cost in time and effort of the care providers. In contrast, patients who have adequate self-management have better outcomes, live longer, enjoy a higher quality of life, and suffer fewer symptoms & minimal complications[67].

Despite scientific support for glucose control as a therapeutic strategy in diabetes, many diabetics do not care enough of their disease, and this causes the lack of or imperfect control of glucose [36, 68, 69]. Several studies which have assessed and managed diabetes in different countries, all indicate that diabetes management in different societies, even in developed countries is not desirable[70]. Similarly Studies conducted in Different Hospitals in Ethiopia have shown that glycaemic control is poor[48].

Local evidences on diabetes knowledge, attitude, levels and predictors of self-care behaviour adherence and glycaemic control are limited in Arba Minch General Hospital. Factors influencing glycaemic control and adherence to self-care behaviour based on seven self-care behaviour components have not been studied so far and Studies conducted elsewhere could not be used to infer about diabetic patients in the study area, as these differs in cultures and life style.

Therefore, to address these discrepancies, this research explored patient's diabetes knowledge, attitude, levels and predictors of self-care behaviour adherence and glycaemic control, amongst adult type 2 diabetics and contribute to the scientific body of knowledge in general and it specifically provide necessary information for health care providers and diabetic patients in the Hospital for appropriate interventions to prevent or delay complications of DM. The study can be used as a basis for future similar studies at a diabetic follow-up unit at Arba Minch General Hospital.

2.5. Conceptual Frame Work
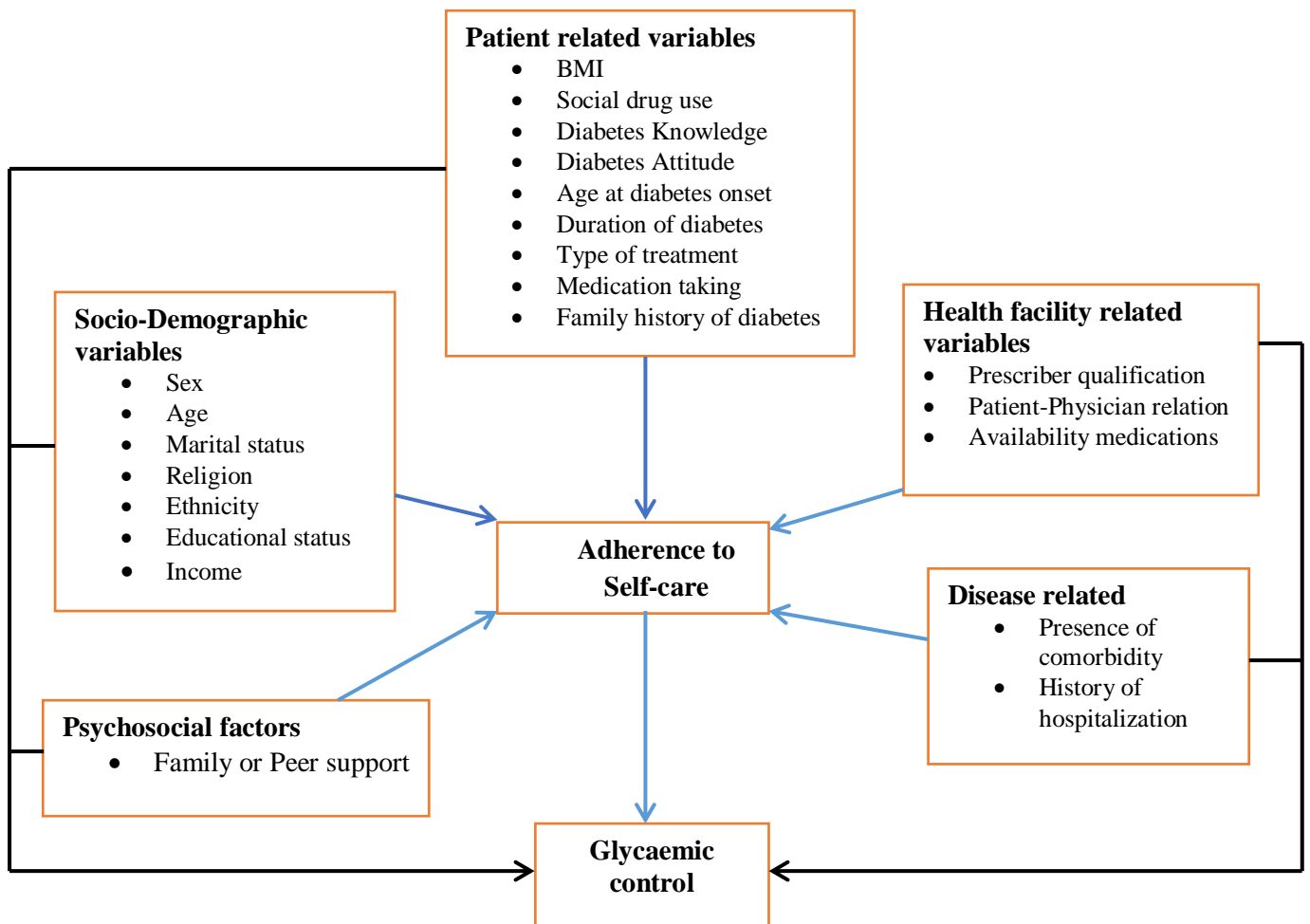
Figure 1: *Conceptual frame work for, adherence self-care behaviour and glycaemic control adapted from different lietratures.*

3. OBJECTIVES AND RESEARCH QUESTIONS

3.1. Research Questions

1. What is level and predictors of glycaemic control in type 2 diabetics at Arba Minch General Hospital?

2. What are level and predictors of adherence to overall self-care behaviour in adult type 2 diabetics at Arba Minch General Hospital?

3.2. General Objective

To asses Levels and Predictors of Self-Care Behaviour Adherence and   Glycaemic Control among Adult Type 2 Diabetics at Arba Minch General Hospital, Southern Ethiopia

3.3. Specific Objectives

- To determine Overall and individual self-care behaviour adherence among adult type 2 diabetics at Arba Minch General Hospital

- To determine the level of glycaemic control among adult type 2 diabetics at Arba Minch General Hospital

- To identify Independent predictors of good glycaemic control and over all self-care behaviour adherence among adult type 2 diabetics at Arba Minch General Hospital

4. METHODS AND MATERIALS

4.1. Study Area and Period

This study was conducted from [15th-February to 15th-March, 2015] at Arba Minch Hospital, in Gamo Gofa zone; which is located about 505 km south from Addis Ababa, about 275 km from Hawassa, the capital of the SNNPR region. According to the 2007 census, Gamo Gofa Zone has a population of 1,595,570; of this 794,485 were male and 801,085 were female. There are three hospitals and 68 health centers offering health care services for the total population. Arba Minch Hospital is one of these hospitals and is located in Arba Minch Town. The hospital has 7 specialists, 15 General Practitioners, 13 Health Officers, 70 Nurses, 4 Pharmacists, 7 Druggists, 10 Laboratory Technologists, 10 Laboratory Technicians and 2 environmental health professionals. The hospital is rapidly expanding in terms of services it provides and infrastructures. It provides multidimensional aspects of care to clients who need health service. There are 6 specialty units (internal medicine, surgery, gynaecology/ obstetrics, paediatrics, dentistry, and ophthalmology) run by the hospital. Besides these, the hospital provides many follow-up services for both paediatric and adult patients. There are about 547 registered diabetes patients including 37 children younger than 23 years of age receiving diabetes follow-up care at the hospital. The clinic provides diabetic services at one OPD two days per week (i.e. Tuesday and Thursday); on average 70 patients are treated per week whilst 280 diabetes patients are treated per month. The service is delivered by physician and nurses.

4.2. Study Design

A facility-based cross sectional study was conducted amongst adult type 2 diabetic follow-up patients at Arba Minch General Hospital, Gamo Gofa Zone; Southern Ethiopia.

4.2.1. Source and Study Population

The source population were all type 2 diabetics who visit Arba Minch general hospital for diabetes follow-up care.

4.2.2. Study Population

Study subjects included in this study were those aged 15 years and older, diagnosed with type 2 diabetes visited the hospital at the time of data collection period and fulfils eligibility criteria.

4.3. Inclusion and Exclusion Criteria

4.3.1. Inclusion Criteria

Type 2 diabetic Patients who were 15 years and above having at least three month follow-up before time of data collection

Patients who gave consent

4.3.2. Exclusion Criteria

Patients with a documented history of psychiatric illness, dementia

Patients with hearing impairments or any other serious health problems and those patients who were unable to provide the appropriate information were excluded.

Patients who were pregnant

4.4. Variables of the Study

4.4.1. Independent Variables

Socio-demographic variables; (Sex, Age, Marital status, Religion, Ethnicity, Educational status, and Income)

Age at diabetes onset

Type of treatment

Duration of diabetes

Family history of diabetes

Social drug use

Presence of comorbidity

History of hospitalization

Patient physician relation

Prescriber qualification

Availability of medications

Family support

Knowledge of diabetes

Attitude about diabetes

4.4.2. Outcome Variables

Primary Outcome variable: Glycaemic control

Secondary outcome variable: Self- care behaviour Adherence

4.5. Sample Size Determination and Sampling Technique

4.5.1. Sample Size Determination

The prevalence of glycaemic control and 17% prevalence was taken according to study conducted in Jimma University specialized Hospital[40] and **Z** value of 1.96 at 95% confidence interval was used and 10% was added for non-response rate.

The sample size was determined by using single population proportion and correction formulas. Formula for Correction for finite population was considered since the source population below 10,000.

$$no = \frac{z^2 pq}{e^2} = 216.8 \approx 217$$

Where;

> **no** = is the sample size (the desired sample size when target population is greater than 10,000)

> $\mathbf{Z^2}$= is the abscissa of the normal curve that cuts off an area α at the tails (1 - α equals the desired confidence level, e.g., 95%) or standard normal deviation, set at1.96, correspond to the 95% confidence interval

> **e** = is the desired level of precision/margin of error

> **p**= is the estimated proportion of glycaemic control (p=17%), and q is 1-p.

Corrected sample size

$$n = \frac{no}{1 + no/N} = 155.6 \approx \mathbf{156}$$

Finally 10% was added for non-response rate.

$$n = 156 + 15.6 = \mathbf{171.6} \approx \mathbf{172}$$

➢ Based on this the final sample size became **172**

Where;

> **N** is size of finite population/source population= 547

> **no** is the sample from an infinite population = 217 and

> **n** is the corrected sample size

4.5.2. Sampling Technique and Procedures

Convenience sampling technique was used to collect data and patient coming to the clinic for a follow-up service during data collection period were interviewed after screening them for eligibility criteria on arrival. The questionnaire was asked to the patients as they move from registration, triage, meeting the clinician to exit with minimal interference with the clinic activities.

4.6. Data Collection Tools and procedures

4.6.1. Data collection tools

The Questionnaire contains five parts, Part I & II were used to collect socio demographic data and clinical status data of the study subjects. Patient professional relationship was determined by using validated tool [71] and respondents were asked about all nine questions in the tool and the response is rated by assigning Yes(1) and No(0). The Percent of response was determined and those who scored greater than or equal to 80% were labelled as having good relationship, those who scored 70-80% were labelled as having moderate relationship and those below 70% were poor. Part III was used to collect medication adherence data by Morisky Medication Adherence Scale (MMAS)[72]. MMAS consists of 8 items with a dichotomous response (yes/no) The scale contains questions asking the patient to respond "yes" or "no" to items 1–7 and a 5 point Likert response for the last item. A positive response indicates a problem with adherence. Therefore, higher scores indicate that a patient is least-adherent to medications. Part IV diabetes knowledge/DKT[73] and Part V diabetes attitude[61] were validated for assessment of Diabetes attitude and knowledge respectively. Part VI is the modified SDSCA, which was used to measure seven areas or domains of diabetes self-care practices. Summary of diabetes self-care activities (SDSCA) is used to measure seven diabetes self-care activities[74]. Using a continuous scale ranging from 0-7, the numerical scoring of items was based on the number of days of the week that the behaviour was performed; the item scores were averaged resulting in an overall score for each self-care activity and self-care behaviour adherence of respondents was rated as optimal if ≥ 75% of mean score and poor otherwise.

4.6.2. Data collection procedures

Informed written consent was obtained from each patient at the time of their visit to the hospital. To determine the level of glycaemic control, patient's charts were reviewed, retrospectively; the last three consecutive FBS results nearest to study period and were recorded from the patient's card. Anthropometric measurements were used to assess the body mass index (BMI) of the patients. Weights of patients were measured using weighing scale up to the nearest 100g. Heights were measured using a standard height board with the participant wearing no shoes. Measurements for height were then taken to the nearest 1cm. BMI was calculated as weight in kg divided by height in meters squared. BMI was categorized as normal ($17.9\text{-}24.9\text{kg/m}^2$), overweight ($25\text{--}30\text{kg/m}^2$), and obese ($>30 \text{ kg/m}^2$). The socio demographic data, disease related factors data, health system related data and data on diabetes knowledge, attitude, and self-care behaviours, and Patient professional relationship were collected by direct patient interview using structured and standardized questionnaires. The data were collected by trained (B.Sc.) nurses who have experience of data collection previously.

4.7. Data Quality Control

Questionnaires were prepared in English and translated into Amharic and translated back into English to check its consistency. The Amharic versions was used for data collection after pretesting on 5% (9) of the actual sample size in Chencha Hospital diabetes clinic to ensure that the respondents could understand the questions and to check for consistency and possible amendments were made to the questionnaire based on findings. Five (B.Sc.) nurses for data collection and one medical doctor (MD.) working in the hospital for supervision were given orientation before data collection about principles to follow during data collection and the contents of data collection format for one day by the principal investigator. Continuous follow up and supervision was made by the principal investigator throughout the data collection period. Data entry was done by using EPI- INFO3.1 after preparing template containing logical answers and skip pattern to the questionnaire to prevent inconsistency and missing values and the data was exported to SPSS 20 for analysis.

4.8. Data Analysis

The collected data was checked for completeness and consistency by principal investigator on daily basis at the spot during the data collection time. Then data was transcribed back to English and entry was made using Epi-data 3.1 software. After data processing, analysis was made using SPSS version 20.0. A summary descriptive statistics was computed for most variables such as socio-demographic data; a bivariate analysis was done to determine the presence of association between glycaemic control and self-care behaviour with socio-demographic characteristics. To avoid many variables and unstable estimates in the subsequent model, only variables that reached a p-value less than 0.05 at bivariate analysis was kept in the subsequent model analysis. Multiple logistic regression analysis was applied to describe the functional independent predictors of glycaemic control and self-care behaviour adherence. A point estimates of Odds ratio (OR) with 95% confidence interval (CI) were determined to assess the strength of association between independent and dependent variables. For all statistical significant tests p- value < 0.05 was used as a cut-off point.

4.9. Ethical Considerations

Ethical clearance was obtained from institutional Review Board of Jimma University College of Public Health and Medical Sciences. Permission letters to conduct the study was obtained from, Gamo Gofa Zone, health department and Arba Minch General Hospital administration. Interview was carried out only with full consent of the patient being interviewed. Each respondent was assured that the information provided by him/ her was confidential and used only for the purpose of research. Respondents were allowed to refuse or discontinue participation at any time they want.

4.10. Dissemination Plan

The findings of this study will be presented at Jimma University College of Public Health and Medical Sciences, Department of pharmacy for fulfilment of master's degree requirement in clinical pharmacy. A report will be communicated to, Gamo, Gofa zone health department, Arba Minch General Hospital and any other respective bodies. Presentations at professional, local, national and international meetings and publication in peer reviewed, national or international journals will be attempted.

4.11. Operational Definitions and definition of terms

Age at disease onset: age when the patient is told by physician about the diagnosis for the first time or documentation of the age of the diagnosis at the first time.

Average fasting blood sugar: The average of three successive months blood glucose measurements of the patient, nearest to study period in the past one year. The three successive measurements are assumed to simulate glycated haemoglobin level which is usually measured every three months and expresses constant glycaemia for these months.

Being Active: respondents were labelled to have optimal physical activity if he/she scores greater than or equal to 75% , moderate if 50-75% and poor if less than 50% of the questionnaire.

Dietary adherence: respondents were labeled to have "optimal dietary adherence" if they score ≥ 75% the mean score, "moderate" if they score 50-75% and "poor" if <50% of the mean score of the total, on the closed ended questions related to dietary adherence.

Family history of diabetes: having a history of diabetes of their parents and first- and second-levels of relatives as self-reported.

Fasting blood glucose (FBS): blood is tested for glucose at least eight hours after meal.

Glycaemic control: The level of glycaemic control was indicated as 'adequate glycaemic control' when FBS results were between 70–130mg/dL (3.9–7.2mmol/L) (i.e. an average of three measures at different visits), or when RBS results were less than 180mg/dL (10.0 mmol/L); 'inadequate glycaemic control' takes place when FBS greater than 130mg/dL and RBS greater than 180mg/dL[24].

Good knowledge: Respondents were labelled to have good knowledge of diabetes if they scored greater than or equal to mean score of the total on the knowledge questions and otherwise poor knowledge.

Good patient relation: Respondents were labelled to have good relationship if he/she scored greater than 80% of the questions related to patient professional relationship, moderate if 70-80% and poor if less than 70% were scored.

Good self-care behaviour: - respondents were labeled to have "good self-care" if they score the mean score of the total or above, on the closed ended questions related to self-care behaviour and poor otherwise.

Health coping: respondents were labeled to have "optimal health coping" if they score $\geq$ 75% the mean score, "moderate" if they score 50-75% and "poor" if <50% of the mean score of the total, on the closed ended questions related to health coping.

Hypoglycaemia: an abnormally diminished concentration of glucose in the blood < 70mg/dl.

Medication adherence: The degree of adherence was determined by using MMAS-8 and participants scoring (1-2) were recorded as good adherence and those ($\geq$3 points) were recorded as poor adherence [75].

Monthly income; defined as all household's total monthly income that participants self-reported & categorized as low if less than 750.00 birr and high otherwise.

Positive attitude: Respondents were labelled to have positive attitude if they scored 50% or above to questions related to attitude; otherwise, negative attitude.

Problem solving: respondents were labeled to have "optimal problem solving" if they score $\geq$ 75% the mean score, "moderate" if they score 50-75% and "poor" if <50% of the mean score of the total, on the closed ended questions related to problem solving.

Risk reduction: respondents were labeled to have "optimal risk reduction" if they score $\geq$ 75% the mean score, moderate if they score 50-75% and poor if <50% of the mean score of the total, on the closed ended questions related to risk reduction.

$$\text{Self care behaviors mean score} = \frac{\text{Number of days patient practiced specific behavior}}{\text{Total number of days under questions designed for that behavior}}$$

Self-care: It is the practice of activities that individual diabetics will initiate and perform on their own behalf in controlling their disease, maintaining life, health and wellbeing.

Self-monitoring of blood glucose: respondents were labeled to have "optimal self-monitoring" if they score $\geq$ 75% the mean score, "moderate" if they score 50-75% and "poor" if <50% of the mean score of the total, on the closed ended questions related to self-monitoring of blood glucose.

5. RESULTS

5.1. Socio-demographic characteristics of the respondents

A total of 194 type 2 diabetic patients were included in this study. With regard to Sex distribution 99 (51.0%) were Females. The majority of study participants 115(59.3%) were in the age group of 35-54 years and mean age (± standard deviation (SD)) of participants was 50.3(±13.2) years, ranging from 17-83 years. One hundred one (52.1%) were orthodox by religion and majority of the respondents 102(52.6%) were Gamo by ethnicity. One third (29.4%) of respondents had monthly income below 750.00 birr per month) with mean monthly income of 1872.55 ± 1351.16 birr ranging from 300-8,000 birr. With regard to educational status of respondents 57 (29.4%) were attended college and above followed by 1-8 grade 54 (27.8%) (Table 1).

Table 1: Socio-demographic characteristics of respondents among adults type 2 diabetics, in Arba Minch General Hospital, Southern Ethiopia, March 2015 (n= 194).

Socio-demographic characteristics	Number (%)
Sex	
Female	99(51.0)
Male	95(49.0)
Age	
15-24	8(4.1)
25-34	4(2.1)
35-44	55(28.4)
45-54	60(30.9)
55-64	38(19.6)
Above 64	29(14.9)
Religion	
Orthodox	101(52.1)
Protestant	66(34.0)
Muslim	22(11.3)
Catholic	5(2.6)
Ethnicity	
Gamo	100(51.5)
Amhara	41(21.1)
Gofa	27(13.9)
Wolayta	19(9.8)
Others *	7(3.6)

Table 1: Socio-demographic characteristics of respondents among adults type 2 diabetics, in Arba Minch General Hospital, Southern Ethiopia, March 2015 (n= 194) cont...

Marital status	
Married	157(80.9)
Divorced	17(8.8)
Widowed	12(6.2)
Single	8(4.1)
Monthly income	
≥ 750.00 birr	137(70.6)
< 750.00 birr	57(29.4)
Educational status of respondent	
College and above	57(29.4)
1-8 grade	54(27.8)
9-12 grade	51(26.3)
Illiterate	32(16.5)
Occupational status	
Merchant	57(29.4)
Gov't/private employee	48(24.7)
Farmer	45(23.2)
House wife	22(11.3)
Retired	13(6.7)
Daily laborer	9(4.6)

* Gurage, Tigre, Hadiya, Kambata, Konso, Zayise

5.2. Diabetes related clinical characteristics

Majority of respondents 114(58.7%) reported that there diabetes was diagnosed at age of 35-54 years with mean age of diagnosis (± SD) 45.29 (± 12.8) years ranging from 15-77 years. More than half of respondents 111 (57.2%) had diabetes duration less than five years, with mean duration of diabetes 5.02 ± 3.8 years, ranging from 1-20 years. Most of patients 169(87.1%) were on oral anti diabetics for their diabetes management and the mean number of drugs per patient for treatment was 2.09 ± 0.5. Most of respondents 129(66.5%) had no family history of diabetes and majority of patients 165(85.1%) had family support for their diabetes care. With regard to social drug use majority of respondents 146(75.3%), 174(89.7%) and 189(97.4%) were ex-drinkers, non-chewers and non-smokers respectively. The BMI of the respondents ranged from 18 kg/m^2 to 33.6 kg/m^2 and the mean BMI (± SD) was 24.7 kg/m^2 (± 2.7kg/m^2, and only 11(5.6%) of the patients were obese. Eighty seven (44.8%) had good glycaemic control and mean, fasting blood glucose of 148.8mg/dl ± 48.7mg/dl, ranging from 87.5-449mg/dl and Majority of respondents 168(86.6%) had no history of hospitalization due to hyperglycaemia. With respect to hypoglycaemia experience 165(85.1%) had not experienced signs of hypoglycaemia during their diabetes treatment and only one respondent did not know signs of hypoglycaemia (Table 2).

Table 2: Clinical characteristics respondents among adults type 2 diabetics, in Arba Minch General Hospital, Southern Ethiopia, March 2015 (n= 194).

Clinical and social factors	Number (%)
Age at disease on set	
15-24	8(4.1)
25-34	28(14.4)
35-44	59(30.4)
45-54	55(28.4)
55-64	27(13.9)
Above 64	17(8.8)
Duration of diabetes in years (n=194)	
≤ 5	122(62.9)
6-10	54(27.8)
11-15	15(7.7)
Above 15	3(1.5)
Number of medications	
Two	144(74.2)
Three and above	34(17.5)
One	16(8.2)
Frequency of administration per day	
Two	160(82.5)
Three	29(14.9)
One	5(2.6)
Family history of diabetes	
No relative	129(66.5)
1st degree relative	51(26.3)
2nd degree relative	14(7.2)
Family support for diabetes care	
Always supporting	166(85.6)
Sometimes supporting	28(14.4)
Alcohol use status	
Ex-drinker	146(75.3)
Non-drinker	36(18.6)
Drinker	12(6.2)
Chat use	
Non-chewer	174(89.7)
Ex-chewer	15(7.7)
Chewer	5(2.6)
Smoking status	
Non-smoker	189(97.4)
Ex-smoker	5(2.6)
Average fasting blood sugar	
> 130mg/dl	107(55.2)
70-130mg/dl	87(44.8)
Body mass index	
17.9-24.9kg/m^2	116(59.8)
25-30kg/m^2	67(34.5)
Above 30kg/m^2	11(5.7)
History of hospitalization related to diabetes	
Not hospitalized	168(86.6)
Hospitalized	26(13.4)
Experience of hypoglycaemia in past one year	
Not experienced	165(85.1)
Experienced	28(14.4)
I don't know	1(0.5)
Presence of comorbidities	
No	158(81.4)
Yes	36(18.6)

Most of patients 169(87.1%) were on oral anti diabetics for their diabetes management followed by insulin 14(7.21%) (Figure 2).
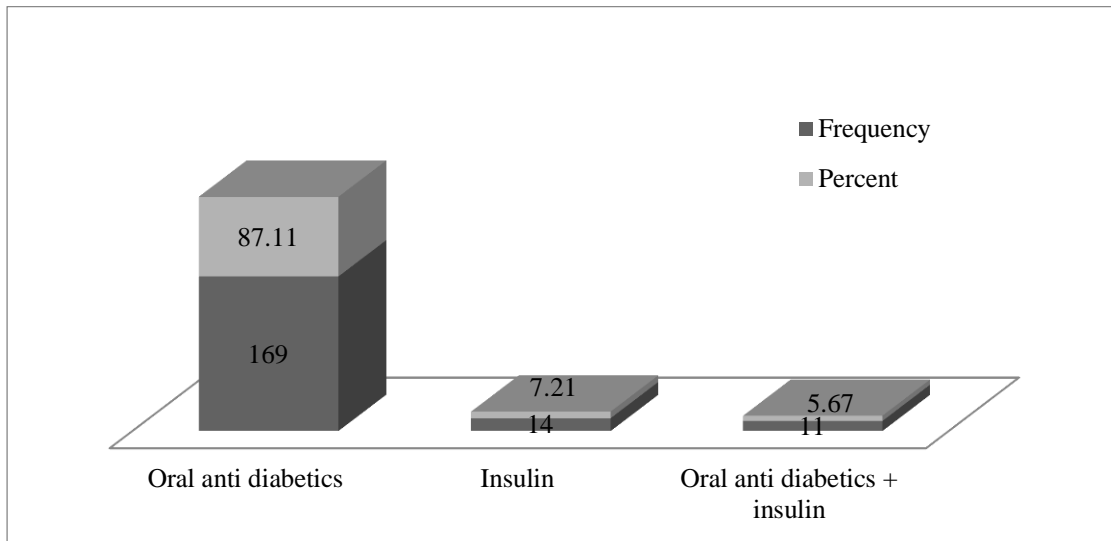
Figure 2; Diabetes management type among adult type 2 diabetic patients at Diabetes follow-up clinic among adults type 2 diabetics, in Arba Minch General Hospital, Southern Ethiopia, March 2015 (n=194)

With regard to presence of comorbidity along with diabetes; only 36(18.6%) of respondents had comorbidity, among which hypertension was the most common 24(69.4%) followed by heart failure and kidney disease (figure 3).
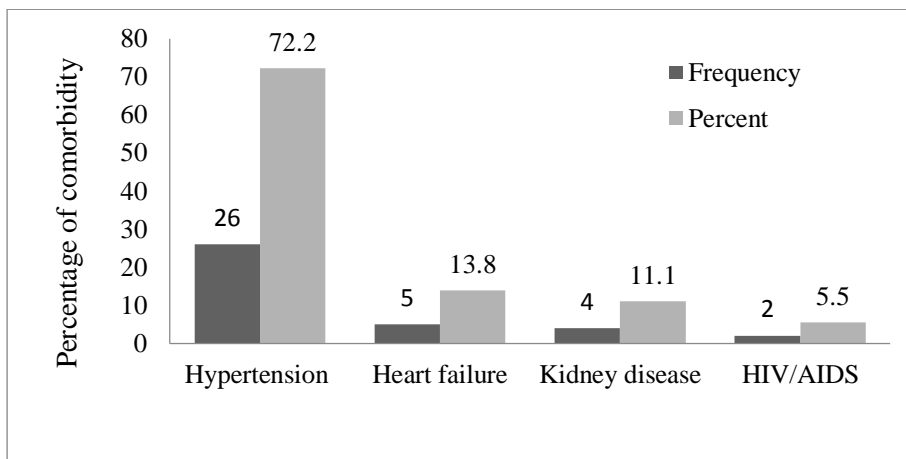
Figure 3; Type of comorbidities among adult type 2 diabetic patients at Diabetes follow-up clinic among adults type 2 diabetics, in Arba Minch General Hospital, Southern Ethiopia, March 2015 (n=36).

5.3. Diabetes and health facility related factors

Majority of respondents 180 (92.8%) reported that the health professionals caring for their diabetes were doctors followed by health officer 3.6% (Figure 4).
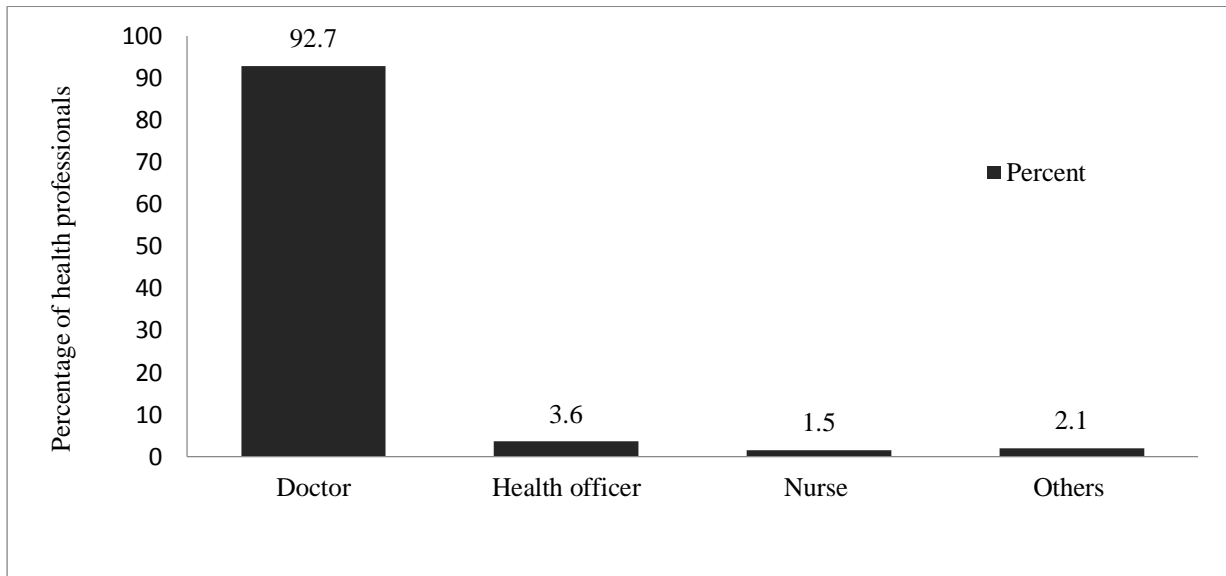
Figure 4; Qualification of health professionals caring for diabetes at Diabetes follow-up clinic among adults type 2 diabetics, in Arba Minch General Hospital, Southern Ethiopia, March 2015 (n=194).

One hundred and twelve (57.7%) of respondents reported that diabetes medications were usually available and only 8(4.2%) of respondents reported that diabetic medications are not available at all.
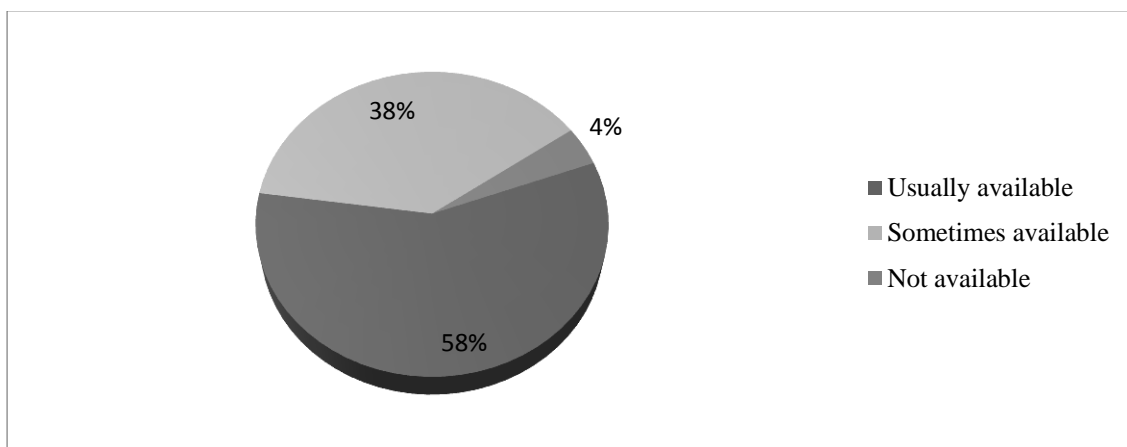
Figure 5; Availability of medications at Diabetes follow-up clinic among adults type 2 diabetics, in Arba Minch General Hospital, Southern Ethiopia, March 2015 (n=194).

Majority 169(87.1%) of respondents had good relationship with professionals caring for their diabetes and only 13(6.7%) respondents had poor relationship with health professionals caring for their diabetes (Figure 6).
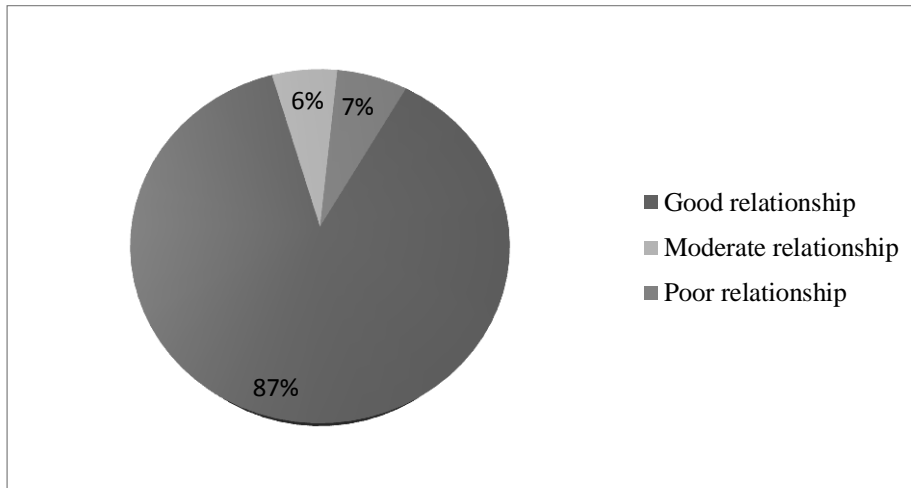
Figure 6; Patient professional relationship at Diabetes follow-up clinic among adults type 2 diabetics, in Arba Minch General Hospital, Southern Ethiopia, March 2015 (n=194).

5.3. Diabetes Knowledge

One hundred eighty six (95.8%), subjects had good knowledge and only 4.2% had poor knowledge about diabetes and its care principles. Participants were asked about causes, types and management principles of diabetes, accordingly, 194(100%), responded that Cuts and abrasions on diabetics heal more slowly; 190(97.9%), said that A fasting blood sugar level of 210 is too high; 165(85.05%), reported that Eating too much sugar and other sweet foods is a cause of diabetes, In untreated diabetes, the amount of sugar in the blood usually increases, If I am diabetic, my children have a higher chance of being diabetic and diabetes is not curable (Table 3).

Table 3: Frequency distribution of diabetic patients' knowledge response among adults type 2 diabetics, in Arba Minch General Hospital, Southern Ethiopia, March 2015 (n=194).

Diabetes knowledge response	Response			
	Correct	%	Incorrect	%
Cuts and abrasions on diabetics heal more slowly.	194	100	0	0
Diabetics should take extra care when cutting their toe nails.	194	100	0	0
A fasting blood sugar level of 210 is too high.	190	97.93	4	2.06
Tight elastic hose or socks are not bad for diabetics.	186	95.87	8	4.12
Diabetes can damage my kidneys.	180	92.78	14	7.21
The way I prepare my food is as important as the foods I eat.	175	90.20	19	9.79
Eating too much sugar and other sweet foods is a cause of diabetes.	165	85.05	29	14.94
In untreated diabetes, the amount of sugar in the blood usually increases.	165	85.05	29	14.94
If I am diabetic, my children have a higher chance of being diabetic.	165	85.05	29	14.94
Diabetes can be cured.	165	85.05	29	14.94
There are two main types of diabetes: Type 1and Type 2.	165	85.05	29	14.94
A person with diabetes should cleanse a cut with iodine and alcohol.	145	74.74	49	25.25
Diabetes can cause loss of feeling in my hands, fingers, and feet.	145	74.74	49	25.25
A diabetic diet consists mostly of special foods.	145	74.74	49	25.25
Diabetes often causes poor circulation.	123	63.40	71	36.59
The usual cause of diabetes is lack of effective insulin in the body.	112	57.73	82	42.26
Frequent urination and thirst are signs of low blood sugar.	112	57.73	82	42.26
Shaking and sweating are signs of high blood sugar.	104	53.60	90	46.39
Medication is more important than diet and exercise to control my diabetes.	102	52.57	92	47.42
The best way to check my diabetes is by testing my urine.	100	51.54	94	48.45
Kidneys produce insulin	98	50.51	96	49.48
Regular exercise will increase the need for insulin or other diabetic medication.	98	50.51	96	49.48
An insulin reaction is caused by too much food.	54	27.83	140	72.16
Diabetes is caused by failure of the kidneys to keep sugar out of the urine.	40	20.61	154	79.38

5.4. Diabetes Attitude

One hundred sixteen (59.8%) of respondents had positive attitude towards diabetes. As per reported by respondents 94 (48.5%) were afraid of their condition and said it was difficult to believe they were suffering from diabetes, 78(40.2%) felt unhappy and depressed because of the diabetes, 105(54.1%) felt satisfied with their life and 165(85.1%) felt they could do anything that they set out to do concerning their diabetes and 32(42.7%) found it hard to carry out all the practices related to the disease. However, 194(100%) stated that, all things considered, they were very well right now (Table 4).

Table 4: Frequency distribution of patients' diabetes Attitude response among adults type 2 diabetics, in Arba Minch General Hospital, Southern Ethiopia, March 2015 (n=194).

Diabetes Attitude questions	Response			
	Positive	%	Negative	%
I'm afraid of my diabetes	100	51.54	94	48.45
I find it hard to believe that I really have diabetes	100	51.54	94	48.45
I feel unhappy and depressed because of my diabetes	116	59.79	78	40.20
I feel I'm not as good as others because of my diabetes	120	61.85	74	38.14
I find it hard to do all the things I have to do for my diabetes	150	77.31	44	22.68
I feel satisfied with my life	105	54.12	89	45.87
I can do just about anything I set out to do	165	85.05	29	14.94
Diabetes doesn't affect my life at all	60	30.92	34	69.07
I am pretty well off, all things considered	130	67.01	64	32.98
Things are going very well for me right now	194	100	0	0

Note: The answer to the question was recorded as positive for the first 5 questions if the respondents answered them No since they are questions of negative nature and for the next 5 questions, recorded as positive if they answered them Yes since they are questions of positive nature.

5.5. Adherence to self-care behaviour

This study revealed both individual and overall adherence to self-care behaviour. Majority 169(87.1%) of respondents practiced health coping behaviour (i.e. managing stress related to diabetes), 163(84.0%) adhered to medication taking behaviour and 116(59.8%) practiced recommended dietary behaviour. On the other hand, only 19(9.8%) and 11(5.7%) practiced problem solving and self-monitoring of blood glucose respectively.

With regard to physical activity 98(50.5%) of respondents reported to have optimal to moderate physical activity (participated in at least 30 minutes of physical activity for total of ≥3 days per week) and 96(49.5%) of participants were least active. On the other hand majority of patients reported having their serum glucose measured at least once or twice a month usually on day of their clinic appointments and only 16(8.2%) of respondents had self-monitoring of their blood glucose at home.

This study also revealed that only 76(39.1%) respondents reported to have optimal risk reduction behaviour practice (checking their foot, inspecting inside of shoes and visiting eye and dental clinic).

Overall self-care behaviour adherence above half 114(58.8%) had poor self-care behaviour adherence and only 80(41.2%) practiced the recommended self-care practices.

Table 5: Diabetes patients' self-care behaviour components among adults type 2 diabetics, in Arba Minch General Hospital, Southern Ethiopia, March 2015 (n=194).

Self-care behaviour components		Number (%)	Mean ± SD
Dietary adherence	Optimal dietary adherence	116(59.7)	0.903±0.06679
	Moderate dietary adherence	44(22.6)	0.6473±0.0763
	Poor dietary adherence	34(17.6)	0.3824±0.04943
Physical activity	Optimal physical activity	78(40.2)	0.9355±0.06679
	Moderate physical activity	20(10.3)	0.6256±0.0693
	Poor physical activity	96(49.5)	0.3653 ± 0.0566
Self-blood glucose monitoring	Optimal self-monitoring	5(2.5)	0.7149± 0.02208
	Moderate self-monitoring	11(5.6)	0.5844± 0.0771
	Poor self-monitoring	178(91.7)	0.2512±0.09337
Medication taking	Optimal medication taking	188(96.9)	0.9686±0.04903
	Poor medication taking	6(3.1)	0.6429±0.04994
Risk reduction	Optimal risk reduction	59(30.4)	0.9531±0.04526
	Moderate risk reduction	17(8.7)	0.6587±0.051
	Poor risk reduction	118(60.8)	0.38±0.036
Health coping	Optimal health coping	169(87.1)	0.9007±0.0506
	Moderate health coping	12(6.2)	0.5893±0.06186
	Poor health coping	13(6.7)	0.3736±0.05943
Problem solving	Optimal problem solving	47(24.2)	0.9688±0.06156
	Moderate problem solving	19(9.8)	0.6190±0.0693
	Poor problem solving	128(66)	0.167±0.06960

All self-care practices were divided into three categories based on the following (below 0.5= poor, 0.5-0.75=moderate, and 0.75-1= optimal) except for medication taking practice 0-0.75= poor and 0.75-1= optimal.

Self care behaviors mean score $= \dfrac{\text{Number of days patient practiced specific behavior}}{\text{Total number of days under questions designed for that behavior}}$

Medication adherence based on MMAS-8

Most of respondents 163(84.0%) had good medication adherence and only 31(15.9%) of respondents had poor adherence. The major reason for not adhering to medication was forgetting to take medications 14(45.2%) followed by failure to understand instructions 8(25.8%) (Figure 7).
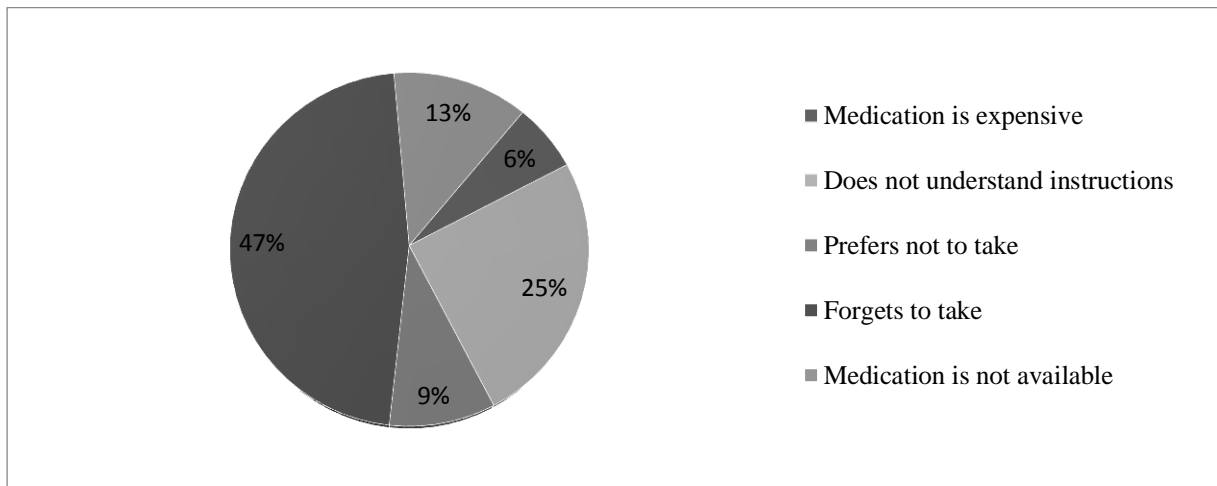
Figure 7: Reasons for not taking Medication among adults type 2 diabetics, in Arba Minch General Hospital, Southern Ethiopia, March 2015 (n=194).

5.6. Predictors of glycaemic control and self-care behaviour adherence

5.6.1. Predictors of glycaemic control

Bivariate analysis showed significant associations between glycaemic control and Age of the respondents, Monthly income, Educational status, Age at diagnosis of diabetes, Duration of diabetes treatment, Family history, Family support, Body mass index, Hospitalization due to diabetes/hyperglycaemia, Presence of comorbidity, Physical activity, risk reduction, Problem solving, Self-care behaviour adherence and Diabetes Attitude.

Multivariable logistic regression analysis was done to identify independent predictors of glycaemic control among the study participants. Respondents aged 35-44 were 7 times [AOR=7.025, 95%CI=2.521, 19.578] more likely to have good glycaemic control as compared to those above the age of 64 years. Respondents with diabetes onset at age of 35-44 were 7.3 times [AOR=7.324, 95%CI=2.587, 20.732] more likely to have good glycaemic control as compared to those whose diabetes was diagnosed above the age of 64 years. Individuals with poor physical activity were less likely [AOR=0.20, 95%CI= 0.002, 0.242] to have good glycaemic control than those with good physical activity. Individuals with poor risk reduction behaviour were less likely [AOR=0.10, 95%CI 0.0012, 0.828] to have good glycaemic control than those with optimal risk reduction behaviour, and Individuals with poor adherence to self-care behaviour were less likely [AOR=0.129, 95%CI=0.03, 0.552] to have good glycaemic control than those with good adherence (Table 8).

5.6.2. Predictors of adherence to self-care behaviour

Bivariate analysis showed significant associations between adherence to self-care behaviour and Age of the respondents, monthly income, Age at diagnosis of diabetes, Hospitalization due to diabetes/hyperglycaemia, Presence of comorbidity, and Diabetes Attitude.

Multivariable logistic regression analysis was done to identify independent predictors of adherence to self-care behaviour among the study participants. Respondents aged 35-44 were 13.4 times more likely to practice self-care activities as compared to those above the age of 64 years, [AOR=13.403, 95% CI=1.582, 113.564], Respondents earning <750.00 birr per month were less likely [AOR=0.340, 95% CI=0.119, 0.976] to have good adherence to self-care behaviour than those earning greater than ≥750.00 birr and individuals with diabetes onset age between 15-24 years were 11.3 times [AOR=11.3, 95% CI=2.621, 49.065] and between 25-34 years were 7.5 times [AOR=7.5, 95% CI=2.0081, 28.23] more likely to have adherence to self-care behaviour than those above 64 years (Table 9).

Table 6: Bivariate analysis of factors associated with Glycaemic control among adults type 2 diabetics, in Arba Minch General Hospital, Southern Ethiopia, March 2015, (n=194).

		Glycemic control			95% CI for COR		
		Optimal control 87(44.8%) N (%)	Poor control 107(55.2) N (%)	COR	Lower bound	Upper bound	P value
Socio-demographic factors							
Age	15-24	3(37.5)	5(62.5)	0.142	0.051	0.397	0.000*
	25-34	3(75)	1(25)	0.416	0.154	1.122	0.083
	35-44	38(69.1)	17(30.9)	0.891	0.292	2.719	0.839
	45-54	26(43.3)	34(56.7)	0.530	0.100	2.803	0.455
	55-64	10(26.3)	28(73.7)	0.106	0.009	1.190	0.069
	Above 64 (Ref)	7(24.1)	22(75.9)	1			
Monthly income	< 750.00 birr (Ref)	19(33.3)	38(66.7)	1			
	≥ 750.00 birr	68(49.6)	69(49.4)	1.971	1.035	3.755	0.038*
Educational status of respondent	Illiterate (Ref)	7(21.8)	25(78.2)	1			
	1-8 grade	23(42.5)	31(57.4)	3.448	1.286	9.243	0.014*
	9-12 grade	29(56.8)	22(43.2)	1.301	0.615	2.751	0.491
	College & above	28(49.1)	29(50.9)	0.732	0.343	1.565	0.422
Patient related factors							
Age at disease onset	15-24	3(37.5)	5(62.5)	0.357	0.054	2.384	0.288
	25-34	23(82.1)	5(19.9)	0.047	0.010	0.226	0.000*
	35-44	34(57.6)	25(42.4)	0.158	0.041	0.608	0.007*
	45-54	18(32.7)	37(67.3)	0.440	0.112	1.730	0.240
	55-64	6(22.2)	21(77.8)	0.750	0.160	3.506	0.715
	Above 64 (Ref)	3(17.6)	14(82.4)	1			
Family history of diabetes	1st degree relative	19(37.3)	32(62.7)	1.764	0.908	3.429	0.094
	2nd degree relative	2(14.3)	12(85.7)	6.286	1.353	29.210	0.019*
	None (Ref)	66(51.2)	63(48.8)	1			
BMI	17.9-24.9	72(62.1)	44(37.9)	0.061	0.008	0.494	0.009*
	25-30	14(20.8)	53(79.2)	o.379	0.045	3.212	0.373
	Above 30 (Ref)	1(9.1)	10(90.9)	1			
Psychological factors							
Family support for diabetes care	Always supporting	80(48.2)	86(51.8)	0.358	0.145	0.888	0.027*
	Sometimes supporting (Ref)	7(25)	21(75)	1			

Table 6: Bivariate analysis of factors associated with Glycaemic control among adults with type 2 DM, continued…

Disease related factors							
History of	Hospitalized (Ref)	6(23)	20(67)	1			
Hospitalization due to diabetes	Not hospitalized	81(48.2)	87(51.2)	3.103	1.187	8.115	0.021*
Presence of	Yes (Ref)	5(16)	31(84)				
comorbidities	No	82(51.8)	76(48.2)	6.689	2.474	18.089	0.000*
Self-care behaviors							
Physical activity	Optimal (Ref)	67(85.8)	11(14.2)	1			
	Moderate	12(60)	8(40)	0.015	0.006	0.039	0.000*
	Poor	8(8.3)	88(91.7)	0.061	0.019	0.192	0.000*
Risk reduction	Optimal (Ref)	55(93.2)	4(6.8)	1			
	Moderate	11(64.7)	6(35.3)	0.016	0.005	0.048	0.000*
	Poor	21(17.8)	97(82.2)	0.118	0.039	0.355	0.000*
Problem solving	Optimal (Ref)	47(100)	0	1			
	Moderate	11(57.8)	8(42.2)	0.000	0.000	.	0.997
	Poor	29(22.6)	99(77.4)	0.213	0.078	0.579	0.002*
Self-care behavior	Optimal (Ref)	53(66.3)	27(33/7)	1			
adherence	Poor	34(29.8)	80(70.2)	0.217	0.117	0.400	0.000*
Diabetes attitude							
Attitude	Positive (Ref)	72(62.1)	44(37.9)	1			
	Negative	15(19.2)	63(80.8)	0.146	0.074	0.286	0.000*

Statistically significant at p<0.05

Table 7: Bivariate analysis of factors associated with adherence to self-care behaviour among adults type 2 diabetics, in Arba Minch General Hospital, Southern Ethiopia, March 2015, (n=194).

		Self-care behaviour adherence			95% CI COR		P value
		Optimal 80(41.2%)	Poor 114(58.8%)	COR	Lower bound	Upper bound	
		N (%)	N (%)				
Socio-demographic factors							
Age	15-24	0	8(100)	.462	.013	16.088	0.670
	25-34	1(33.3)	3(66.7)	0.955	0.085	10.710	0.970
	35-44	52(94.5)	3(5.5)	5.727	1.091	30.078	0.039*
	45-54	18(30)	42(70)	0.742	0.269	2.047	0.565
	55-64	2(5.2)	36(94.8)	0.018	0.004	0.078	0.000*
	Above 64 (Ref)	7(24.1)	22(85.9)	1			
Monthly income	< 750.00 birr	13(22.8)	44(77.2)	3.240	1.603	6.547	0.001*
	≥ 750.00 birr(Ref)	67(48.9)	70(51.1)	1			
Patient related factors							
Age at onset of DM	15-24	0	8(100)	0.041	0.001	2.227	0.117
	25-34	22(78.5)	6(21.5)	0.084	0.020	0.354	0.001*
	35-44	45(76.3)	14(23.7)	2.462	0.476	12.716	0.000*
	45-54	6(10.9)	49(89.1)	2.513	0.616	10.243	0.199
	55-64	3(11.1)	24(88.9)	0.096	0.027	0.341	0.282
	Above 64 (Ref)	4(23.5)	13((76.5)	1			
Disease related factors							
History of Hospitalization due to diabetes	Hospitalized	6(23.1)	20(76.9)	2.624	1.003	6.866	0.049*
	Not hospitalized (Ref)	74(44)	94(56)	1			
Presence of comorbidities	Yes	8(22.2)	28((77.8)	2.930	1.258	6.827	0.013*
	No (Ref)	72(45.6)	86(54.4)	1			
Diabetes attitude							
Attitude	Positive	57(49.1)	59(50.9)	2.310	1.258	4.242	0.007*
	Negative (Ref)	23(29.5)	55(70.5)	1			

* Statistically significant at p<0.05

Table 8: Multivariable logistic regression of Predictors of glycaemic control predicting the likelihood of glycaemic control among adults type 2 diabetics, in Arba Minch General Hospital, Southern Ethiopia, March 2015, (n=194).

Glycaemic control [a]		Glycaemic control			95% C.I. for COR			95% C.I. for AOR		P value
		Optimal	Poor		Lower bound	Upper bound		Lower bound	Upper bound	
		N (%)	N (%)	COR			AOR			
Optimal glycaemic control	**Age of patient**									
	15-24	3(37.5)	5(62.5)	0.530	0.100	2.803	1.886	0.357	9.967	0.455
	25-34	3(75)	1(25)	0.106	0.009	1.190	9.429	0.840	105.790	0.069
	35-44	38(69.1)	17(30.9)	0.142	0.051	.397	7.025	2.521	19.578	0.000*
	45-54	26(43.3)	34(56.7)	0.416	0.154	1.122	2.403	0.891	6.481	0.083
	55-64	10(26.3)	28(73.7)	0.891	0.292	2.719	1.122	0.368	3.425	0.839
	Above 64 (Ref)	7(24.1)	22(75.9)	1			1	.	.	.
	Age at diagnosis of diabetes									
	15-24	3(37.5)	5(62.5)	0.357	0.054	2.384	1.837	0.341	9.879	0.479
	25-34	23(82.1)	5(19.9)	0.047	0.010	.226	7.847	0.673	91.540	0.100
	35-44	34(57.6)	25(42.4)	0.158	0.041	.608	7.324	2.587	20.732	0.000*
	45-54	18(32.7)	37(67.3)	0.440	0.112	1.730	2.420	0.881	6.646	0.086
	55-64	6(22.2)	21(77.8)	0.750	0.160	3.506	1.106	0.360	3.392	0.860
	Above 64 (Ref)	3(17.6)	14(82.4)	1			1			
	Physical activity									
	Optimal (Ref)	67(85.8)	11(14.2)	1			1			
	Moderate	12(60)	8(40)	0.015	0.006	0.039	0.009	0.001	0.098	0.000*
	Poor	8(8.3)	88(91.7)	0.061	0.019	0.192	0.020	0.002	0.242	0.002*
	Risk reduction									
	Optimal (Ref)	55(93.2)	4(6.8)	1			1			
	Moderate	11(64.7)	6(35.3)	0.016	0.005	0.048	0.009	0.001	0.087	0.000*
	Poor	21(17.8)	97(82.2)	0.118	0.039	0.355	0.100	0.012	0.828	0.033*
	Adherence to self-care behaviour									
	Optimal (Ref)	53(66.3)	27(33.7)	1			1			
	Poor	34(29.8)	80(70.2)	0.217	0.117	0.400	0.129	0.030	0.552	0.006*

Statistically significant at p<0.05
a. The reference category is: Poor glycaemic control.

Table 9: Multivariable logistic regression of Predictors of adherence to self-care behaviour predicting the likelihood of self-care behaviour adherence among adults type 2 diabetics, in Arba Minch General Hospital, Southern Ethiopia, March 2015, (n=194).

adherence to self-care behaviour [a]			Self-care behaviour		COR	95% CI COR			95% CI for AOR		P value
			Optimal N (%)	Poor N (%)		Lower bound	Upper bound	AOR	Lower bound	Upper bound	
Optimal adherence to self-care behaviour	Age of the patient	15-24	0	8(100)	0.462	0.013	16.088	0.493	0.033	7.306	0.607
		25-34	1(33.3)	3(66.7)	0.955	0.085	10.710	1.652	0.076	35.802	0.749
		35-44	52(94.5)	3(5.5)	5.727	0.004	0.078	13.403	1.582	113.564	0.017*
		45-54	18(30)	42(70)	0.742	0.269	2.047	1.839	0.374	9.040	0.453
		55-64	2(5.2)	36(94.8)	0.018	1.091	30.078	0.033	0.005	0.223	0.000*
		Above 64 (Ref)	7(24.1)	22(85.9)	1			1			
	Monthly income	< 750.00	13(22.8)	44(77.2)	3.240	1.603	6.547	0.340	0.119	0.976	0.045*
		≥750.00 (Ref)	67(48.9)	70(51.1)	1			1			
	Age at onset of diabetes	15-24	0	8(100)	0.041	0.001	2.227	11.339	2.621	49.065	0.001*
		25-34	22(78.5)	6(21.5)	0.084	0.020	0.354	7.530	2.008	28.233	0.003*
		35-44	45(76.3)	14(23.7)	2.462	0.476	12.716	.320	.076	1.355	0.122
		45-54	6(10.9)	49(89.1)	2.513	0.616	10.243	.369	.070	1.954	0.241
		55-64	3(11.1)	24(88.9)	0.096	0.027	0.341	.	.	.	.
		Above 64 (Ref)	4(23.5)	13((76.5)	1			1			

a. The reference category is: Poor adherence to self-care behaviour.

Statistically significant at p<0.05

6. Discussion

6.1. Glycaemic control

This study was conducted with the intention to assess Diabetes Knowledge, Attitude, Levels and Predictors of Self-Care Behaviour Adherence and Glycaemic Control among Adult Type 2 Diabetics at Arba Minch General Hospital, Southern Ethiopia.

In this study only 87(44.8%) had achieved targeted glycaemic control range (i.e. FBS 70-130mg/dl). This is similar to study conducted in the United Arab Emirates showed that; 43% of patients had HbA1c levels reflecting good glycaemic control[61]. However this is in contrast to study done in JUSH showed that; only 17.1% of the respondents were able to control their Fasting Blood Sugar (FBS) to level below 126mg/dL[40]. This difference might be attributed due to difference in the glycaemic target range used by the researcher.

Hypertension was the most common comorbidity reported 69.4% and there was no significant association between hypertension and glycaemic control. This is consistent with study done in JUSH; Hypertension (61.2%) and obesity (10.8%) as the most frequent co-morbidities among the patients studied and hypertension was not associated with poor glycaemic control[40]. However study conducted in Vietnam revealed that BP, obesity related measures (waist circumference, and abdominal obesity), and alcohol consumption were the independent risk factors for hyperglycaemia[76]. This could be due to silent nature of hypertension and use of patient reported presence of hypertension that could under estimate the actual prevalence in the study subjects. Therefore further studies that use measuring the blood pressure of patients and using glycated haemoglobin A1C should be considered to prove the association between hypertension and glycaemic control.

In this study BMI was not associated with glycaemic control. However study conducted in Vietnam; BP, obesity related measures (Waist circumference and abdominal obesity), and alcohol consumption were the independent risk factors for hyperglycaemia (IFG, IGT, and diabetes)[76] and study done in India showed that hypertension, obesity and dyslipidaemia was found associated with hyperglycaemia[77]. This could be due to Diagnosis of obesity was based on BMI while waist circumference/WC is most sensitive measure of obesity and patients underweight by BMI could be obese based on WC[78].

This study family support showed no statistically significant association with glycaemic control. This finding is incomparable with findings from other studies; friends and families of individuals with diabetes play an important role in their well-being, successful self-management, and achievement of in-range glycaemic control[57]. Optimistic or positive family communication about diabetes and its complications has been linked with better glycaemic control[56]. One study of rural African-American adults with type 2 diabetes showed an indirect association between social support and HgbA1c, through promotion of glucose monitoring[58]. The difference might be explained by difference in study design, study population and geographical variation.

Respondents aged 35-44 were 7 times [AOR=7.025, 95% CI=2.521, 19.578] and age at diagnosis of diabetes 35-44 were 7.3 times [AOR=7.324, 95% CI=2.587, 20.732] more likely to have good glycaemic control as compared to those above the age of 64years. This is similar with study conducted in Egypt; subjects with younger age groups had more glycaemic controls than the older ones[79]. This could be due to older persons have less education, worse cognitive function and have more co-morbidities, which might lead to confusion[51]. Another explanation might be younger patients were more likely to be more educated, faster in remembering and recall and they were eager to have more knowledge about their disease[80].

In this study dietary adherence was not associated with glycaemic control. This was supported by evidences from study conducted in England showed that; dietary self-care behaviours did not predict diabetes control (A1C levels)[81] and study done in Tanzania; there was no statistically significant differences between glycaemic control and following a healthy eating plan[82] and study done in JUSH; each self-care activity was not significantly predicting glycaemic control[40] but study done in Bahrain showed positive relationship between dietary practice and the level of HbA1c[83]. Dietary strategies for weight loss, encouraging people to adopt their diet of choice may improve diabetes treatment outcomes. It is the degree of adherence that will predict outcomes rather than type of dietary strategy[84]. This difference could be due to use of FBS rather than HbA1c and difficulty of carbohydrate monitoring, by carbohydrate counting, exchanges, or experience-based estimation, and lack of determined glycaemic index and glycaemic load for common foods in the study area which are key strategy in achieving glycaemic control.

In this study individuals with poor physical activity were less likely [AOR=0.20, 95%CI= 0.002, 0.242] to have good glycaemic control than those with good physical activity. This is comparable with ADA recommendations; structured regular exercise at least 150 minutes per week of moderate intensity aerobic physical activity have been shown to lower A1C by an average of 0.66%[18], study conducted in JUSH; physical activity was a strong predictor of glycaemic control[40], the study conducted to investigate self-care practices of Chinese individuals with diabetes showed that; less active participants had a higher mean FBG[85] and study conducted in India showed that Sedentary lifestyle (64.70%), stress (20.00%), alcohol (30.59%), positive family history (41.18%; *P*<0.05), and non-vegetarian diet (45.88%) had shown contribution to hyperglycaemia[77].

In this study 84% of respondent's adhered to medication and it had shown no association with glycaemic control. This is supported by one study conducted in South western Nigeria among ambulatory patients with type 2 diabetes showed that; there was no statistically significant difference (p=0.095) between fasting plasma glucose of adherent and non-adherent patients[86]. Improving medication adherence improves glycaemic control through self-care behaviour adherence. Further research is needed to quantify the specific improvement in glycaemic control that might be obtained from improved medication adherence. Developing methods that properly assess medication adherence as a behaviour that can be modified could provide a clinically significant improvement in glycaemic control for some patients[87].

In this study only 16(8.2%) of respondents reported that they monitor their blood glucose 2-3 times per week and there was no association between glycaemic control SMBG. This is comparable with study conducted in Malaysia showed that; there was no statistical significant difference in fasting blood glucose level of respondents who practiced SMBG four or more times per week and non-testers[88]. However meta-analysis done on noninsulin treated patients suggested that SMBG reduced A1C by 0.25% at 6 months[89]. This difference could be due to the use of FBS rather than HbA1c by the researchers.

In this study individuals with poor adherence to self-care behaviour were less likely [AOR=0.129, 95%CI=0.03, 0.552] to have good glycaemic control than those with optimal adherence to self-care behaviour. This is supported by findings from other similar studies; Study conducted in JUSH showed that; overall self-care activity was significantly associated with adequacy of glycaemic control[40].

This study identified 95.5% of respondents had moderate to good knowledge on diabetes and its self-care practices and diabetes knowledge was not statistically associated with glycaemic control. This is comparable with study done in Jordan showed that; knowledge, attitude, and self-care behaviour adherence were not found to have significant relationships with glycaemic control[90]. However in other study diabetes knowledge and attitude were associated with glycaemic control[91]. This might be due to effect of other factors on glycaemic control of patients like physical activity, self-monitoring, problem solving and difference in tool used to access diabetes knowledge; even though the English version has been validated but the Amharic version used could have influenced actual level of knowledge and hence affected its effect on the glycaemic control of the study subjects and Multi-centered longitudinal studies are required to prove this effect.

This study showed no statistically significant association between diabetes attitude and glycaemic control. This is in contrast to study conducted in Dilla University referral hospital showed that; individuals who had positive perception towards diabetes were 2.7 times more likely to perform recommended self-care than negative perception[25]. Study conducted in JUSH; Patients with high perceived severity of the disease was more likely to adhere to self-care practice[40]. This could be explained by; improved glycaemic level associated with positive attitude on bivariate analysis explains the role of positive attitude about diabetes and its care principles. However being single- centered study and the use of different instruments to rate diabetes attitude could have influenced its effect on glycaemic control of the study subjects. This might also be due to difference in tool to assess Attitude and study population.

6.2. Adherence to self-Care behaviour

Diabetes self-care is an essential component of diabetes care. Diabetes self-management strategies increase lifestyle adjustments to maintain best possible diabetes management to achieve optimal glycaemic control in type 2 diabetics[83]. In this study the current situation of self-care behaviour adherence of type 2 diabetics in Arba Minch General Hospital to enhance the understanding of the factors that contribute to efficient self-care behaviour adherence of diabetics was investigated in addition to glycaemic control.

In this study only 80(41.2%) practiced the recommended self-care behaviour activities. The finding of this study was similar to study done in Harari 39.3% of the study participants had good self-care practices[48]. However findings from study done in JUSH; 45% of the participants had Good self-care practice[40] and Nekemte Referral Hospital showed that; 45% of study participants had good self-care practices[9]. This variation could be due to difference in glycaemic target range used, instruments used to access self-care behaviour adherence since previous studies have used old AADEs criteria while we used new AADEs criteria which included two more behaviour components; health coping and problem solving .

There is no statistically significant association between educational level and good adherence self-care behaviour. This is incomparable with systematic review, showed that there is a positive correlation between education and regular diabetic self-care[92]. High educational attainment was associated with good and regular Type 2 DM self-care and it was also discovered that higher educational attainment were associated with less dependence on medications, high level of physical activity, and SMBG regularly and were associated with positive support behaviour or attitude[93].

This study showed that respondents aged 35-44 years were 13.4 times [AOR=13.4, 95% CI=1.582, 113.564] more likely to have good adherence to self-care behaviour than those above the age of 64 years. This study is similar to study done in Nekemte Referral hospital, showed respondents in age group 35-44 were more likely perform self-care as compared to those above the age of sixty five [9, 48] and study done in JUSH, age is associated with self-care practices[40], study conducted in Changhan Hospital Thailand, age was an independent predictor of self-care practices[60] being young aged in Type 2 DM was associated with ability to shifting of view or mentality and motivation to engage in healthy lifestyles[94]. This could be attributed to lack of motivation and lack of social support in elderly individuals compared to young adults.

Respondents earning <750.00 birr per month were less likely [AOR=0.340, 95%CI=0.119, 0.976] to have good adherence to self-care behaviour than those earning greater than ≥750.00 birr. This is similar with study done in Nekemte Referral Hospital; Subjects earning relatively high average monthly income (750-1050) Birr were 5.6 times more likely to practice self-care than those earning less than 350 Birr [9] and study done in Harari; patients relatively in high income category can get healthy foods that are recommended for diabetic patients[48], high income was correlated with high self-care ability or low income was associated with low self-care ability than those middle & high income patients[93].

About one half of the study population 96(49.5%) reported typical activities of daily living as regular exercise and only small proportion 76(40%) did additional activities purely for exercise. This is lower than the current recommendation made by ADA which states that adults with diabetes should be advised to perform at least 150min/week of moderate-intensity aerobic physical activity (50–70% of maximum heart rate), spread over at least 3 days/week with no more than 2 consecutive days without exercise[24]. This might be due to lack knowledge on difference between physical activity and daily living activities and lack of access to recreational centers in the area.

Diabetes knowledge was not statistically associated with adherence to self-care behaviour. This is comparable with study done in Jordan showed that; knowledge, attitude, and self-care adherence were not found to have significant relationships with glycaemic control[90]. However It has been reported that an essential basis for effective diabetes management is diabetes-related knowledge, including knowledge with regard to the correct diet, medication and SMBG[85] and study conducted in Nekemte; knowledge was statistically significant predictor of self-care practices[9]. This could be due to time and effort burden placed on diabetic patients by self-care practice; it has been estimated that approximately 2hr/day are required to meet the ADA-recommended guidelines for self-care for patients taking oral medications, which could have affected the self-care behaviour of study subjects[95]. This might also be due to lack facilities like glucometer and recreational facilities for practicing self-care that could affected the actual practice of study subjects irrespective the knowledge about diabetes and its care principles.

There was no statistically significant association between Diabetes Attitude and good adherence to self-care behaviour. This is in contrast to study conducted in Dilla University referral hospital showed that; individuals who had positive perception towards diabetes were 2.7 times more likely to perform recommended self-care than negative perception[25]. Similarly a study conducted in JUSH; Patients with high perceived severity of the disease was more likely to adhere to self-care practice[40]. This variation could be explained by difference in socio-economic characteristics, hospital setting and instruments used.

6.3. Limitations of the study

The results of this study should be interpreted in light of its limitations. The adherence to self-care behaviours of the study participants were based on self-reports and possibility of desirability bias. Mean fasting blood sugar of the last three months nearest to study period rather than glycosylated haemoglobin to determine the level of glycaemic control was used, being single-centered study inferences should be made with caution and the use of cross-sectional data that can only demonstrate an association and not causality.

6. 4. Conclusion and recommendations

6.4. 1 Conclusion

This study revealed that; adherence to self-care behaviour particularly physical activity, self-monitoring of blood glucose; problem solving and glycaemic control of adult type 2 diabetics were low. In this study respondents had high level of knowledge on diabetes and its care principles but inappropriate self-care practices and glycaemic control. The respondents' age, age at onset of diabetes, physical activity, risk reduction and self-care behaviour adherence were independent predictors of glycaemic control. The study also identified; age of respondents, monthly income and age at diagnosis of diabetes as independent predictors for adherence to self-care behaviour.

6.4.2. Recommendation

The following recommendations were made as per results of this study to improve the situation of diabetic patients:

1. Regional Health Bureau and Zonal Health Department in coordination with Arba Minch Hospital Diabetic Association Coordinators should have to develop health information dissemination programmes and strategies to improve the awareness of diabetic patients about the importance of glycaemic control and self-care practices especially physical activity, self-monitoring, and risk reduction.

2. All professionals working in diabetes clinic should give diabetes education and counselling during every visit on importance of self-care practices and should not rely on medical intervention only.

3. Arba Minch Hospital Administers and Arba Minch Hospital Diabetic Association Coordinators should design strategies to avail facilities to monitor HbA1c level of patients; hence it is more reliable method of determination of glycaemic level.

4. To researchers who are interested in the area it is important to conduct, further follow-up study to look into the sustainability of the self-care behaviour and its effect on diabetic related morbidity since observing behaviour is better than studying it as reported.

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ANNEX I

Consent and assent Form

Title of the research: Diabetes Knowledge, Attitude, Levels and Predictors of Self-Care Behaviour Adherence and Glycaemic Control among Adult Type 2 Diabetics at Arba Minch General Hospital.

Name of the investigator: Mende Mensa

Name of the organization: Jimma University

My name is ----------------------------- Address --

I am working as a data collector which is conducting a study on Diabetes self-care practices and predictors among adults with type 2 diabetes. The objective of the study *is to assess Diabetes Knowledge, Attitude, Levels and Predictors of Self-Care Behaviour Adherence and Glycaemic Control among Adult Type 2 Diabetics at Arba Minch General Hospital, Southern Ethiopia*.

During the interview you will be asked some short questions about your/your son/daughter's Socio-demographic characteristics, about knowledge, and other information's regarding diabetes management. Your answers will be recorded on a survey questionnaire. No personal identifiers will be recorded to the interview. All the data obtained will be kept strictly confidential by using only code numbers. Your participation in the study is upon purely voluntary basis. What we learn from this study will be used to generate information necessary for the planning to improve, redesign and scale up diabetes management practice in our country particularly in our hospital. The interview will be conducted in private and will take 15-20 minutes. During the interview period, if you feel inconvenient, you can interrupt and clarify inconvenience, appoint to other time or even withdraw any time after you get involved in the study. Your honest and genuine participation in responding to the questions prepared is very important & highly appreciated.

If you agree to participate in this study I will interview you.

The purpose of the study and confidentiality procedures has been explained to me and I on my own consent: a) Agree _____ b) Disagree_____

Interviewer name _____ Signature _____

Checked by supervisor: Name_____ Signature_____ Date_____

ANNEX II

Questionnaire

Patient Card Number _____ Code Number _____ Date _____

Instruction to the interviewer: Encircle the number where choices are given and fill blank space for open ended questions during patient interview, and chart review appropriately.

Note: There is only one question that could have more than answer from choices given.

Part I. Socio demographic data

1.	Sex	1. Male 2. Female
2.	Age	_____ years
3.	Religion	Orthodox 2. Muslim 3.Protestant 4. Catholic 5. Others-----------------
4.	Ethnicity	1. Gamo 3. Wolyta 2. Goffa 4. Amhara 5. Other _____
5.	Marital status	1. Married 3. Widowed 2. Divorced 4. Single/ never married
6.	Monthly Income	In Birr _____
7.	Level of education	1. Illiterate 2. If Literate(Yrs. completed)_____
8.	Occupation/ employment	1. Employed 2. Farmer 3. Merchant 2. House wife 4. Retired 5. Others specify _____

Part II. Patient and drug related characteristics data

9.	Age at disease onset	_____years
10.	Duration of treatment	_____ months/ years
11.	Diabetes management type	1. Oral ant diabetics 2. Insulin 3. Oral ant diabetics + insulin 4. Oral antidiabetics before & insulin now
12.	Number of medications taken per day	1. One 2. Two 3. Three and above
13.	What is the maximum number of medications taken per day	1. One 2. Two 3. Three 4. Four
14.	Family history of diabetes	1. None 2. 1st Degree relative 3. 2nd Degree relative
15.	How do you rate your family members support for your diabetes care	1. Always supporting 2. Sometimes 3. Not at all
16.	Alcohol use	1. User 2. Non-drinker 3. Ex-drinker
17.	Chat use	1. Chewer 2. Non-chewer 3. Ex-chewer
18.	Cigarette	1. Smoker 2. Non-smoker 3. Ex-smoker
19.	What is the recent fasting blood glucose level? FBS _____and RBS _____ and current (FBS_____ and RBS_____)	
20.	What is the recent BMI_____(ht_____ and Wt_____) and measure the current Weight and Height(Wt_____ and ht_____)	

Disease related variables

21.	Have you ever been hospitalized due to blood glucose rise?	1. Hospitalized 2. Not hospitalized
22.	Do you experience signs hypoglycaemia/ hyperglycemia?	1. Experiencing 2. I don't know 3. Not experiencing
23.	Do you have any disease seeking treatment/under treatment other than diabetes?	1. Yes 2. No
24.	If yes to the above question; what is the disease you are having on top of Diabetes	1. CVD (specify)_____ 2. Kidney disease 3. Liver disease 4. Others (specify) _____

Health facility related

25.	Qualification of health professional caring for your diabetes	1. Doctor 2. Health officer 3. Nurse 4. others
26.	How often do you face shortage of diabetes	1. Usually 2. Sometimes 3. not at all

27. Measures of patient physician relationship

Questions	Yes	No
My Care provider helps me in my diabetes		
My Care provider has enough time for me		
I trust my Care provider		
My Care provider understands me		
My Care provider is dedicated to help me		
My Care provider and I agree about the nature of my medical symptoms		
I can talk to my Care provider		
I feel satisfied with Care provider's treatment		
I find my Care provider easily accessible		

Validation of the Patient-Doctor-Relationship Questionnaire (PDRQ-9) in a Representative Cross-Sectional German Population Survey[71].

Part III: Medication adherence assessment tool

Medication: Morisky Medication Adherence Scale- MMAS-8	Yes(1)	No(0)
Do you sometimes forget to take your diabetes medication?		
In the last two weeks, was there any day when you did not take your diabetes medication?		
Have you ever stopped taking your medications or decreased the dose without first warning your doctor because you felt worse when you took them?		
When you travel or leave the house, do you sometimes forget to take your medications?		
Did you take your diabetes medication yesterday?		
When you feel your diabetes is controlled, do you sometimes stop taking your medications?		
Have you ever felt distressed for strictly following your diabetes treatment?		
How often do you have difficulty to remember taking all your diabetes medications? Never/ Almost never / Sometimes/ Frequently/ Always *Never = 0; Almost/Almost never/Sometimes/Frequently/Always = 1*		

MMAS consists of 8 items with a dichotomous response (yes/no) for items 1–7 and a 5 point Likert response for the last item. The total score ranges from 1 to 8 with a higher total score indicating poor medication adherence[72].

9. If the response to the above question is less than three, what is the reason for not taking medication regularly?

A. Medication is expense

B. Patient doesn't understand instructors

C. Patient prefers not to take

D. Patient forgets to take

E. Medication is not available

F. Patient can't swallow/administer

Part IV: Diabetes Knowledge Questionnaire

S.No	Questions	Yes	No
1	Eating too much sugar and other sweet foods is a cause of diabetes.		
2	The usual cause of diabetes is lack of effective insulin in the body.		
3	Diabetes is caused by failure of the kidneys to keep sugar out of the urine.		
4	Kidneys produce insulin		
5	In untreated diabetes, the amount of sugar in the blood usually increases.		
6	If I am diabetic, my children have a higher chance of being diabetic.		
7	Diabetes can be cured.		
8	A fasting blood sugar level of 210 is too high.		
9	The best way to check my diabetes is by testing my urine.		
10	Regular exercise will increase the need for insulin or other diabetic medication.		
11	There are two main types of diabetes: Type 1 (insulin-dependent) and Type 2 (non-insulin-dependent).		
12	An insulin reaction is caused by too much food.		
13	Medication is more important than diet and exercise to control my diabetes.		
14	Diabetes often causes poor circulation.		
15	Cuts and abrasions on diabetics heal more slowly.		
16	Diabetics should take extra care when cutting their toenails.		
17	A person with diabetes should cleanse a cut with iodine and alcohol.		
18	The way I prepare my food is as important as the foods I eat.		
19	Diabetes can damage my kidneys.		
20	Diabetes can cause loss of feeling in my hands, fingers, and feet.		
21	Shaking and sweating are signs of high blood sugar.		
22	Frequent urination and thirst are signs of low blood sugar.		
23	Tight elastic hose or socks are not bad for diabetics.		
24	A diabetic diet consists mostly of special foods.		

Development of the Spanish-language diabetes knowledge questionnaire[73].

Part V: Diabetes Attitude

S. No	Questionnaire	Yes(1)	No(0)
1	I'm afraid of my diabetes.		
2	I find it hard to believe that I really have diabetes.		
3	I feel unhappy and depressed because of my diabetes.		
4	I feel I'm not as good as others because of my diabetes.		
5	I find it hard to do all the things I have to do for my diabetes.		
6	I feel satisfied with my life		
7	I can do just about anything I set out to do.		
8	Diabetes doesn't affect my life at all.		
9	I am pretty well off, all things considered.		
10	Things are going very well for me right now.		

For items 1, 2, 3, 4 and 5 the option **No** (0) related to a positive attitude; for items 6, 7, 8, 9 and10 the option **Yes** (1) related to a positive attitude.

Note: Attitude will be assessed by giving 1 to positive and 0 to negative attitude. The scale measures attitude from maximum 10 to minimum 0.

Part IV. Revised English SDSCA questionnaire

The questions below ask about your diabetes self-care activities during the past seven days. If you were sick during the past seven days please think back to the last seven days when you were not sick.

Healthy eating	Number of days							
1. On average, over the past month, how many days per week have you followed your eating plan?	0	1	2	3	4	5	6	7
2. On how many of the last seven days did you eat five or more servings of fruits and vegetables?	0	1	2	3	4	5	6	7
3. On 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 space carbohydrates evenly through the day?	0	1	2	3	4	5	6	7
5. On how many of the last seven days have you followed a healthful eating plan?	0	1	2	3	4	5	6	7
Being active								
1. 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
2. On how many of the last seven days did you participate in a specific exercise session (such as such swimming, walking, biking) other than what you do around the house or as part of your work?	0	1	2	3	4	5	6	7
Monitoring Blood sugar								
1. On how many of the last seven days did you test your blood sugar?	0	1	2	3	4	5	6	7
2. On how many of the last seven days did you test your blood sugar the number of times recommended by your health care provider?	0	1	2	3	4	5	6	7
Taking Medication								
1. On how many of last seven days did you take your oral diabetes medication?	0	1	2	3	4	5	6	7
2. On how many of last seven days did you take your insulin injection?	0	1	2	3	4	5	6	7
Reducing risk								
1. On how many of the last seven days did you check your feet?	0	1	2	3	4	5	6	7
2. On how many of the last seven days did you inspect the inside of your shoes?	0	1	2	3	4	5	6	7
3. How many times did you visited eye clinic in the past one year	0	1	2	3	4	5	6	7
4. How many times did you visited dental clinic for your dental examination in the past one year	0	1	2	3	4	5	6	7
5. How many times did you smoke in the past seven days	0	1	2	3	4	5	6	7
Healthy coping								
1. How many times did you face difficulty in Managing stress in the past one month	0	1	2	3	4	5	6	7
2. How many times did you ask for help when problem arises with diabetes in the past one year	0	1	2	3	4	5	6	7
Problem solving								
1. How many times did you carry sweet foods (candy, soft drinks, table sugar) when you are travelling away from home in the last month	0	1	2	3	4	5	6	7

Amharic questionnaire

የስኳር ህመምተኞች በበሽታዉ ላይ ያላቸዉ ግንዛቤና አመለካከት፣ እንዲሁም በሽታዉን ለመቆጣጠር የሚያደርጉትን ግላዊ ልምምድ እና የስኳር መጠን ቁጥጥር ሁኔታቸዉን ለማጥናት የተዘጋጀ መጠይቅ፣

ቃለ መጠይቁን ከማድረግ በፊት የተሳታፊዎች ፈቃደኝነት መጠየቂያ ቅጽ

ጤና ይስጥልኝ፣እኔ ------------------ እባላለሁ፡፡ እዚህ የመጣሁት ከጅማ ዮንቨርሲቲ ነው፡፡ የዚህ ጥናት ዋና ዓላማ በአርባምንጭ ሆስፒታል የስኳር ህመምተኞች በበሽታዉ ያላቸዉ ግንዛቤና አመለካከት፣ እንዲሁም በሽታዉን ለመቆጣጠር የሚያደርጉትን ግላዊ ልምምድ እና የስኳር መጠን ቁጥጥር ሁኔታቸዉን ለማጥናት የተዘጋጀ ነው፡፡ በመሆኑም ይህንን መረጃ ለማግኘት ቃለ መጠይቅ በማካሄድ ላይ እገኛለሁ፡፡

ይህ ጥናት ሲጠናቀቅ የስኳር ህመምተኞችን ጤና ለማሻሻል በሚደረገው ጥረት ከፍተኛ አገዝ ይኖረዋል፡፡ በጥናቱ የማሳትፍዎ የእርስዎን ሙሉ ፈቃደኝነት ሳገኝ ብቻ ነው፡፡ ከእርስዎ የማገኘውን ማንኛውንም መልስ በሚስጥር እጠብቃለሁ፡፡ ስለሙሉ ፈቃደኝነትዎና ስለሚያደርጉት ድጋፍ ሁሉ ከፍተኛ ምስጋና እያቀርብኩኝ ፣ከሁሉም በላይ ይህ ጥናት በእርስዎ ላይ ምንም ዓይነት ጉዳት እንደማያስከትል ማረጋገጥ እወዳለሁ፡፡ በውይቱም ጊዜ የማይስማማዎ ነገር ካለ የማጹረጥ መብትዎ በማንኛውም ሰዓት የተጠበቀ ነው፡፡

የጥናቱ ዓላማና ተግባር ከተብራራልኝ በኋላ ጥያቄውን ለማስተናገድ ተጠይቁ

    ሀ. ተስማምቻለሁ   ለ. አልተስማማሁም

የጠያቂው ስም------------------------------------ ፊርማ   --------------------------

መጠየቁ የተሞላበት ቀን ------------- የተጀመረበት ሰዓት -----------የተጠናቀቀበት ሰዓት --------

 ውጤት፣ 1. ተሟልቷል   2. ተቃውሞ   3. በከፊል ተሞልቷል

የአረጋገጠው ሱፐርቫይዘር ስም -------------------------ፊርማ -----------ቀን --------------

መጠይቅ አቅራቢዎች በተጨማሪ ሊከተሉት የሚገባ መመሪያ፣

1. ውይት ሊካሄድ የሚገባው ተጠያቂዎች መጠይቁን ለማካሄድ ከተስማሙ ብቻ ይሆናል፡፡

2. መጠይቁ የሚሞላው በእስክርቢቶ ብቻ ይሆናል

3. በሚሰጠው መልስ መሰረት በተገቢው መልኩ የምርጫ መልሱን ማክበብ

4. መጠይቁ የሚመለከታቸው ከ15 ዓመት እድሜ በላይ የሆኑ የስኳር ህመምተኞች ሊሆኑ ይገባል፡፡

I. የሚከተሉት ጥያቄዎች የስነ-ህዝብ ገጽታና ማህበራዊ ሁኔታ፣ከህመምተኛዉ ጋር የተያያዙ ሁኔታዎችን፣ ከሀመሙ ጋር የተያያዙ ሁኔታዎችንና ከተቋሙ ጋር የተያያዙ ሁኔታዎችን ለማጥናት የተዘጋጁ ናቸዉ፡፡ ተጠያቂዉን በመጠየቅ፣ አማራጭ መልሶችን በማክበብ ወይም ባዶ ቦታዉን በመሙላት መልሳቸዉ፡፡

ተ.ቁ	ጥያቄዎች	አማራጭ መልሶች

የማህበራዊና የሥነ-ሕዝብ ገፅታዎች

1	ፆታ	1. ወንድ 2. ሴት
2	ዕድሜ	--------------ዓመት
3	ሀይማኖትዎ ምንድነዉ?	1. ፕሮተስታንት 2. አርቶዶክስ 3. ሙስሊም
		4. ካቶሊክ 5. ሌላ /ይጠቀስ_____
4	ብሔረሰብዎ ምንድነዉ?	1. ጋሞ 2. ጎፋ 3. ወላይታ
		4. አማራ 5. ሌላ /ይጠቀስ-------------
5	የጋባቻ ሁኔታ	1. ያገባ 2. የፈታ/የፈታች 3. ባል/ምስት የሞተበት/ባት 4. ያላገባ
6	የወር ገብ	-------------------- ብር
7	የትምህርት ደረጃዎ?	1. ያልተማሩ 2. መደበኛ ትምህርት /ክፍል ይጠቀስ/----------------------
8	የሥራ ሁኔታ	1. የመንግስት ሠራተኛ 2. ገብሬ 3. ነጋዴ 4. የቤት እመቤት 5. ጡረተኛ 6. ሌሎች -------------------

ከህመምተኛዉና መድኃንት ጋር የተያያዙ መረጃዎች

9	የስኳር ህመም እንዳለብት ያወቁት በስንት ዓመትዎ ነዉ.	---------------ዓመት
10	ለስኳር ህመምዎ ህክምና ከጀመሩ ይኼ ስንተኛ ዓመት ነዉ.	---------------ዓመት
11	ለስኳር በመምዎ የሚወስዱት መድኃንት ምንድነዉ.	1. የሚዋጡ እንክብሎች 2. እንሱሊን 3. የሚዋጡ እንክብሎችና እንሱሊን
12	በቀን የምወስዱት የመድኃንት ብዛት ስንት ነዉ.	1. አንድ 2. ሁለት 3. ሶስትና ከዚያ በላይ
13	በቀን ምን ያህል ጊዜ ነዉ. መድኃንት የሚወስዱት	1. አንድ 2. ሁለት 3. ሶስትና ከዚያ በላይ
14	የስኳር ህመም ያለበት የቅርብ ዘመድ	1. እናት፣ አባት፣እህት፣ወንድም 2. አጎት፣አክስት 3. ሌሎች-------------
15	ቤተሰብ የስኳር ህመምም ህክምና ላይ ያላቸዉ እስተዋፅዕ	1. ሁልጊዜ ይረዱኛል 2. እንዳንድ ጊዜ ይረዱኛል 3. ምንም አይረዱኝም
16	አልኮል ጠጥተዉ ያዉቃሉ	1. እጠጣለሁ 2. ትቸዋለሁ 3. አልጠጣም
17	ጪጪት ቅመዉ ያዉቃሉ	1. እቅማለሁ 2. ትቸዋለሁ 3. አልቅምም
18	ስጋራ አጭሰዉ ያዉቃሉ	1. አጨሳለሁ 2. ትቸዋለሁ 3. አላጨስም
19	ቅርብ ጊዜ የተለካዉን የስኳር መጠን የሁለት ወር በተከታታይ (ከመዝገባቸዉ ይወሰድ)	1. ጡዋት/ሳይበሉ የተለኩት የስኳር መጠን------------------ እና -------------- 2. በማንኛዉም ሰዓት የተለኩት የስኳር መጠን---------------እና -----------
20	የሰዉነት ክብደታቸዉ እና ቁመታቸዉ (ከመዝገባቸዉ ይወሰድ)	ኪ.ብደት----------------ኪ.ግ ቁመት --------------ሜትር
	ከህመሙ ጋር የተያያዙ ሁኔታዎች	
21	በስኳር ህመም ምክንያት ሆስፒታል ተኝተዉ ያዉቃሉ	1. አዎ 2. አላዉቅም
22	የስኳር መጠን ማነስ ምልክቶች አጋጥሞዉት ያዉቃሉ	1. አዎ 2. አላጋጠሙኝም 3. ምልክቶቹን አላዎቃቸዉም
23	ከስኳር ህመም ዉጭ ሌላ በህክምና ላይ ያለት ህመም አለብዎት ወይ	1. አዎ 2. የለብኝም
24	ለጥያቄ ቁጥር 18 መልስዎ አዎ ከሆነ ህመሙ ምንድነዉ.	1. የልብ በሽታ (ስሙ ይጠቀስ) --------------------- 2. የኩላሊት በሽታ 3. የጉበት በሽታ 4. ሌሎች

የጤና ተቋሙ አገልግሎት አሰጣጥና አቅርቦት

25	ለስኳር ህመምዎ ክትትል የምያደርጉት ባለሙያዎች (የሙያ ደረጃ)	1. ሀኪም 2. ጤና መኮንን 3. ነርስ 4. ሌሎች----------------

| 26 | በጤና ተቋሙ ምን ያህል ጊዜ የመድኃኒት እጥረት አጋጠመዉት ያዉል | 1. ሁል ጊዜ | 2. አንዳንድ ጊዜ | 3. ምንም እጥረት የለም |

27	**የጤና ባለሙያና የመምተኛ ግንኙነት**		
	መጠይቆች		አዎ	አይደለም
1	የስኳር ክትትል የምያደርግልኝ ባሌሙያ ይረዳኛል		
2	ክትትል የምያደርግልኝ ባሌሙያ ለኔ በቅ ሰዓት ስጦቶ ያዋዬኛል		
3	ክትትል የምያደርግልኝ ባሌሙያ እተማመናለሁ		
4	ክትትል የምያደርግልኝ ባሌሙያዬ ይረዳኛል		
5	ክትትል የምያደርግልኝ ባሌሙያ አኔን ለመርዳት ዝግጁ ነዉ.		
6	እኔና ክትትል የምያደርግልኝ ባሌሙያዬ በስኳር ህመም ባሪያትና ምልከቶች ዙሪያ በደንብ እንወያያለን		
7	ክትትል የምያደርግልኝ ባሌሙያዬን በጹነት ለማናገር እችላለሁ		
8	ክትትል የምያደርግልኝ ባሌሙያ በምሰጠዉ አገልግሎት እረካለሁ		
9	ክትትል የምያደርግልኝ ባሌሙያዬን ሁሌም አገኘዋለሁ		

III. የስኳር ህመምተኞችን የመድኃንት አወሳሰድን ለማጥናት የተዘጋጀ መጠይቅ

መጠይቆች	አዎ(1)	አይደለም(0)
አንዳንድ ጊዜ የስኳር ህመም መድኃንትን ሳይወስዱ ቀርተዉ ያዉቃሉ		
ባለፉት ሁለት ሳምንታት መድኃንትን ሳይወስዱ የፉርበት ቀን አለ		
መድኃንት በመዉሰድዎ ሚከንያት በሽታዉ ያገረሽ መስሎት፤ መዲኃንትን ህክምን ሳያማክሩ አቃርጠዉ ወይም ከታዘዘዉ መጠን ቀንሰዉ ወስደዉ ያዉቃሉ		
መንገድ ስኬዱ መድኃንትን ሳይወስዱ ቀርተዉ ያዉቃሉ		
ትናንትና የስኳር በሽታ መድኃንትን ወስደዋል		
የስኳር ህመምዎ የተሻለ መስሎት መዲኃንትን አቃርጠዉ ያዉቃሉ፤		
የስኳር ህመምዎን ህክምና መመሪያዎችን መከተል ከብደዉ ያዉቃሉ		
ምን ያህል ጊዜ የስኳር ህመምዎን መድኃንት ለመዉሰድ የማስታወስ ችግር አጋጥመዉት ያዉቃሉ		
ሀ. ምንም ለ. በጣም ጥቂት ጊዜ ሐ. አንዳንዴ መ. ብዙ ጊዜ ሠ. ሁል ጊዜ		
ሀ=0 ለ/ሐ/መ/ሠ=1		

9. ተራ ቁጥር II ላሌዉ ጥያቄ መልስ ድምር ዉጤት ሶስትና ከዚያ በላይ ከሆነ መድኃንቶችን ሁል ጊዜ የማይወስዱበት ምክንያት ምንድነዉ.

ሀ. መድኃንቱ ዉድ ስለሆነ

ለ. የአወሳሰድ መመሪያዉ ስላልገባኝ ነዉ.

ሐ. መዉሰድ ስለማላፈልግ

መ. ሁል ጊዜ ስለሚረሳ

ሠ. መድኃንቱ ስለሌለ

ረ. መዋጥ/እንሱሊን መዉጋት ስለማልችል

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IV. የስኳር ህመምተኞች በበሽታዉ ላይ ያላቸዉን ግንዛቤ ለማጥናት የተዘጋጀ መጠይቅ

ጥያቄዎች	አዎ	አይደለም
ጣፋጭ ቀይም ስኳር የበዛባቸዉን ምግቦች ማዘወተር የስኳር በሽታን ያመጣል		
የስኳር በሽታ ዋናዉ መንስኤ እንሱሊን የምባል ንጥረ ነገር ማነስ ነዉ.		
የስኳር በሽታ የሚከሰተዉ ኩላሊት ስኳርን ከሰዉነታችን በሽንት መልክ ማስወገድ ስያቅተዉ ነዉ.		
ኩላሊት እንሱሊን ያመርታል		
የስኳር በሽታ በአግባቡ ካልታከመ በበሽተኛዉ ሰዉነት ዉስጥ ስኳር መጠን ይጨምራል		
የስኳር በሽታ በዘር ልተላለፍ ይችላል		
የስኳር በሽታን በህክምና ማዳን ይቻላል		
ጡዋት/ቁርስ ሳይበሉ የተለኩት ስኳር 210 ብሆን በጣም ከፍተኛ የስኳር መጠንን ያሳያል		
የስኳር መጠንን ለማወቅ ዋነኛዉ መንገድ የሽንት ምርመራ ነዉ.		
መጠነኛ የአካል እንቅስቃስ ማድረግ የእንሱሊንና የለሎች የስኳር በሽታ መድኃንቶችን ፍላጎት ይጨምራል		
ሁለት ዋና ዋና የስኳር በሽታ አይነቶች አሉ፤ 1. በእንሱሊን እጥረት የምመጣና 2. ያለ እንሱሊን እጥረት የምመጣ ናቸዉ.		
በእንሱሊን ምክንያት የምመጡ ጎንዩሽ ጉዳቶች የሚከሰቱት ብዙ ምግብ በመመገብ ነዉ.		
መድኃንቶች ከአካል እንቅስቃሴ እና የተመጣጠነ ምግብ ከመመገብ የተሻለ ስኳርን ይቆጣጠራሉ		
የስኳር ህመም የደም ዝዉዉርን ዘገምተኛ/slow ልያደርግ ይችላል		
ማንኛዉም ቁስል በስኳር ህመምተኞች ቀስ ብሎ ነዉ የሚዲነዉ.		
የስኳር ህመምተኞች የእግር ጥፍራቸዉን ስቆርጡ ጥንቃቄ ማድረግ አለባቸዉ.		
የስኳር ህመምተኞች የመቁረጥ/የመቁሰል አደጋ ከደረሰባቸዉ ቁሱልን በአልኮል ወይም በአዮድን ማጠብ አለባቸዉ.		
የምግብ አዘገጃጀቴ ለአመጋገባብ እንደማደርገዉ ጤንቃቁ ይህል አስፈላግ ነዉ.		
የስኳር ህመም በአግባቡ ካልታከመ ኩላሊትን ልጎዳዉ ይችላል		
የስኳር ህመም የእጅ የእግር እና የጣት መደንዘዝ ልያመጣ ይችላል		
ማንቀጥቀጥና ማላብ የስኳር መጠን ብዛት ምልክቶች ናቸዉ.		
ቶሎ ቶሎ መሽንትና መጠጣት የስኳር መጠን ማነስ ምልክቶች ናቸዉ.		
ጠባብ ፕላስትክ ጫማዎችና ካልስዎች ለስኳር ህመምተኛ ምንም ችግር የለባቸዉም		
የስኳር ህመምተኛ መመገብ ያለነት ምግባ ብዙ ጊዜ ለየት ያለ መሆን አለበት		

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V. የስኳር ህመምተኞች በበሽታዉ ላይ ያላቸዉን አመለካከት ለማጥናት የተዘጋጀ መጠይቅ

መጠይቆች	አዎ	አይደለም
የስኳር ህመምተኛ በመሆኔ አፍራለሁ		
የስኳር ህመምተኛ መሆኔን ማመን ይከብደኛል		
የስኳር ህመምተኛ በመሆኔ ብዙ ጊዜ አዝናለሁ/ይከፋኛል		
የስኳር ህመም እንደሌላቸዉ ሰዎች መስራትም ሆነ መንቀሳቀስ የምችል አይመስለኝም		
የስኳር ህመሜን ለመቆጣጠር የሚያስፈልጉ ነገሮችን ማድረግ ሁል ጊዜ ይከባዶኛል		
በሕይወቴ ሁል ጊዜ ደስተኛ ነኝ		
ማድረግ የምፈልገዉን ማንኛዉም ነገር ማደረግ እችላለሁ		
የስኳር ህመሜ በሕይወቴ ምንም ተዕዕኖ የለዉም		
በማንኛዉም ሕይወቴ ጤናማ ነኝ		
ሁሉም ነገር እስከ አሁን በሰላም አየሄደልኝ ነዉ።		

VI. የስኳር ህመምተኞች የስኳር መጠናቸዉን ለመቆጣጠር የሚያደርጉት ግላዊ ተግባራት ለማጥናት የተዘጋጀ መጠይቅ

ከዚህ በታች ያሉ ጥያቄዎች የስኳር መጠንን ለመቆጣጠር የምደርጉትን ተግባራት ባለፉት ሰባት ቀናት የተመለከቱ ናቸዉ፤ በእነዚህ ቀናት ታመዉ ከሆነ፤ያልታመሙበትን ሌላ ሰባት ቀን ያስቡና ይመልሷቸዉ።

ጤናማ አመጋገብ	የቀናት ብዛት							
	0	1	2	3	4	5	6	7
በአማካይ ምን ያህል ጊዜ ነዉ ባለፈዉ ወር የአመጋገብ ጊዜ ሰሌዳዎን/eating plan ተከትለዋል	0	1	2	3	4	5	6	7
ባለፉት ሰባት ቀናት ምን ያህል ጊዜ፤ አምስትና ከዚያ በላይ ፍራፍሬ እና ቅጠላቀጠል የያዙ ምግቦችን ተመግበዋል	0	1	2	3	4	5	6	7
ባለፉት ሰባት ቀናት ምን ያህል ጊዜ ስብ የበዛባቸዉን ምግቦች፤ለምሳሌ፤ ቀይ ስጋ፤ቅቤ ወይም አይብ ተመግበዋል	0	1	2	3	4	5	6	7
ባለፉት ሰባት ቀናት ምን ያህል ጊዜ፤ ሁል ሰዓ ምግቦችን በተመሳሳይ ሰዓት ልዩነት ተመግበዋል	0	1	2	3	4	5	6	7
ባለፉት ሰባት ቀናት ምን ያህል ጊዜ የአመጋገብ ሰለዳዎን ተከትለሃል	0	1	2	3	4	5	5	7
እንቅስቃሴ ማድረግ								
ባለፉት ሰባት ቀናት ምን ያህል ቀን፤ የ30 ደቂቃና ከዚያ በላይ እናቅስቃስ ያደርጉት	0	1	2	3	4	5	6	7
ባለፉት ሰባት ቀናት ዉስጥ ስንት ቀን (ዋና፤የአግር ጉዞ፤ ሳይክል መንዳት) እንቅስቃሴ ያደርጉት (በቤት አከባብ ከምያደርጉት እንቅስቃሰዎች ዉጭ)	0	1	2	3	4	5	6	7
የስኳር መጠንን መለካት								
ባለፉት ሰባት ቀናት ዉስጥ ስንት ቀን የስኳር መጠንዎን ተለክተዋል	0	1	2	3	4	5	6	7
ባለፉት ሰባት ቀናት ዉስጥ ስንት ጊዜ የስኳር መጠንዎን እንድለኩ በባለሙያ ታዘዋል	0	1	2	3	4	5	6	7
መድኃንቶችን መዉሰድ								
ባለፉት ሰባት ቀናት ዉስጥ፤ ስንት ቀን የእንሱሊን መርፌ ተወጉተዋል	0	1	2	3	4	5	6	7
ባለፉት ሰባት ቀናት ዉስጥ፤ ስንት ቀን የሚዋጡ እንክሎችን ወስደዋል	0	1	2	3	4	5	6	7
ተዛማች ችግሮችን መቀነስ								
ባለፉት ሰባት ቀናት ዉስጥ፤ ስንት ቀን እግርዎን ከታጠቡ በኃላ የጣቶችዎን ዉስጥ አይተዋል	0	1	2	3	4	5	6	7
ባለፉት ሰባት ቀናት ዉስጥ፤ ስንት ቀን የጫማዎን ዉስጥ አይተዋል	0	1	2	3	4	5	6	7
ባለፉት አንድ ዓመት ዉስጥ፤ ስንት ጊዜ የዓይን ምርመራ አድርገዋል	0	1	2	3	4	5	6	7
ባለፉት አንድ ዓመት ዉስጥ፤ ስንት ጊዜ የጥርስ ምርመራ አድርገዋል	0	1	2	3	4	5	6	7
ባለፉት ሰባት ቀናት ዉስጥ፤ ስንት ጊዜ አጭሰዋል	0	1	2	3	4	5	6	7
ጤናማ አኗኗርን መለማመድ								
ባለፈዉ አንድ ወር ዉስጥ፤ ምን ያህል ጊዜ ነዉ ጭንቀትን ለመቆጣጠር የተቸገሩት	0	1	2	3	4	5	6	7
ከስኳር ህመምዎ ጋር በተያያዘ ባለፈዉ አንድ ዓመት ዉስጥ ስንት ጊዜ እርዳታ ጠይቀዋል	0	1	2	3	4	5	6	7
ችግር ፈቺ መሆን								
ባለፈዉ አንድ ወር ዉስጥ ስንት ጊዜ ነዉ ጣፋጭ ምግቦችን ይዘዉ የተጋዙት	0	1	2	3	4	5	6	7