ADDIS ABABA UNIVERSITY

COLLEGE OF HEALTH SCIENCES

SCHOOL OF NURSING AND MIDWIFERY

DEPARTMENT OF NURSING

PREVALENCE OF DIABETIC RETINOPATHY AND ITS ASSOCIATED FACTORS AMONG TYPE TWO DIABETES MELLITUS PATIENTS IN HIWOT FANA SPECIALIZED UNIVERSITY HOSPITAL, HARAR, EASTERN ETHIOPIA, 2021.

BY: FEKADU ABERA (BSc).

A RESEARCH THESIS SUBMITTED TO DEPARTMENT OF NURSING, SCHOOL OF NURSING AND MIDWIFERY, COLLEGE OF HEALTH SCIENCES, ADDIS ABABA UNIVERSITY IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTERS OF SCIENCE IN ADULT HEALTH NURSING.

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JUNE, 2021.

ADDIS ABABA, ETHIOPIA.

APPROVAL BY THE BOARD OF EXAMINATION

This thesis by **"Prevalence of Diabetic Retinopathy and Its Associated Factors among Type Two Diabetes Mellitus Patients in Hiwot Fana Specialized University Hospital, Harar, Ethiopia, 2021"** is accepted in its present form by the board of examiners as satisfying thesis requirement for the degree of masters in Adult Health Nursing.

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ACKNOWLEDGMENT

First of all, I would like to thank Jigjiga University for sponsored me to attend my Master of Science (MSc) and Addis Ababa University, college of health science, school of nursing and midwifery for allowed me to conduct this study. Next, I extend my heartfelt gratitude to my advisors Mr. Yosief Tsige (assistant professor), and Sr. Akilil Hailu (Lecturer) for their guidance, support and a tremendous unreserved constructive comment throughout the proposal and thesis development. My great appreciation also extends to Library staff for their support and patience in getting the literature. I am grateful to physicians, nurses working at the medical diabetic unit for their help and encouragement during data collection. I wish to thank Dr. Jibat Gemida (MD, assistant professor of ophthalmology), and optometrist staff for their help and encouragement throughout the course of the data collection period. I also extend my heartfelt appreciation to all my friends for their constructive suggestion and inspiration. Last but not the least, I would like to extend my heartfelt gratitude to data collectors and respective respondents.

LIST OF ABBREVIATION AND ACRONYMS

AAU Addis Ababa university

AOR Adjusted odds ratio

BDR Baseline Diabetic Retinopathy

BMI Body mass index

BUN Blood urea nitrogen

CCR Creatinine clearance rate

CKD Chronic kidney disease

Cr Creatinine

DR Diabetic Retinopathy

FBS Fasting blood sugar

HbA1c Hemoglobin A1c or Glycated hemoglobin

HFSUH Hiwot Fana Specialized University Hospital

IDF International Diabetes Federation

IRMAS Intra-retinal microvascular abnormalities

NPDR Non-Proliferative Diabetic Retinopathy

PDR Proliferative Diabetic Retinopathy

SBP Systolic blood pressure

TADDS Tool for Assessment of Diabetes and Diabetic Retinopathy

UK United Kingdom

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ABSTRACT

Background: Diabetic retinopathy (DR) is a serious sight-threatening microvascular complication of type two diabetes mellitus. Globally, it is one of the leading causes of irreversible vision loss. Ninety-three million people live with diabetic retinopathy suffer some sort of eye damage worldwide. **Aim**: The aim of this study was therefore to assess the prevalence of diabetic retinopathy and its associated factors among type two diabetes mellitus patients who attend diabetic unit of Hiwot Fana Specialized Hospital, 2021. **Methods:** A cross-sectional study was conducted from February to March 2021 at Hiwot Fana Specialized Hospital, Harar, Ethiopia. Data was collected using semi structured questionnaire and direct eye examination with Slit-Lamp biomicroscopy. Data was analyzed using SPSS for Windows version 20. Logistic regression models were used to identify predictors of diabetic retinopathy. Statistical significance was determined using odds ratio with 95% confidence interval. **Results:** A total of 210 type 2 diabetes patients, the mean age of 46.7 ±12.7 years, participated in this study. The prevalence of diabetic retinopathy was 58 (27.6%) with 95% CI (22-34%). Of these, almost three quarters (72.4%) of DR participants had mild NPDR, around one – fourth (22.4%) of DR participants had moderate NPDR, whereas less than one tenth (3.4%) and (1.7%) of DR participants had severe NPDR and PDR respectively. Being < 60 years old (AOR= 0.28, 95% CI: 0.09, 0.84), having comorbid hypertension (AOR= 8.63, 95% CI: 2.51, 29.75), glycemic control less than 7 (AOR= 0.06, 95% CI: 0.01, 0.28), having family history of DM (AOR= 3.29, 95% CI: 1.02, 10.67), < 5 years diabetes duration (AOR= 0.18, 95% CI: 0.06, 0.61) were factors significantly associated with diabetic retinopathy. **Conclusion:** Our study showed the prevalence of diabetic retinopathy was 27.6%. Diabetic retinopathy was significantly associated with HbAlc ≥ 7%, Being ≥ 60 years old, hypertension, having family history of DM, and ≥ 5 years diabetes duration. Early screening of diabetic retinopathy and giving more attention for type two diabetes patients with those associated factors were recommended.

Key words: Diabetic Retinopathy, Type Two Diabetes Patients, Prevalence, Harar, Ethiopia.

1.INTRODUCTION

1.1 Background

Diabetes mellitus (DM) is a metabolic disorder of carbohydrate, fat, and protein in which there are high blood sugar levels over a prolonged period. It is a complex metabolic syndrome that occurs either when the pancreas does not produce adequate insulin or when the cells of the body are not responding appropriately to the insulin produced. Diabetes is an important public health problem and the most known possible complications of diabetic mellitus includes; heart attack, stroke, kidney failure, leg amputation, vision loss, and nerve damage(1). Currently, diabetes mellitus is the most common cause of both moderate or severe visual impairment and blindness (2).

Type 2 diabetes is well understood as a serious public health concern with an underline impact on human life and health expenditures. Fast economic advance and urbanization have a tremendous impact on escalating the burden of diabetes in different parts of the world (3). The global prevalence of diabetes in 2019 is predicted to be 9.3% (463 million people) escalating to 10.2% (578 million) by 2030 and 10.9% (700 million) by 2045 (4).

World Health Organization (WHO) report indicates that an estimated 422 million adults were living with diabetes in 2014, relatively compared to 108 million in 1980. The global prevalence of diabetes has nearly twofold since 1980, escalating from 4.7% to 8.5% in the adult population matter of fact, this escalation was caused by an unhealthy diet and a sedentary lifestyle. Additionally, this prevalence has incredibly risen faster in low- and middle-income countries than in high-income countries (5).

According to International Diabetes Federation evidence, type 2 Diabetes Mellitus has known incredible rise in numbers over the past 20 years from a global prevalence of 151 million adults (20–79 years) in 2000 to a stupefying 425 million adults in 2017, additionally the estimated prevalence of DM in Ethiopia was 5.2% (6).

International Diabetes Federation has estimated that the number of adults with diabetes in Africa will twofold in 20 years, from 12 million in 2010 to 24 million in 2030. People with DM have a great risk of developing a number of serious life-threatening health problems and complications which increase medical care costs and lower the quality of life. These complications are caused by both macro vascular and microvascular complications for instance, cardiovascular diseases, diabetic eye disease, diabetic nephropathy, diabetic polyneuropathy (7). Globally, the prevalence of blindness is predicted to be 1.5 billion, of which 0.4 million is caused by diabetic retinopathy (DR). As a matter of fact, blindness and visual impairment have reduced globally. However, blindness which is caused by DR doubled from 0.2 million to 0.4 million and moderate–severe visual impairment from 1990 to 2015 (8).

DR is a well-known potentially sight-threatening disease of diabetic mellitus complication in which the retinal microvasculature is associated with prolonged hyper glycaemia (9). It is a progressive disease that can be broadly divided into two stages according to its severity: non proliferative and proliferative. Nonproliferative diabetic retinopathy (NPDR) is characterized by micro aneurysms, cotton-wool spots, intraretinal micro vascular abnormalities, hard exudates and venous beading, whereas proliferative diabetic retinopathy (PDR) is hallmarked by new vascular structure assemble of the optic disc or elsewhere, pre-retinal and vitreous hemorrhage (10).

Diabetic retinopathy is the leading cause of blindness in the middle-aged and elderly (11). The prevalence of diabetic retinopathy among type two DM in Sub Saharan was 15% (12). Early diagnosing diabetes and diabetic retinopathy minimizes the complications which cause irreversible visual impairment. The involvement of population-based educational programs on diabetes, diabetes retinopathy and persistence medical education on diabetes management can ameliorate diabetes care and prevent eye complications (13). Complications of diabetes in Ethiopia have a great risk of morbidity and mortality with incredible consequential economic impact. In fact, the prevalence of diabetes in Ethiopia ranged from 2.0%–6.5% with the low 2% in smaller rural areas (14).

Additionally, Study conducted in Jimma University Hospital shows prevalence of DR was 41.4% (15).

1.2. Statement of the problem

Diabetic retinopathy (DR) is a common microvascular complication of diabetic mellitus which causes irreversible blindness. Worldwide, DR accounts for about 5% of all blindness and afflicted 2 million people throughout the globe (16). Diabetic retinopathy (DR) is a progressive malady of the retinal microvasculature and it is one of the sixth leading causes of global visual impairment (17). The report of IDF showed that diabetic retinopathy is the leading cause of blindness in working-age adults and affects more than one-third of the 425 million adults (20-79 years old) with diabetes (4).

Globally, more than 93 million people suffer from some form of diabetes-related eye damage. This phenomena makes DR the leading cause of new blindness in 25- to 74-year-olds (18). The prevalence of diabetic retinopathy in the UK was 28.3% (19) . On the other hand, in Iran it was 41.9% (20). Furthermore, the number of peoples with visual impairment which is caused by DR is intensifying globally, accounting for an increasing proportion of all blindness. Age-standardized prevalence of DR-related blindness was higher in sub-Saharan Africa and South Asia (21). The prevalence of DR was lowest in Europe at 20.6% , South East Asia at 12.5% and highest in Africa at 33.8%, the Middle East and North Africa at 33.8% and the western Pacific region at 36.2% (22). The prevalence of diabetic retinopathy in Ethiopia was 19.48% (23).

Different solid risk factors associated with progression and severity of DR among type two DM. For instance, independent risk factors for any diabetic retinopathy included, diabetes duration, HbA1c, serum glucose, and systolic blood pressure, treatment with insulin (2, 15, 24, 25). On the other hand, there are studies which indicate significant predictors of diabetic retinopathy include, obesity, age, male sex, lower education level (26-28). The other predictors of DR include higher body mass index, pubertal , pregnancy, cataract surgery (29).

Diabetic retinopathy, which is often early undiagnosed and treated late, has long-term consequences and is increasingly becoming a leading cause of blindness, especially in developing countries (8). However, early detection and prompt treatment allow the prevention of visual impairment due to diabetes (29). As a key intervention, WHO evidence showed that good control of diabetes and hypertension significantly minimizes the risk for diabetic retinopathy (9).

Early screening and treatment can prevent many cases of blindness caused by diabetic retinopathy (10). Despite the fact that early diabetes screening has a significant impact on lowering the risk of diabetic retinopathy, routine early diabetes screening is not a common practice in developing countries (30). Early diagnosis and on-time treatment have a tremendous impact on the prevention of diabetes-related visual impairment (29).

In Ethiopia, there is an insufficient number of studies regarding the prevalence and associated factors of diabetic retinopathy among type two DM (31). Even though, there are studies which investigate the prevalence of diabetic retinopathy and its associated factors in some parts of the country (15, 31-34), in Hiwot Fana Specialized University Hospital there is a paucity of information on the prevalence of diabetic retinopathy among T2DM with its associated factors. For this reason, this study was conducted to assess the prevalence of diabetic retinopathy and its associated factors among adult type two DM patients who attend the diabetic unit in Hiwot Fana Specialized University Hospital.

2. LITERATURE REVIEW

Diabetic retinopathy is a serious sight-threatening disease of the retinal microvasculature associated with prolonged hyperglycaemia and other conditions allied to diabetes mellitus(9).

2.1. Prevalence of Diabetic Retinopathy

According to a cross-sectional study conducted in the United States of America prevalence of diabetic retinopathy and vision-threatening diabetic retinopathy among US adults with diabetes was respectively 28.5% and 4.4% (35). Similarly, a study conducted in the US showed that age- adjusted prevalence of diabetic retinopathy among type 2 diabetes and type 1 diabetes was 9.1 % and 5.6% respectively (36). On the other hand, a study conducted in North-East Poland shows that the prevalence of DR in T2DM, NPDR, PDR, and DME was 23.04%, 17.11%, 1.01%, and 4.81% respectively (37).

A cross-sectional study conducted in Spain showed that the prevalence of diabetic retinopathy among T2DM was 14.9% (38). On the other hand, a cross-sectional conducted on the Island of Funen, Denmark showed that the prevalence of diabetic retinopathy among type two DM was 21.2% (39). A cross-sectional study conducted in Southern Iran revealed that the prevalence of diabetic retinopathy and non-proliferative diabetic retinopathy was respectively 32.8% and 91.7% (26). On the other hand, a cross sectional-descriptive analytical study conducted in Kerman, Iran showed that the prevalence of diabetic retinopathy among type two DM was 45.1% (40). Similarly, a systematic review report in Iran showed the overall prevalence of diabetic retinopathy among type two DM patients was 37.8% (41).

According to an analytical cross-sectional study conducted in Gegharkunik provinces, Armenia the prevalence of diabetic retinopathy was 36.2%, while a total of 90.2% of patients with DR had non-proliferative, 9.8% had proliferative DR (13). A systemic review report in Asia showed that the prevalence of DR, PDR, and NPDR among T2DM was 28%, 6%, and 27% respectively. Similarly, the prevalence of PDR and NPDR in DR patients was 17% and 83%, respectively (42).

A cross- sectional population- based study conducted in rural Southern China showed that the prevalence of DR was 18.2%. Of these, 32.8% were patients with earlier diagnosed diabetes and 12.6% were newly diagnosed patients with T2DM (43). According to cross-sectional study conducted in Beijing, China the prevalence of diabetic retinopathy was 8.1% (27). Across-sectional study conducted in a Rural Area of the Villupuram District of Tamil Nadu, India showed that the prevalence of DR in any eye and both the eye was 32.53%and 31.58% respectively. The severity of DR was moderate 51.9% followed by mild 44.4% and severe 3.7% (28).

Another hospital based cross-sectional study conducted in western India revealed that the overall prevalence of DR in type two DM patients was 33.9%. On the other hand, prevalence of Nonproliferative DR and proliferative DR was 25.5 % and 8.33% respectively (44). A population-based cross-sectional study conducted in Indonesia noted that the prevalence of DR was 43.1%, with mild (9.41%), moderate (7.46%), severe NPDR (11.1%), and PDR (12.1%). Additionally, the prevalence of VTDR was 26.3% (45).

A prospective, non-interventional, case series study in a tertiary level hospital in Kathmandu, Nepal showed that the prevalence of DR was 38 % (46). Another hospital-based retrospective study conducted in a teaching hospital of Biratnagar, Nepal revealed that the prevalence of diabetic retinopathy was 32.39% (47). A cross -sectional study conducted at diabetic center in Taify city showed that 16% had DR (48). On the other hand, a cross- sectional study conducted in Karachi, Pakistan showed that the prevalence of diabetic retinopathy among type 2DM patients was 42.86%. Additionally, in patients with diabetic retinopathy, the prevalence of background retinopathy, pre proliferative DR, proliferative DR, Maculopathy was 56%, 5% ,6%, 25% respectively (49).

A cross sectional hospital-based study conducted in Oman shows the prevalence of diabetic retinopathy, visual-threatening diabetic retinopathy (VTDR) was 31%, 15.4% respectively mild NPDR was 94(21.3%) of 137 DR participant, 20 (4.5%) had moderate–to-severe non-proliferative DR and 23 (5.2%) had proliferative diabetic retinopathy. while diabetic Maculopathy was shown in 59 (13.3%) (50).

According to a study conducted in Sub-Saharan Africa, the prevalence of diabetic retinopathy among type two DM was 15% (12). On the other hand, population based cross sectional survey conducted in the Kastina state of Nigeria revealed that the prevalence of having retinopathy and Maculopathy was 26.2%, in addition, the sight threatening lesion was 7.5% (51).

Cross sectional study conducted in Zambia showed that the prevalence of diabetic retinopathy was 52 %, additionally sight threatening DR and proliferative DR was found in 36% and 5% of type two diabetic respectively (52). A cross- sectional study conducted in Alexanderia -Egypt showed that the prevalence of diabetic retinopathy among type 2DM was 34.6%. Of these 48.3% known type two DM patients and 10.4% were newly diagnosed patients (53). A cross sectional hospital-based study conducted in Khartoum, Sudan revealed that the frequency of DR was 82.6 %, in addition to this prevalence of proliferative diabetic retinopathy (PDR) and non-proliferative diabetic retinopathy(NPDR) was 39.9% and 42.7% respectively (54). Similarly, a descriptive cross sectional hospital-based study conducted in Sudan showed that the prevalence of diabetic retinopathy among type two DM was 72.6 % (55).

In Africa, DR ranges 7%– 62.4%, of which 15% have severe diabetic retinopathy, Although Ethiopia is among the top four countries with the highest adult diabetic populations in sub-Saharan Africa (33). Cross sectional study design conducted in Tikur Anbesa Specialized Hospital among 191 type two diabetic patients shows prevalence of DR was 51.3 % (31). Cross-sectional hospital- based study conducted at Jimma University Hospital shows the prevalence of diabetic retinopathy was 41.4%. Of these, 2.2 % diabetic retinopathy had severe NPDR in addition to this 6% diabetic retinopathy patients had significant macular edema .VTDR was noted in 7.3% of patients (15).

An institution- based cross-sectional study conducted at Debre Markos Referral Hospital among 302 patients shows the prevalence of diabetic retinopathy was 18.9% additionally ,among the diabetic retinopathy patients 75.4% had the non-proliferative type and 37.7% of the patients had visual acuity problems (32).

2.2. Factors associated with diabetic retinopathy among type two DM patients

A study conducted in the US revealed that male sex, increased hemoglobin A1c level, longer year duration of diabetes, insulin use, and raised systolic blood pressure was strongly associated with the presence of diabetic retinopathy (35). According to cross sectional study conducted in Island of Funen, Denmark, there was a positive correlation between severity of retinopathy and duration of diabetes, HbA1c, systolic blood pressure and treatment with insulin (39). Furthermore, cross -sectional study performed in Spain shows that DR was more common in women ($p = 0.0087$) and in older patients ($p < 0.0001$). Duration of disease (OR = 5.3, IC95%, $p < 0.0001$), eGFR < 60 ml/min/1.73 m2 (OR = 2.0, IC95% 1.6–2.4; $p < 0.0001$), levels of HbA1c ≥ 7% (OR = 1.9, $p < 0.0001$) and high blood pressure (OR = 1.6, $p = 0.0032$) was associated with higher risk of DR. DR also occurs frequently in patients taking insulin (32, 6% vs. 10, 2%; $p < 0.0001$) (38).

A cross-sectional study conducted in Southern Iran shows lower education levels (AOR, 0.43; 95%CI, 0.24 to 0.76), overweight (AOR, 1.70; 95% CI, 1.02 to 2.83) or obese (AOR, 1.88; 95% CI, 1.09 to 3.26), diabetes duration between 10 to 20 years (AOR, 2.35; 95% CI, 1.48 to 3.73) similarly, diabetes duration of above 20 years (AOR, 5.63; 95% CI, 2.97 to 10.68), insulin use (AOR, 1.99; 95% CI, 1.27 to 3.10), and having chronic diseases (AOR, 1.71; 95% CI, 1.02 to 2.85) were strongly associated with DR (26).

According to cross sectional population –based study conducted in rural Southern China DR was significantly associated with male gender ($p=0.001$), higher education level ($p=0.043$), longer duration of DM (>10 years vs ≤5 years; OR=8.037, 95%CI 3.467 to 18.631 (43). Study conducted in Beijing , China revealed that disease duration ($p < 0.001$) , BMI ≥24 kg/m2 ($p=0.046$), SBP ($p=0.012$), creatinine clearance rate (CCR) ($p=0.014$), UA ($p=0.018$) and FPG ($P<0.001$) (27).

The study revealed that among T2DM patients the risk of proliferative diabetic retinopathy strongly escalated in smokers (RR = 1.48, $P < 0.001$). On the other hand, in type 2 diabetes, compared with non-smokers, in contrary to T1DM the risk of diabetic

retinopathy strongly decreased in smokers (RR = 0.92, $P = 0.02$) and the risk of proliferative diabetic retinopathy incredibly decreased in smokers (RR = 0.68, $P < 0.001$) (56). A retrospective cross-sectional study conducted in northern China noted that regarding behavioral factors of patients with T2DM like smoking, alcohol consumption, and regular exercise was not predictor factors of DR (57).

A study conducted in rural Korean patients with T2DM type showed that the likelihood of developing diabetic retinopathy increased with the duration of diabetes mellitus (5-10 yrs.: 5.2- fold; greater than 10 yrs.: 10-fold), postprandial glucose levels (> 180 mg/dL: 2.5-fold), and HbA1c levels (every 1% elevation: 1.34-fold) (58). On the other hand, a study conducted in Gegharkunik provinces, Armenia showed that the odds of experiencing diabetic retinopathy were more prevalent in participants those who had insulin use (AOR = 3.24; 95% CI: 1.56–6.75), diabetes duration (AOR = 1.23; 95% CI: 1.16–1.31) and age (AOR = 1.05; 95% CI: 1.02–1.08) (13).

Cross -sectional descriptive- analytical study conducted in Kerman, Iran indicated no significant relationship was observed between retinopathy and sex, age, history of disease, family history, education, and duration of the disease. However, there was a significant relationship (p Z 0.006) between the level of HbA1c and diabetic retinopathy (40). Additionally, cross- sectional study conducted at the hospital of Babol, Iran showed that there is no significant relationship of diabetic retinopathy with; gender, smoking, dyslipidemia, and hypertension however, a study showed that many factors which are associated with retinopathy including age, duration of diabetes, history of ischemic heart disease, nephropathy, neuropathy, insulin consumption, family history of diabetes, body mass index (BMI), serum hemoglobin level, HbA1c, FBS, BUN and creatinine (59).

A study conducted in a Rural Area of the Villupuram District of Tamil Nadu, India showed that the DR prevalence was more prevalent among participants above 60 years' age group (p=0.032) and lesser education level (p=0.057). There was no association between DR and duration of disease, family history of diabetes, treatment regularity, presence of hypertension, visual acuity, or cataract (p>0.05) (28). Additionally, a cross-sectional study conducted among adult type two DM patients in Indonesia revealed that

there was no significant association between sleeping duration, walking distance, vigorous activity, and DR (60).

According to hospital –based cross sectional study conducted in western India hypertension showed a statistically significant association (p-value < O.O5%) (44). A population-based cross-sectional study conducted in Indonesia revealed that the odds of developing DR and VTDR were high in participants those who had longer diabetes duration, higher fasting glucose, presence of hypertension, and foot ulcers (45). A case series study conducted in a tertiary level hospital at Kathmandu, Nepal shows DR was significantly associated with the duration of diabetes (P-value = 0.001) and concurrent hypertension (P value = 0.004) (46) .

Cross-sectional hospital- based study conducted in Khartoum, Sudan shows duration of diabetes, hypertension was found to be absolute risk factors with P- value of 0.007 and 0.003 respectively. Duration of DM of more than 10yrs have more than double risk (p=0.007) , on the other hand having hypertension triples the risk of retinopathy (p=0.003) however , age, BMI, cholesterol, triglyceride and HbA1c were not significant risk factors for DR according to this finding (54).

Study conducted in Khartoum, Sudan indicates living in urban areas (P < 0.004) and duration of diabetes (P < 0.001) was associated with complication of type 2 DM (55). A cross sectional study conducted in Zambia shows Duration of diabetes, random blood glucose, hypertension (JNC grade 2: systolic >160 or diastolic >100) and use of insulin and oral hypoglycaemics have independent association with DR (52). Additionally, study conducted in Tanzania showed that duration of diabetes, systolic blood pressure, random blood sugar and attending governmental diabetic clinics have strong association with diabetic retinopathy (61).

Study conducted in Tikur Anbesa Hospital shows that, DR was strongly associated with T2DM for one year duration (AOR=1.126, 95%CI=1.022, 1.242), male sex (AOR=11.248, 95%CI=1.816, 69.689), participants with HbA1c ≤ 7% (AOR=0.099, 95% CI=0.020, 0.485), client those who visited diabetes unit every month (AOR=0.027,

95%CI=0.003, 0.0253), and client without comorbid hypertension had about 3.2% less chance for diabetic retinopathy than with comorbid hypertension(AOR= 0.039, CI=0.008-0.191) (31).

The study conducted in Jimma University medical center revealed that, the likelihood of developing diabetic retinopathy were five times higher in patients with age 60 years and above than patients under 60 years of age (AOR = 5.04: 95%CI; 1.83, 13.87), illiterate diabetic patients had seven times higher odds of experiencing diabetic retinopathy than literates (AOR = 7.17, 95%: CI 2.61, 19.70). Furthermore, Systolic Blood Pressure level of 140 mmHg and above (AOR: 3.38, 95%CI: 1.26, 9.05), diabetic patients with poor blood glucose control (AOR: 9.08, 95%CI: 3.7, 22.29) were nine times higher odds of developing diabetic retinopathy than those who had good glycemic control, respondents who had a family history of DM and who had other micro-vascular complications AOR = 3.95; 95%CI: 1.64, 9.54), (AOR = 3.76; 95%CI: 1.33, 10.66) respectively were significantly associated with DR, similarly the odds of developing diabetic retinopathy were decreased by 79 % (AOR = 0.21, 95%CI: 0.08, 0.514) in patients with poor cholesterol level than diabetic patients who had a good serum cholesterol level (62).

Cross-sectional Hospital based study conducted at Jimma University Hospital shows that a statistically significant association between diabetic retinopathy and duration of diabetes, fasting blood sugar, and systemic blood pressure ($p < 0.05$) (15). Furthermore, a cross-Sectional Study conducted at Debre Markos referral hospital revealed that, poor glycemic control (AOR 4.58, 95% CI 1.86–11.31), above 10 years' diabetes duration (AOR 3.91, 95% CI 1.86–8.23), body-mass index greater than 25 kg/m2 (AOR 3.74, 95% CI 1.83–7.66), and hypertension (AOR 3.39, 95% CI 1.64–7.02) were strongly associated with diabetic retinopathy (32).

A study conducted at Arbaminch General Hospital showed the hazard of developing DR was more than four times higher for patients with baseline SBP level >140 mmHg than their counterparts (AHR = 4.1: 95% CI; 1.76–9.44). A hazard of developing DR was increased by 0.2% when fasting plasma glucose level increase by 1 mg/dl (AHR = 1.002: 95% CI; 1.00–1.003) (34).

2.3. Summary

Diabetic retinopathy (DR) is a common sight-threatening microvascular complication of diabetes mellitus. Globally, it is one of the leading causes of visual impairment. Its prevalence is rising additionally, causes blindness and visual impairment especially in developing countries. Currently, 93 million people live with diabetic retinopathy worldwide. Diabetic retinopathy has an enormous negative impact on the quality of life. Population -based educational programs on diabetes, diabetes retinopathy and diabetes management can ameliorate diabetes care and prevent eye complication. Studies conducted in different parts of the world found out socio-demographic, treatment modality, diabetic care, behavioral factors and clinical factors are typical indicators of DR in T2DM.

2.4. Conceptual frame work

This conceptual frame work is developed by reviewing different literatures(15, 31, 32, 34, 59) and through guideline for screening diabetic retinopathy. the following diagram indicates association between diabetic retinopathy and socio -demographic factors, clinical factors, treatment modalities, diabetic care and behavioral factors.

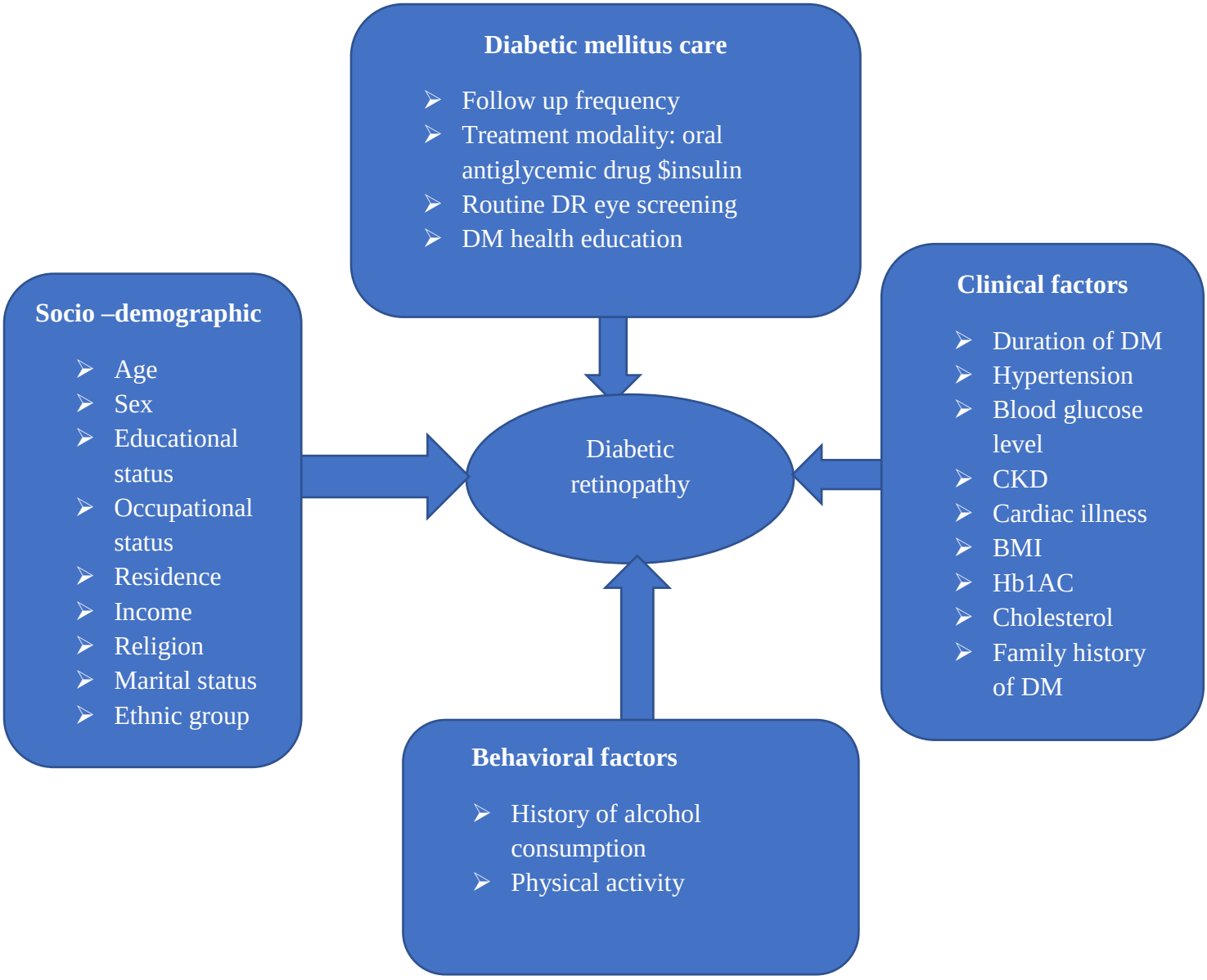

Figure 1. Conceptual frame work for assessment of the prevalence of diabetic retinopathy and its associated factors among type two diabetes mellitus patients in HFSUH, Ethiopia, 2021

3. JUSTIFICATION OF THE STUDY

Diabetic retinopathy is a serious sight-threatening microvascular complication of diabetes. The impact of diabetic retinopathy on diabetic patients is well documented in industrialized countries. However, in Sub Saharan Africans, including Ethiopia, there is a paucity of studies regarding the burden of diabetic retinopathy among diabetic patients. Additionally, knowing the prevalence of diabetic retinopathy and its associated factors has a tremendous impact on the outcome of health service quality, particularly among diabetic patients. knowing the correction of diabetic retinopathy leads to improved quality of life and prevents irreversible visual impairment due to complications of diabetic retinopathy. Globally, the enormous impact of diabetes on retinopathy has been well documented. However, studies on the prevalence of diabetic retinopathy and its associated factors among type two diabetic mellitus have not been well understood in the study area. Therefore, the purpose of this study was to assess the prevalence of diabetic retinopathy and its associated factors among type two diabetic mellitus in HFSUH, Harar, East Ethiopia, 2021.

4. SIGNIFICANCE OF THE STUDY

The finding of this study will deliver information on the risk factor of diabetic retinopathy to the nursing profession and other health workers in the study area to improve diabetic retinopathy care and it gives evidence-based data of prevalence and associated factors of diabetic retinopathy among type 2 DM. Investigating and knowing the prevalence of diabetic retinopathy will help to comprehend the degree of DR impact on T2DM patients and, accordingly, it will help to develop a well-organized treatment guide line to tackle visual impairment caused by complications of T2DM. Furthermore, the data from this study will be used as a baseline for HFSUH in order to revise or strengthen their plan for diabetic retinopathy in type 2 DM. T2DM adult patients who are at risk of developing diabetic retinopathy will benefit directly or indirectly from this study because recommendations will be made to HFSUH based on the study findings; it can also serve as baseline information for other studies with similar interests in the future for research purposes; and it serves as baseline data for policymakers.

5. OBJECTIVES

5.1. General objective

- To assess the prevalence of diabetic retinopathy and its associated factor among adult type 2 DM patients attending diabetic unit of HFSUH, Harar, Eastern Ethiopia, 2021.

5.2. Specific objectives

- To determine the prevalence of diabetic retinopathy among adult type 2 DM patients.
- To identify factors associated with diabetic retinopathy.

6. METHODS AND MATERIALS

6.1. Study Area

Harar Town is a historical site located 526 kilometers east of Addis Ababa capital city of Ethiopia. According to the central statistical office, the total population of Harari Regional State in 2007 was 183,415 people, with 91,099 women and 92,316 men. It is divided into nine districts, three of which are urban and six of which are rural. Four government hospitals, eight public health facilities, and 20 health posts are available. Hiwot Fana Specialized University Hospital (HFSUH) is one of the oldest hospitals in Ethiopia, which was established during the occupation of Italian soldiers (1928-1933). Currently the hospital serves about 5.2 million people around Harar and neighboring regions like Dire Dawa administrative council, Oromiya and Ethiopian Somali Regional State. It serves as a teaching center of eastern Ethiopia and delivers different health services to the community, provides inpatient, outpatient, emergency additionally, it has different specialty clinics which give follow up service. Among those, diabetic follow up clinic were selected as a study unit for this study.

6.2. Study Period

The study was conducted from February to March, 2021.

6.3. Study Design

Hospital based cross sectional study design

6.4. Population

6.4.1. Source Population

All type two DM patients who are on follow up at HFSUH.

6.4.2. Study Population

All type two DM patients who attended diabetic unit in HFSUH during the study period.

6.4.3. Study subject

All selected type 2 DM patients who fulfill the inclusion criteria.

6.5. Inclusion and Exclusion criteria

6.5.1. Inclusion criteria

All adult Type 2 DM patients age ≥18 years who attended diabetic unit in HFSUH during the study period and on anti-diabetic medication.

6.5.2. Exclusion criteria

Patients who were critically ill and not volunteer to participate.

6.6. Sample Size Determination

Sample size was calculated by using single population proportion formula and added 10% estimated nonresponse rate made a final sample size of 210, by the following assumption:

$$n = \frac{Za/2^2 \ p(1-p)}{d^2} = \frac{(1.96^2)\ 0.189\ (1-0.189)}{0.05^2}$$

$$nf = \frac{ni}{1+\frac{ni}{N}} = \frac{236}{1+\frac{236}{1000}} = 191 + 10\% = 210$$

n= Estimated sample size

P= anticipated proportion of diabetic retinopathy 18.9%, taken from a study conducted in Debre Markos Referral Hospital, Northwest Ethiopia (32)

Zα/2 = value of standard normal distribution (Z-statistic) at the 95% confidence level (α= 0.05) which is 1. 96,

d= Margin of error 5% (0.05);

10% = a contingency for incomplete data

The total sample size of the study population was, 210.

6.7. Sampling Procedures

A total of 210 adults with type 2 diabetes were enrolled from the list of outpatients attending at diabetic unit in HFSUH using systemic sampling method. The kth value in the systematic sampling procedure was calculated by dividing source population by the total sample size. The kth value was calculated based on the source population monthly attended in diabetic unit of HFSUH. The kth value for T2DM was 2 from the list of 1 to 2 T2DM patients, the first patient was selected by using lottery method, then data was collected from every second patient starting from the first patient selected by lottery method and continued until the desired sample size was obtained. The patient registry was used as a sampling frame.

6.8. Variables

6.8.1. Dependent Variable

- Diabetic retinopathy

6.8.2. Independent Variables

- Socio demographic:

  Age, Sex, Residence, Ethnic group, Religion, Marital status, Educational Status, occupational status, Monthly income of patients, family history of DM.

- DM care:
  - Attending health education regarding diabetic retinopathy, Frequency of visit, Routine DR eye screening, Treatment modality
- Clinical factors
  - Hypertension, Cholesterol, Blood glucose level, HbA1C, BMI, Duration of illness, CKD, Cardiac illness.

- Behavioral factors:
  - History of alcohol consumption
  - Physical activity

6.9. Operational Definition

Diabetic retinopathy is considered when the presence of any characteristic lesions of the following are detected: micro aneurysms, hemorrhage, hard exudates, cotton-wool spots; retinal vein beading changes, microvascular abnormalities in the retina, and/or neovascularization lesions on fundus images. The minimum criterion for diagnosis of DR is the presence of at least one definite micro aneurysm in any photographed field (63).

1.**Non-Proliferative Diabetic Retinopathy (NPDR**) : the presence of micro aneurysm without any formation of abnormal new blood vessels on retinal camera examination (64).

I. **Mild NPDR**: the presence of microaneurysms only on retinal camera examination.

II**. Moderate NPDR**: on retinal camera examination the presence of microaneurysms and other signs (e.g., dot and blot hemorrhages, hard exudates, cotton wool spots), but less than severe nonproliferative DR.

III. **Severe NPDR**: presence of moderate nonproliferative diabetic retinopathy with any of the following:

- intraretinal haemorrhages (≥ 20 in each quadrant)
- definite venous beading (in two quadrants)
- intraretinal microvascular abnormalities (in one quadrant)
- no signs of proliferative retinopathy

2.**Proliferative Diabetic Retinopathy (PDR):** the presence of severe nonproliferative diabetic retinopathy and one or more of the following on retinal camera examination(64).

- neovascularization
- vitreous/ pre retinal hemorrhage

❖ Physical activity was defined in the following ways (65).

- **Physical inactivity**: anyone who does not perform any form of physical activity for at least 10 min per day (65).
- **Low physical activity**: anyone who performs activities (walking, running, or cycling) less than five days for at least 30 min per day or vigorous intensity activities (like carrying or lifting heavy loads or digging) less than three days for at least 20 min per day (65).
- **Moderate physical activity**: anyone who performs moderate activity for more than five days for at least 30 min per day or vigorous intensity activity more than three days for at least 20 min per day (65).

❖ Alcohol consumption was defined based on National Institute on Alcohol Abuse and Alcoholism (66).

- Nondrinkers (abstainers, or no alcohol consumption history),
- Moderate drinkers (up to one drink/day for women and up to two drinks/day for men), and
- Heavy drinkers (>1 drink/day for women and >2 drinks/day for men)

6.10. Data Collection Tools

The data collection instrument was adopted and modified by reviewing different literature which were designed to seek information pertaining to socio demographic factors, clinical factors, treatment modality, behavioral factors and diabetic care. Data was collected using semi-structured questionnaire and Slit-Lamp biomicroscopy examination. The developed English language semi- structured questionnaire was translated into Amharic and Afaan Oromo language. It was translated back to English language. The questionnaire was modified further after a pre-test was conducted.

6.11. Data Collection Procedure

Data was collected by one Optometrist and two Bsc Nurse who have experience in DR screening and who are at work in the study area during the study period. Type 2 DM patients who attended diabetic unit of HFSUH and fulfilled inclusion criteria were examined by Slit-Lamp biomicroscopy of the posterior pole using contact lens after dilation of pupil with tropic amide 1% eye drop. Additionally, the patient chart was reviewed for needed laboratory investigation.

6.12. Data Quality Control

Pretest was done on 5% of the total sample size at Jugla general hospital to assess whether the checklist items are easily understood by the data collector. Careful modification of the checklist was done before the main study began to improve data quality. One Optometrist and two Bsc Nurse were recruited for the data collection. Training was given for one days, regarding the research tool and how to collect data from the patient chart. Information exchange and close supervision by the principal investigator was made on a daily basis in order to correct problems during the data collection time, frequent checking of information collected for errors, missing values, and its consistency in order to avoid ambiguity daily. Coding and data cleaning was done by the principal investigator.

6.13. Data Processing and Analysis

All the interviewed semi-structured questionnaires and results of Slit-Lamp bio microscopy examination were checked visually by the principal investigator. Data was coded, entered and cleaned using Epi Data version 3.1 software. Double entry was made to cross check the data for completeness before analysis. The entered data was exported and analyzed with Statistical Package for Social Science (SPSS) version 20 software.

Descriptive statistics was performed to identify the distribution of socio-demographic characteristics of the study participants. Bivariate logistic regression was used to assess the association between dependent and independent variables. To control confounding effects, those variables having p-value of < 0.25 were included in the multi-variable analysis. The level of statistical significance was declared for a variable having p-value < 0.05.

6.14. Ethical Consideration

Prior to the commencement of data collection, ethical clearance and approval was obtained from the Institutional Review Board (IRB) of the College of Health Sciences of Addis Ababa University. Official letter was obtained from School Nursing and Midwifery, Department of Nursing. Clear description of the study title, procedure and duration, possible risks and benefits of the study was explained for each study participant. Their rights during the interview were also guaranteed.

After explaining the purpose and possible benefit of the study, oral and written informed consent was obtained from each patient before starting the interview. The study participants were informed about their rights to refuse to join, ask any question or withdraw at any time during the data collection process without any fear. The information of participants was kept confidential.

6.15. Dissemination of the Result

The finding of this study will be submitted and presented to Addis Ababa University College of health sciences, department of nursing. Findings from this study will be delivered to the HFSUH. The manuscript of this study will be submitted to a national or international peer reviewed journal for possible publication and it will also be presented on scientific conferences.

7. RESULTS

7.1. Demographic, Clinical, Behavioral, Treatment modality and Diabetic care related characteristic of type two DM patients.

7.1.1. Socio-Demographic Characteristics of the Participants.

A total of 210 adult type 2 DM patients who attended diabetic unit at HFSUH were included in this study making a response rate of 100%. Of these, more than half (53.8 % and 53.3%) were female and less than 60 years old respectively. Regarding their marital status around three-quarters (78.1%) were married, whereas 20 (9.5%) were never married. The mean age (± standard deviation) of participants were 46.7 ±12.7 years. Nearly two-third (61.4 %) were urban dwellers. One-third (32.9%) were government employees, more than half (58.6 %) had completed college education.

Table 1. Sociodemographic characteristics of type two DM patients who attended diabetic unit at Hiwot Fana Specialized University hospital, Harar, Ethiopia, 2021 (n=210)

Variable	**Category**	**Diabetic Retinopathy**		**Total N (%)**
		Yes	**No**	
		N (%)	N (%)	
Sex	Male	41 (19.5)	56 (26.7)	97 (46.2)
	Female	17 (8.1)	96 (45.7)	113(53.8)
Age	<60 Years	13 (6.2)	99 (47.1)	112(53.3)
	≥60 years	45(21.43)	53(25.24)	98 (46.7)
Monthly income	Less than 3700	39 (18.6)	108(51.4)	147(70)
	Greater than 3700	19 (9)	44 (21)	63 (30)
Residence	Urban	34 (16.2)	95 (45.2)	129(61.4)
	Rural	24(11.43)	57(27.14)	81 (38.6)
Occupation	Government employee	14 (6.7)	55 (26.2)	69 (32.9)
	Daily laborer	17 (8.1)	33 (15.7)	50 (23.8)
	Merchant	12 (5.7)	22 (10.5)	34 (16.2)
	Farmer	15 (7.14)	41(19.52)	56 (26.7)

	Student	0	1 (0.5)	1 (0.5)
Marital status	Single	2 (0.95)	18 (8.6)	20 (9.5)
	Married	50 (23.8)	114(54.3)	164(78.1)
	Divorced	6 (2.9)	14 (6.6)	20 (9.5)
	Widowed	0	6 (2.9)	6 (2.9)
Educational status	Unable to read and write	10 (4.8)	9 (4.3)	19 (9)
	Primary school	2 (0.95)	9 (4.3)	11 (5.2)
	Secondary school	21 (10)	36 (17.1)	57 (27.1)
	College and above	25 (11.9)	98 (46.7)	123(58.6)

7.1.2. Clinical Factors of Participants.

Regarding duration of diabetes mellitus, 121 (57.6 %) were with diabetic duration of less than 5 years, whereas the remaining 89 (42.4%) were with diabetic duration of 5 years and above. One-third (31%) of participants had a history of hypertension. Less than one-tenth (5.7 %) of participants were diagnosed as having micro-vascular complication of both renal and heart disease. Mean fasting blood glucose was 185.1 ± 75 mg/dl, and more than half (51.9 %) of participants had seven and above glycemic control. More than half (57.1 %) of the participants had a body mass index (BMI) of 18.5-25 kg/m^2. Whereas, 41% of them had a body mass index of greater than 25 kg/m^2. Near to half (44.8%) of participants had a family history of DM and only 41(19.5 %) of them had developed DR (**Table 2**).

Table2. Clinical factors of type two diabetic patients who attended diabetic unit at Hiwot Fana Specialized University Hospital, Harar, Ethiopia, 2021 (n=210)

Variable	Category	Diabetic Retinopathy		Total (%)
		Yes (%)	No (%)	
Hypertension	Yes	37 (17.6)	28 (13.3)	65 (31)
	No	21 (10)	124 (59)	145 (69)
Duration of DM in (years)	<5 years	8 (3.8)	113(53.8)	121(57.6)
	≥ 5 years	50 (23.8)	39 (18.6)	89 (42.4)
CKD	Yes	4 (1.9)	8 (3.8)	12 (5.7)
	No	54 (25.7)	144(68.6)	198(94.3)
Chronic cardiac illness	Yes	0	12 (5.7)	12 (5.7)
	No	58 (27.6)	140(66.7)	198(94.3)
Family history of DM	Yes	41(19.52)	53(25.24)	94 (44.8)
	No	17 (8.1)	99 (47.1)	116(55.2)
HbA1C	<7	5 (2.4)	96 (45.7)	101(48.1)
	≥7	53 (25.2)	56 (26.7)	109(51.9)
Body mass index	<18.5kg/m^2	0	4 (1.9)	4 (1.9)
	18.5-25 kg/m^2	20 (9.5)	100(47.6)	120(57.1)
	>25kg/m^2	38 (18.1)	48 (22.9)	86 (41)

7.1.3. Behavioral Factors of Participants.

More than one-third (42.4%) of participants had performed moderate physical activity. But, 79 (37.6%) of the participants performed low physical activity. One hundred ninety-one (91.4%) of the participants were nondrinkers (**Table 3**).

Table3. Behavioral factors of type two diabetic patients who attended diabetic unit at Hiwot Fana Specialized University Hospital, Harar, Ethiopia, 2021(n=210)

Variable	**Category**	**Diabetic Retinopathy**		**Total (%)**
		Yes (%)	**No (%)**	
Drinking status	Non drinkers	52(24.8)	140(66.7)	192(91.4)
	Moderate drinkers	1(0.5)	6 (2.9)	7 (3.3)
	Heavy drinkers	5 (2.3)	6 (2.9)	11 (5.2)
Physical activity	Physically inactive	14 (6.7)	28(13.3)	42 (20)
	Low physical activity	18 (8.6)	61 (29)	79 (37.6)
	Moderate physical activity	26(12.4)	63 (30)	89 (42.4)

7.1.4. Diabetic Care Related Factors of Participants.

Among study participants, half (49 %) of them were visiting health institution every three month for DM follow up, whereas more than one-fourth (28.6 %) of them were visiting health institution every one month and near to one-fourth (22.4%) were visiting health institution every two month. More than one- fourth (27.1%) of participants had a history of dilated eye checkup, whereas the remaining three-quarter (72.8%) of participants had no checkup. A total of 133 (63.3 %) were not attended diabetic health education which is given in the hospital, whereas the remaining about one-third (36.4 %) of them attended diabetic health education which was given in the hospital **(Table 4).**

Table4. Diabetic care related factors of type two diabetic patients who attended diabetic unit at Hiwot Fana Specialized University Hospital, Harar, Ethiopia, 2021 (n=210).

Variable	**Category**	**Diabetic Retinopathy**		**Total (%)**
		Yes (%)	**No (%)**	
History of dilated eye check up	Yes	12 (5.7	45(21.4)	57(27.1)
	No	45(21.4)	108(51.4)	153(72.8)
Health education about DM	Yes	8 (3.8)	69 (32.9)	77 (36.7)
	No	50(23.8)	83 (39.5)	133(63.3)
Follow up frequency	Every one month	8 (3.8)	52 (24.8)	60 (28.6)
	Every two month	19 (9.1)	28 (13.3)	47 (22.4)
	Every three month	31(14.8)	72 (34.3)	103 (49)

7.1.5. Treatment Modality of the Participants.

Concerning treatment modality, more than one third (38.6 %) of participants used insulin alone, whereas nearly a quarter (22.4 %) of participants used oral antiglycemic agents.

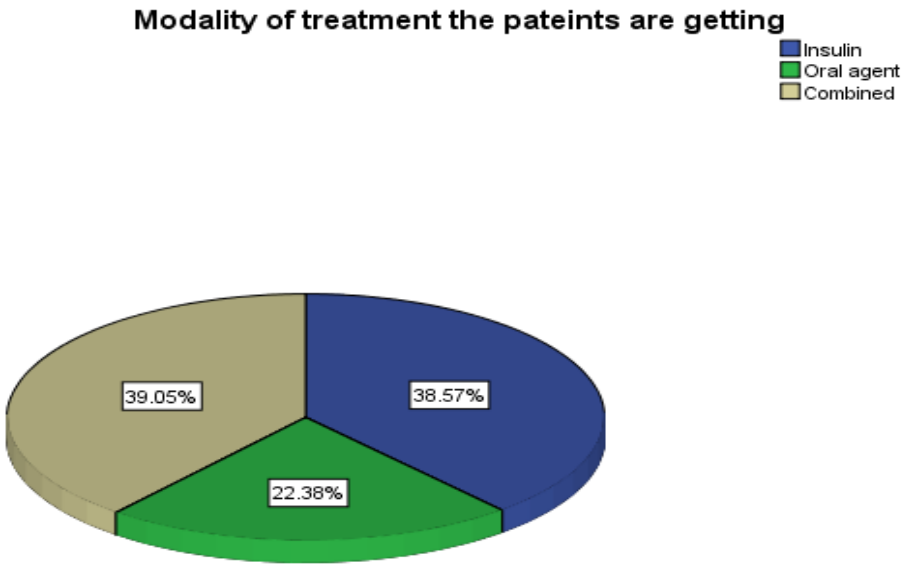

Figure 2. Modality of treatment of type two diabetic patients who attended diabetic unit at Hiwot Fana Specialized University Hospital, Harar, Ethiopia, 2021 (n=210).

7.2. Prevalence of Diabetic Retinopathy among adult type two Diabetes Mellitus patients

In the current study, 58 (27.6%) of the study participants had DR (Figure 3). Among those who had DR, three-quarter (72.4 %) of the participants had mild NPDR, one – fourth (22.4%) had moderate NPDR and less than one-tenth (3.4%, 1.7%) had severe NPDR and PDR respectively (Table **5**).

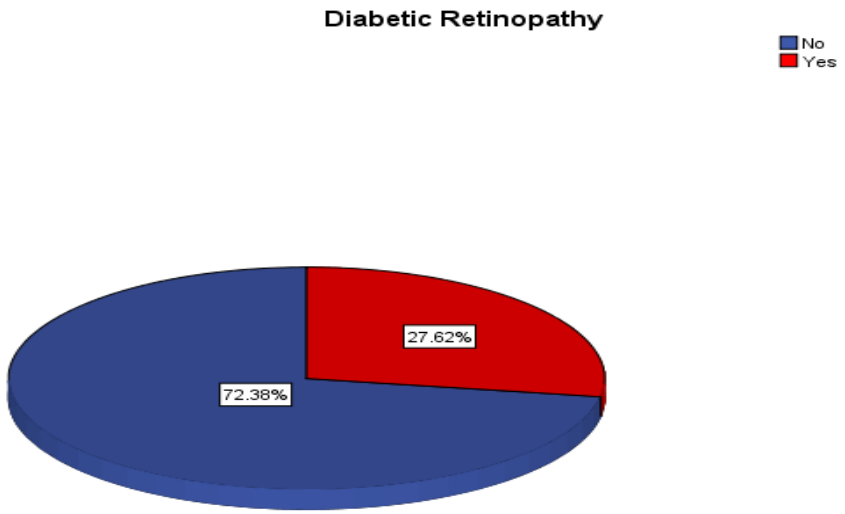

Figure 3. Prevalence of Diabetic retinopathy among adult type two Diabetes Mellitus patients at Hiwot Fana Specialized University Hospital, Harar, Ethiopia, 2021.

Table5. The prevalence of Classification of Diabetic Retinopathy in the affected eye among adult type two Diabetes Mellitus patients who attended diabetic unit at Hiwot Fana Specialized University Hospital, Harar, Ethiopia ,2021 (n=210).

Diabetic Retinopathy	Frequency	Percent
1.Normal (no DR)	152	72.38
2.Mild NPDR	42	20
3.Moderate NPDR	13	6.19
4.Severe NPDR	2	0.95
5.PDR	1	0.48
Total	210	100%

7.3. Factors associated with Diabetic Retinopathy among type two DM patients.

To identify factors associated with diabetic retinopathy among type two DM patients, logistic regression model was used. The variables that were used first correlated with bivariate logistic regression and that had a P<0.25 were used for the multiple logistic regression analysis as independent variables. On bivariate analysis, sex, mode of treatment, comorbid hypertension, fasting blood glucose, family history of DM, age, duration of DM illness, glycemic control, educational status of respondent, body mass index, number of health institution visit were significantly associated with DR.

After obtaining statistically significant variables at p<0.25 in binary logistic regression analysis, multiple logistic regression analysis was carried out to see the independent predictors of diabetic retinopathy. The multi variable logistic regression was carried out by taking diabetic retinopathy as a covariate in addition to those variables where significant association was obtained in binary logistic regression.

After adjusting potential confounders, comorbid hypertension, duration of DM illness, having a family history of DM, age and HbA1c were independent predictors of DR. However, mode of treatment, fasting blood glucose, sex, educational status of participants, body mass index, number of health institution visit were lost their significance.

Type two diabetes patients with a history of comorbid hypertension had around nine times higher odds for diabetic retinopathy (AOR= 8.63, 95% CI: 2.51, 29.75) as compared to patients without history of comorbid hypertension while adjusting for other variables in the model. The likelihood of experiencing DR were 3.29 times higher among participants with family history of DM (AOR= 3.29, 95% CI: 1.02, 10.67) compared to those who had no family history of DM. The odds of developing DR were decreased by 72% (AOR= 0.28, 95% CI: 0.09, 0.84) among participants aged less than 60 years compared to those aged 60 and above while adjusting for other variables in the model. The likelihood of developing DR were decreased by 82 % (AOR= 0.18, 95% CI: 0.06, 0.61) among participants whose duration of DM illness was less than five years compared to those whose duration of DM was five years and above. Keeping other variables in the model constant the odds of experiencing DR were decreased by 0.06 among type 2 DM patients with HbA1c less than 7% (AOR= 0.06, 95% CI: 0.01, 0.28) as compared to those with HbA1c 7 % and above (**Table 6).**

Table 6. Bivariable and multivariable logistic regression analysis of DR among adult type two DM patient at Hiwot Fana Specialized University Hospital, Harar, Ethiopia ,2021 (n=210).

Variable	Category	Diabetic retinopathy		COR (95% CI)	AOR (95% CI)	p-value
		Yes (%)	No (%)			
Sex	Male	41 (19.5)	56 (26.7)	4.13 (2.15, 7.96)	2.134 (0.7, 6.51)	0.183
	Female	17 (8.1)	96 (45.7)	1	1	
Age	<60 Years	13 (6.2)	99 (47.1)	0.16 (0.08, 0.31)	**0.28 (0.09,0.84)**	**0.023***
	≥60 years	45(21.43)	53 (25.24)	1	1	
Hypertension	Yes	37 (17.6)	28 (13.3)	7.803 (3.98, 15.32)	**8.63 (2.51, 29.75)**	**0.001***
	No	21 (10)	124 (59)	1	1	
Follow up frequency	Every one month	8 (3.8)	52 (24.8)	0.36 (0.15, 0.84)	0.48 (0.09, 2.28)	0.099
	Every two month	19 (9.1)	28 (13.3)	1.58 (0.77, 3.23)	1.83(0.49,6.75)	0.494
	Every three month	31 (14.8)	72 (34.3)	1	1	
Duration of DM in (years)	<5 years	8 (3.8)	113 (53.8)	0.06 (0.02, 0.13)	**0.184 (0.06, 0.61)**	**0.006***
	≥ 5 years	50 (23.8)	39 (18.6)	1	1	
Mode of treatment	Insulin alone	21(10)	60 (28.6)	1.34 (0.65 ,2.78)	1.71(0.45, 6.46)	0.428
	Oral antiglycemic	20 (9.5)	27 (12.9)	2.83 (1.29, 6.22)	3.59 (0.79,16.25)	0.098
	Combined	17 (8)	65 (31)	1	1	
HbA1C	<7	5 (2.4)	96 (45.7)	0.06 (0.02, 0.15)	**0.06(0.013,0.283)**	**0.000***
	≥7	53 (25.2)	56 (26.7)	1	1	
FBS				1.004(1.00, 1.01)	1.003(0.996,1.011)	0.386
Body mass index	<18.5 kg/m^2	0	4 (1.9)			0.999
	18.5 25kg/m^2	20 (9.5)	100 (47.6)	0.25 (0.13,0.48)	0.998(0.316,3.154)	0.997
	> 25 kg/m^2	38 (18.1)	48 (22.9)	1	1	

Family history of DM	Yes	41(19.52)	53 (25.24)	4.51 (2.34,8.69)	**3.29 (1.02, 10.67)**	**0.047***
	No	17 (8.1)	99 (47.1)	1	1	
Educational status	Unable to read and write	10 (4.8)	9 (4.3)	4.37 (1.59,11.86)	1.66 (0.26,10.78)	0.597
	Primary	2 (0.95)	9 (4.3)	0.87 (0.18,4.29)	1.77 (0.104, 3.002)	0.692
	Secondary	21 (10)	36 (17.1)	2.29 (1.14, 4.58)	0.45 (1.62 0.46)	0.453
	College and above	25 (11.9)	98 (46.7)	1	1	

Note: ***P-value < 0.05.**

Abbreviations: COR, Crude odds ratio; AOR, Adjusted odds ratio; CI, Confidence interval; FBS, Fasting blood sugar; HbAlc, Hemoglobin A1c.

8. DISCUSSION

The current study aimed to explore the prevalence of diabetic retinopathy and its associated factors among type two DM patients who attended the diabetic unit at Hiwot Fana Specialized University Hospital, Harar, Ethiopia. According to this study, the prevalence of DR among type two diabetes patients was 27.6 % which is in line with a study conducted in the US (28.5%) (35), Asia (28%) (42), Nigeria 26.2 % (51). However, it is higher than study conducted in, US (9.1 %) (36), North East Poland (23.04%) (37), Spain (14.9 %) (38), Denmark(21.2 %) (39), Rural Southern China (18.2%) (43), Beijing, China (8.1%) (27), Taify City (16%) (48), Debre Markos Referral Hospital (18.9 %) (32), Arbaminch General hospital 13% (34). The possible explanation for this variation might be due to the differences in the Study period, health-seeking behavior among the respondent, study area, diagnostic methods, discrepancy in self-care practice might be possible explanations for this discrepancy of the prevalence of diabetic retinopathy among type two DM patients.

On the other hand, this study is lower than study conducted in Armenia (36.1%) (13), Iran (45.1%) (40), Pakistan (42.86%) (49), Zambia (52%) (52), Egypt (34.6%) (53), Sudan (82.6%) (54), Jimma University Hospital, Ethiopia (41.4%) (15), Tikur Anbesa Specialized Hospital, Addis Ababa, Ethiopia (51.3%) (31). The possible reason may be due to a difference in methodology, sample size, and study population.

The current study indicated that among DR patients, 98.29 % had non-proliferative DR. Of these, one-fourth (22.4%) had moderate non-proliferative DR, three-quarter (72.49%) had mild non-proliferative DR, one-tenth (3.4%) had severe non-proliferative DR and (1.7%) of DR patients had proliferative DR. In our finding the result of non-proliferative DR is higher than study conducted in North-East Poland (17.11%) (37), Armenia (90.2%) (13), Meta-analysis in Asia (83%) (42), Sudan (42.7%) (54), Debre Markos Referral Hospital (75.4%) (32). However, the result of proliferative DR is lower than study finding in Asia (17%) (42), Western India (8.33%) (44), Indonesia (12.1%) (45), Pakistan (6%) (49), Sudan (39.9%) (54). The possible explanation for this variation

might be due to differences in diagnostic methods (measurement tool), sample size, study area, and discrepancy in self-care practice.

The result of multivariate logistic regression model indicated, HbAlc level, age, having a family history of diabetes mellitus, comorbid hypertension, and duration of diabetes illness were significantly associated with DR. In this study, type two diabetes patients with a history of comorbid hypertension had about nine times higher odds for diabetic retinopathy (AOR= 8.63, 95% CI: 2.51, 29.75) as compared to type two diabetes patients without a history of comorbid hypertension which is in line with the study conducted in Western India (44), Nepal (46), Indonesia (45), Sudan (54), Zambia (52), Tikur Anbessa Specialized Hospital (31), Debre Markos Referral Hospital (32). However, it is inconsistent with the study conducted in India (28), Iran (59). This inconsistency might be due to the difference in the sample size, study period, health-seeking behavior among the respondent, study area, diagnostic method, and different levels of understanding in self-care practice. Other possible explanations for such results might be due to hypertension upregulating the expression of vascular endothelial growth factor (VEGF) in retinal endothelial cells and ocular fluids, which can promote DR (67).

The present study demonstrated that those patients who had a family history of DM were three times more likely to develop diabetic retinopathy as compared to patients who do not have a family history of DM (AOR= 3.29, 95% CI: 1.02, 10.67). This finding is in agreement with a study conducted in Iran (59), Jimma, Ethiopia (68). The current study revealed that the likelihood of developing DR was decreased by 82 % (AOR= 0.18, 95% CI: 0.06, 0.61) among type 2 DM patients whose duration of DM illness was less than five years compared to those whose duration of DM was five years and above, while adjusting for other variables in the model.

The result of this study is in line with study conducted in Denmark (39), Spain (38), Southern China (43), Korean (58), Armenia (13), Indonesia (45), Iran (59), Southern Iran (26), Nepal (46), Sudan (55), Zambia (52), Tanzania (61), Debre Markos University Hospital (32), Jimma Specialized University Hospital (15). However, it is inconsistent with a study conducted in India (28), Iran (40). The possible explanation for this

discrepancy might be due to the variation in the lifestyle of participants, variation in awareness regarding health-seeking behavior, and sample size. However, a possible reason for this result might be due to the duration of diabetes illness increases the exposure of the retina to hyperglycemia gives rise to the accumulation of advanced glycation end products that play a tremendous role in retinopathy, additionally advanced glycation end products may increase procoagulant activity, vascular permeability, adhesion molecule expression, and monocyte influx actions that may cause vascular injury (69).

The odds of developing DR were decreased by 72% (AOR= 0.28, 95% CI: 0.09, 0.84) among type 2 DM patients aged less than 60 years as compared to those aged 60 and above while adjusting for other variables in the model. This finding is consistent with studies conducted in India (28), Jimma, Ethiopia (68), and Iran (59). The possible explanation for this finding might be due to the retinal vessel density decreased during aging (70). The current study showed that participants with HbAlc less than 7% were about 94 % less likely (AOR= 0.06, 95% CI: 0.01, 0.28) to have diabetic retinopathy as compared to those who had HbA1c 7% and above. This finding is consistent with studies conducted in the US (35), Denmark (39), Spain (38), Korean (58), Iran (59), and Tikur Anbesa Specialized Hospital (31).

Similarly, the study conducted at Jimma University Hospital revealed that the likelihood of developing DR was nine times higher in diabetic patients with poor glycemic control as compared to those with good glycemic control (68). Additionally, a study conducted in Debre Markos Referral Hospital revealed that the odd of developing DR among diabetic patients with poor glycemic control were five times higher than those with good glycemic control (32). The possible explanation for this result might be due to poor glycemic control causes the retinal vasculature to suffer a progressive dysfunction, retinal mitochondria become dysfunctional and levels of superoxide species upsurge, which eventually accelerates cytochrome c release, capillary cell apoptosis, and DNA damage (71).

9. STRENGTHS AND LIMITATION OF THE STUDY

This study was conducted to assess the prevalence of diabetic retinopathy and its associated factors among type two DM patients at Hiwot Fana Specialized University Hospital. There are some important strengths of this study. Primarily, in this study 100% of the response rate included, and a face-to-face interview was used which prevents ambiguity, for data completeness, and minimizing certain sort of recall bias. On the other hand, the use of cross-sectional design also provided a sufficiently large sample size and it may include different independent variables. As a matter of fact, this study was not without limitation, by its definition Crosse sectional studies are difficult to draw a cause-and-effect relationship between associated factors and dependent variable. Additionally, the study participants enlisted into our study were merely from a single hospital, this may not be illustrative of the overall population with diabetes, this was another limitation of our study.

10.CONCLUSION AND RECOMMENDATION

10.1. Conclusion

The overall prevalence of diabetic retinopathy among adult type two diabetes patients attending the diabetic unit at Hiwot Fana Specialized University Hospital, Harar, Ethiopia, 2021 was 27.6%. Of these, three-quarters of DR participant had mild non-proliferative DR 42(72.4 %), one- fourth of DR participant had moderate non-proliferate DR 13 (22.4%), whereas less than one-tenth of DR participant had severe non-proliferative DR 2(3.4%) and proliferative DR 1(1.7%). An important predictor of diabetic retinopathy among type two DM patients were identified in our study. The identified predictors were the presence of comorbid hypertension, longer duration of diabetes, higher HbA1c level, having a family history of DM, older age was significantly associated with diabetic retinopathy. This predictor could help to develop a policy that may mitigate the complication of diabetic retinopathy among type two DM patients.

10.2. Recommendations

Based on the finding of this study the following recommendations were forwarded accordingly**: -**

For policy makers

- To construct the care delivery systems that allow diabetic retinopathy screening for type two DM patients. So that providing access of a screening system for early detection of diabetic retinopathy for type two DM patients could mitigate the occurrence of late complication of DR.

For Hospital administrators

- The hospital administration should consider establishing a specialized DM clinic in which early DR screening can be easily integrated into follow-up care.
- The hospital administration should consider establishing giving ongoing trainings and preparing different workshops for the health workers in diabetic unit is beneficial for improving their level of knowledge regarding early screening DR and complication of type two DM, especially diabetic retinopathy with ultimate goal of ameliorating the late complication of DR in patients with T2DM.

For health care providers

- It is recommended that the health workers provide health education on the target of poor glycemic control by glucose self-monitoring to mitigate poor glycemic control among type two DM patients.
- Providing an important education regarding exercise and their diets lifestyle to minimize comorbid hypertension since this may cause DR.
- It is recommended that the health workers of the medical diabetic unit be able to do an HbA1c investigation for type two DM patients.
- Taking consideration of patients' age, presence of comorbid hypertension, having family history of DM, long duration of diabetic illness, and other factors is essential while providing health education for type two DM patients regarding possible predictors of DR.

For future researchers

- Further study with different study design and long study period is needed to illustrate the determinant of diabetic retinopathy among type two DM patients.
- Furthermore, we recommend that future researchers find out the reasons for having family history of DM.

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12. APPENDIX

ANNEX I. Participant's information sheet

My name is _____I am working on behalf of research conducted by Fekadu Abera, a post graduate Student from Addis Ababa University, School of Nursing and midwife. I am conducting a study on the prevalence of diabetic retinopathy and its associated factors among type two diabetic patients attending Hiwot Fana specialized University Hospital, Harar, Ethiopia,2021. The result that will come out of this study will be used by the hospital to base their rational decision to develop appropriate strategies to combat this problem. The research is intended to benefit the community including the people that will be participating in this research and will introduce no risk to the participant. The questionnaire requires maximum of 30 minutes to complete. Your participation is entirely voluntarily, and you can quit from the study any time you want. You will have no penalty if you fail to show desire to participate. however, your genuine responses that you are going to give are very important to identify problems related to DR and design programs. Your name and other personal identity will not be used, and hence the information we will collect from you will completely be kept confidential and will not be disclosed to any third person other than the people participating in this study. For any question you want to ask us, you can use the contact address here under.

Contact address

If there are any questions or enquires any time about the study or the procedures, you can contact by using the following addresses.

Principal investigator: Fekadu Abera

E-mail: fekaduabera777@gmail.com

Mobile phone: +251- 920698679

ANNEX II: Informed consent

I have read this form or it has been read to me in the language I understand. I have clearly understood the purpose of the research, the procedures, the risks and benefits, issues of confidentiality, the rights of participating and the contact address for any queries. I have been given the opportunity to ask questions for things that may have been unclear. I was informed that I have the right to withdraw from the study at any time or not to answer any question that I do not want. Are you willing to participate in this study?

1. No -------(say Thanks!)
2. Yes--------I declare my voluntary consent to participate in this study with my signature as indicated below.

Signature of participants _____ date____

Data collector Name: _____ Signature of data of data collector_____date_____

N.B. This is to be signed face to face in the presence of the data collector.

ANNEX III- Data collection form of English version

Part 1: Socio- demographic factors

General information

Serial no._____ Card No____ Kebele _____

Data collection date_____

Name of data collector_____

Signature _____

Part I: Assessment of Socio-demographic factors

S. No	Assessment of Socio-demographic and socio-economic variables		
	Question	**Response**	**Remark**
101	Sex	1. Male 2. Female	
102	How old are you?	----------Years	
103	What is your ethnic group?	1. Oromo 2. Amhara 3. Harari 4. Others, specify----------	
104	What is your religion?	1. Orthodox 2. Muslim 3. Protestant 4. Others, specify----------	
105	What is your marital status?	1. Single 2. Married 3. Divorced 4. Widowed	
106	What is the highest level of education you have completed?	1. Unable to read and write 2. Read and write 3. Primary school (1-8th grade) 4. Secondary school (9-10th grade) 5. preparatory school (11-12th grade) 6. College/University completed	
107	Occupational status?	1. Government employee 2. Daily laborer 3. Merchant 4. Farmer 5. Others, specify _____	

108	Residence?	1. Urban 2. Rural	
109	Average Family monthly income?	_----------__ETB	

Part II: Behavioral factors

S. No	Question	Response	Remark
201	Do you ever smoke cigarettes?	1. Yes 2. No	If no skip to question 205
202	For how long do you smoke cigarettes?	1. Below 1 year 2. 1-5 year 3. >5 year	
203	Do you smoke daily?	1. Yes 2. No	
204	How many cigarettes per day?	---------Number	
205	Do you consume an alcoholic drink during the last 6 months?	1. Yes 2. No	If not skip to Q209
206	What type of alcohol did you drink?	1. Beer 2. Wine 3. Tella/Local beer 4. Areki 5. Others, specify____	
207	On average how many glasses/bottles do you drink per day?	_____bottles/glasses/birlie/Tassa	
208	How frequent did you drink alcoholic drink per week?	---------days	
209	Does your work involve vigorous-intensity activity that causes large increases in breathing or heart rate like [carrying or lifting heavy loads, digging or construction work] during the last 6 months?	1.Yes 2.No	
210	In a typical week, on how many days do you do vigorous-intensity activities as part of your work?	_____days	
211	How much time do you spend doing vigorous-intensity activities at work on a typical day?	_____Hours/minutes	

212	Do you walk or use a bicycle (pedal cycle) to go to and from places in the last 6 months?	1.Yes 1. No	If No skip to Q 301
213	In a typical week, on how many days do you walk or bicycle to get to and from places?	_____ days	
214	How much time do you spend walking or bicycling for travel on a typical day?	_____Hours/minutes	

Part III: Treatment related factors

S.no	Question	Response	
301	Does the client currently take insulin therapy	1=yes 2=No	If NO skip to Q303
302	If the patient is on insulin, when does the patient start insulin therapy	_____	
303	Does the client currently take oral antiglycemic	1=yes 2=No	If NO skip to Q401
304	If yes on question number 303 please state the medication	_____	

Part IV: Diabetic care related

S.no	Questions	Response	
401	How often do you visit health care institution for your diabetes follow ups?	1=every one month 2= every two months 3=every three months 4= 4 to 6 months 5=once a year	
402	Did you have an eye screening for retinopathy in the last one year?	1=yes 2=No	

403	Have you ever attended a Diabetes education session?	1=yes 2=No	

Part V: Clinical data

S.no	Question	Response	Remark
501	How long have you been since you have diagnosed with DM	_____	By interviewing
502	History of hypertension	1=yes 2=No	If no proceed to 504
503	What types of Antihypertensive medications are you taking?	1.ACE inhibitor 2. Calcium Channel Blocker 3. Diuretics 4. Combination 5. Not taking	
504	History of chronic kidney disease	1=yes 2=No	From card records
505	Fasting blood glucose level	_____	
506	Result of HgA1c	_____	From card records
507	Result of lipid profile	1=Total cholesterol 2=HDL 3= LDL 4= TG	From card records
508	History of heart disease	1=yes 2=No	From card records
509	Family history of DM	1=Yes 2=No	By interviewing
510	BMI	_____Kg/m2	

Thank you, dear respondent for your tremendous participation!

Part VI: Recorded data of retinopathy

S. No	Variable	Response	
601	Does the patient have Diabetic retinopathy on the right eye	1.yes 2.No	If NO skip to Q602
	If yes which type	1. Mild NPDR 2. Moderate NPDR 3. Severe NPDR 4. PDR	
602	Does the patient have Diabetic retinopathy on the left eye	1.Yes 2.No	
	If yes which type	1. Mild NPDR 2. Moderate NPDR 3. Severe NPDR 4. PDR	

ANNEX IV. Amharic version of participant's information sheet

የመረጃ መግለጫ ቅፅ

ቀን.....ሰዓት.....የቃለመጠይቅ መለያ ቁጥር.....

እንደምን አደሩ/ዋለ?

ስሜ.....ሲሆን የስራ ባሌደረባዬ ፍቃዱ አበራ ይባላል። በአዲስ አበባ ዩኒቨርሲቲ በነርሲንግ እና ሚድዋይፌሪ ትምህርት ቤት የድህረ ምረቃ ተማሪ ሲሆን የመመረቂያ ፅሁፌን በህይወት ፋና ስፔሻላይዝድ ዩኒቨርሲቲ ሆስፒታል የስኪር ህክምና ክሊኒክ በተመላላሽ ህክምና የሁለተኛው አይነት የስኪር ህመምተኞችን በስኪር ህመም የሚመጣው የአይን ችግርና ተያያዥ ጉዳዮች በሚል ላይ ነው። የሚሰበሰበዉ መረጃ ሙለ በሙለ በሚስጥር የሚያዝ መሆኑን እናረጋግጥልዎታለን። የእርስዎ ስም፤ መለያ አድራሻ አይመዘገብም; መረጃ መስጠት ካልፈለጉ መብትዎ ነዉ። መመለስ ያልፈለጉትን ጥያቄ መዝለል/ማለፈ/ ይችላሉ። ይሁን እንጂ የእርስዎ ትብብር እና ትክክለኛ ምላሽ ጥናቱና ምርምሩ እንዲሳካ ትልቅ አስተዋጽኦ ይኖረዋለ; ስለዚህ ለሚቀርብሎዎት ጥያቄ ትክክለኛ መለስ ለመስጠት ፍቃድኛ ሆነዉ በትዕግስት እንዲመልሱልን እንጠይቅዎታለን። ቃለ መጠይቁ በግምት 30 ድቂቃ ይፈጃለ።

ጥያቄ አለዎት?

መጠይቁን በሚመለከት ማንኛውም አይነት ችግር ካለ በሚከተለው አድራሻ ያሳውቁ

የጥናቱ ባለቤት፡- ፍቃዱ አበራ

ስለክ ቁጥር - 0920698679

ኢሜይለ - fekaduabera777@gmail.com

ANNEX V: Informed consent in Amharic version

<u>የስምምነት ቅጽ</u>

ከላይ ያነበብኩልዎትን መረጃ በሚገባ ከተረዱት በጥናቱ ላይ ለመሳትፍ ፈቀደኛ ነዎት?

1) አይደለሁም (አመሰግናለሁ)

2) አዎ (ቃለ መጠይቁ ይቀጥላል)

ጥናቱን የሚያካሄደዉ ተማሪ፡- ፍቃዱ አበራ

የተጠያቂዉ ፊርማ …… ቀን……

ቃለ መጠይቁ የተካሄደበት ቀን…… የቃለ መጠይቁ ዉጤት

ያረጋገጠዉ ተቆጣጣሪ

ስም……...ፊርማ……ቀን……

ANNEX VI. Data collection form of Amharic version

አጠቃላይ መረጃ

01. መለያ ቁጥር---------- ቀበሌ ----------

02. መጠይቁ የተካሔደበት ቀን ----------/----------/----------

03. የመረጃ ሰብሳቢው ስም---------- ፊርማ ----------

-

ክፍል አንድ ማህበራዊና ስነ ህዝባዊ መረጃዎች

ተ.ቁ	ጥያቄዎች	ምላሽ	ምርመራ
101	ፃታ	1. ወንድ 2. ሴት	
102	እድሜዎ ስንት ነው?	_____ዓመት	
104	ሐይማኖት?	1. ኦርቶዶክስ 2. ሙስሊም 3. ፕሮቴስታንት 4. ሌላ ይገለጽ----------	
105	የጋብቻ ሁኔታ?	1. ያላገባ/ች 2. ያገባ/ች 3. የፈታ/ች 4. የሞተችበት/ባት	
106	የትምህርት ደረጃ?	1. ማንበብና መፃፍ የማይችል/የማትችል 2. ማንበብና መፃፍ የሚችል/የምትችል 3. የመጀመሪያ ት/ት (1-8) 4. 2ኛ ደረጃ ትምህርት (9-10) 5. መሰናዶ ትምህርት (11-12) 6. ኮሌጅ/ዩኒቨርሲቲ ያጠናቀቀ	
107	የስራ ሁኔታ?	1. የመንግስት ሰራተኛ 2. የቀን ሰራተኛ 3. ነጋዴ 4. ገበሬ 5. ሌላ ይገለጽ-----	
108	የመኖሪያ አድራሻ?	1. ከተማ 2. ገጠር	
109	አማካይ ወርሃዊ የቤተሰብ ገቢ?	----------የኢትዮድያ ብር	

ክፍል ሁለት፡- ከስነ ባህሪ ጋር የተያየዙ ጥያቄዎች

ተ.ቁ	ጥያቄዎች	ምላሽ	ምርመራ
201	ሲጋራ አጭሰዉ ያዉቃሉ?	1. አዎ 2. የለም	የለም ካሉ ወደ ጥያቄ 205 ይለፉ
202	ለምን ያክል ጊዜ አጭሰዉ ያዉቃሉ? በላይ	1. ከ 1 አመት በታች 2. ከ 1-5 አመት 3. ከ 5 አመት	
203	በየቀኑ ያጨሻሉ?	1. አዎ 2. የለም	
204	በቀን ምን ያክል ሲጋራ ያጨሻሉ?	---------በቁጥር	
205	በዚህ 6 ወር ዉስጥ የአልኮል መጠጦችን ጠጥተዉ ያዉቃሉ?	1. አዎን 2. የለም	መልሱ የለም ከሆነ ወደ ጥያቄ 209 ይለፉ
206	ምን አይነት የአልኮል መጠጦችን ተጠቅመዉ ያዉቃሉ?	1. ቢራ 2. ወይን 3. ጠላ 4. አረቂ 5. ሌላ ይገለጽ----------	
207	በቀን ዉስጥ ምን ያክል የአልኮል መጠጥ ተጠቅመዉ ያዉቃሉ?	---------- ጠርሙስ/ብርጭቆ/ብርሌ/ጣሳ ባለ---------ሚሊ ሊትር	
208	በሳምንት ዉስጥ ስንት ቀን ይጠጣሉ?	----- ቀን	
209	በዚህ 6 ወር ዉስጥ የሚሰሩት ስራ ብዙ ጉልበትና ሀይል የሚጠይቅ የልብ ምትንና የአተነፋፈስን ፍጥነት የሚጨምር ነዉን? ማለትም መሸከም፣ መቆፈር፣ወይም ግንባታን ወዘተ	1. አዎ 2.የለም	መልሱ የለም ከሆነ ወደ ጥያቄ 212 ይለፉ
210	በሳምንት ዉስጥ ምን ያህል ቀናት ጉልበትና ኃይል የሚጠይቅ ስራ ይሰራሉ?	_____ቀናት	
211	በቀን ዉስጥ ምን ያህል ደቂቃ/ሰዓት ከባድ ጉልበትና ሃይል የሚጠይቅ ስራ እየሰሩ ያሳልፋሉ?	------- በሰዓት/በደቂቃ	
212	ባለፈዉ 6 ወር ዉሰጥ ወደ ተለያዩ ስፍራዎች ለመድረስ/ለመንቀሳቀስ በእግር ጉዞ አድርገዉ ያዉቃሉ?	1. አዎ 2.የለም	
213	በሳምንት ዉስጥ ምን ያህል ቀናት ወደ ተለያዩ ስፍራዎች ለመድረስ ወይንም ለመንቀሳቀስ በእግር ጉዞ አድርገዉ ያዉቃሉ?	--------ቀናት	
214	በቀን ዉስጥ ምን ያህል ሰዓት/ደቂቃ በእርምጃ ከቦታ ቦታ በመዘዋወር የሳልፋሉ	----በሰዓት/በደቂቃ	

ክፍል ሶስት: የስኪር መዳኒት አይነቶች

ቁ	ጥያቄ	የኮድ ክፍፍል	
301	ኢንሱሊን ይወስዳሉ	1. አዎ 2. የለም	
302	ኢንሱሊን መውሰድ መቼ ጀመሩ	_____	
303	በአፍ የሚወሰዱ የስኪር መዳኒት ይወስዳሉ	1. አዎ 2. የለም	
304	ከወሰዱም የሚወስዱት መድሀኒት አይነት ይጥቀሱ	_____	

ክፍል ኣራት ፡ስለ ስኪር አጠባብቅ ዘዴ

ቁ	ጥያቄ	የኮድ ክፍፍል
401	በየስንት ጊዜ የስኪር ክትትል ያደርጋሉ	1 በየ1ወር 2 በየ 2 ወር 3 በየ 3 ወር 4 ክ 4 እስክ5 5 በየ 6ወር 6 በ አመት አንዴ
402	ባለፈው አንድ አመት ውስጥ የአይን ምርመራ አርገው ያውቃሉ	1. አዎ 2. የለም
403	የስኪር ትምህርት በሚሰጥበት ጊዜ ተካፍለው ያቃሉ	1.አዎ 2. የለም

ክፍል ኣምሰት: ህክምና ነክ መግለጫዎች

ቁ	ጥያቄ	የኮድ ክፍፍል	
501	የስኪር ህመምተኛ ከሆኑ ምን ያህል ጊዜ ሆኖት	_____	
502	ከዚህ በፊት የደም ግፊት አለቦት	1. አዎ 2. የለም	
503	ካለቦትስ የሚወስዱት የደም ግፊት መድሀኒት ምን ይባላል	1.ACE inhibitor 2. Calcium Channel Blocker 3. Diuretics 4. Combination 5.የለም	
504	ከዚህ በፊት የቆየ የኩላሊት በሽታ አለቦት	1. አዎ 2. የለም	
505	በባዶ ሆድ የሚሰራ የስኪር መጠን ውጤት		
506	የስኪር የ 3ወርውጤት	_____	
507	የደም ውስጥ የቅባት መጠን	_____	
508	ከዚህ በፊት የቆየ የልብ በሽታ አለቦት		
509	የክብደት እና ቁመት ምጣኔ	_____	
510	በወላጆችዎ መካከል የሱካረ ህመም ያለበት ሰው አለ?	1. አዎ 2. የለም 3. አይታውቅመ	

ANNEX VII: Afaan Oromoo Version of Information Sheet

Odeeffannoo

Akkam bultan? Maqaan Koo_____ jedhama ykn gaafataa Fiqaadu Abarra bakka bu'aa dha. Inni barnoota digirii lammataa isaa Yunivarsiitii Finfinneerraa, Kolleejjii fayyaa, dippaartimentii Nursing barataa jira. Yoo fedhii keessan ta'e yaada keessan naaf ergisaatii waa'ee mata duree qorannoo isaa isiniifan ibsa. Mataa dureen qorannoo isaa "Sadarkaa Rakkoo ijaa dhiibbe sukkaara gosa lammaffattin dhufuu fi rakkole walqabbatto Hospitala bekkamma University Hiwot Fana, Harar, Oromia. Bu'aan qorannoo isaas sadarkaa fi wantoota rakko ijaa sababba dhiibbe sukkarra gosa lammaffattin dhufuu erga addaan bahee booda murteen akka irratti fudhatamu taasisuudha. Ani gaaffileen isin gaafaadhu jira, gaaffileen kunis yoo baay'ate daqiiqaa 30 qofa isinitti fudhata, kanaan ala dhiibbaa tokko illee isinirratti hin qabu.

Bu'aan isin qorannoo kana irraa argattan, rakkoolee jiran bulchiinsa fayyaa godinaa fi hospitaalaaf ni barreeffama, isinis wantoota rakkoo ijaa sababba dhibbee sukkarra gosa lammaffattin dhufuu hubachuun fayyaa kessan egachuuf isin gargarra**.** Qorannoo kana irratti kan hirmaattan fedhii keessaniini, yeroo barbaaddan addaan kutuu, akkasummas gaaffii hin barbaanne deebisuu dhiisuu ni dandeessu. Icitiin keessaan/gaafatama yeroo kammiyyuu kan eegameedha

Yeroo barbaadanittit yaada fi gaaffii kamiyyuu qabdan karaa armaan gadii kanan gaafachuu dandeessu.

Abbaan qorannoo: Fiqaadu Abarra

E-mail: fekaduabera777@gmail.com

Lakka bilbilaa: +2521-0920698679

ANNEX VIII: Informed Consent in Afaan Oromoo

Foormii Waliigaltee Afaanii

Yaadooliin waa'ee bu'aa qorannoo kanaa, mirgii fi dirqamni ani qabu, jechuun yeroon barbaadetti gaafatamuu addaan kutuu fi gaaffii ani hin barbanne deebisuu dhiisuu, akkasumas yaada ifa naaf hin taane gaafachuun mirgaa koo akka ta'e afaan ani beekuun haala sirrii ta'een naaf ibsameera.

Qorranicha irratti hirmaachuuf fedhii qabdaa?

A: Lakkii-------galaatoomi itti dhiisi.

B: Eyyee--------itti fufi

Fedhii keetiin qoranicha irratti hirmachuu keetiif guddaa galatoomi.

Mallattoo hirmaataa_____

Maqaa gaafataa_____ Mallattoo_____ Guyyaa_____

Koodii Gaafannoo_____

ANNEX IX. Data Collection Form of Afaan Oromoo Version

Kutaa I: Dhiibbaa Hawaasummaa fi Dinagdee.

Deebii gaafatamaan deebisee sanduuqa filannoo jala jiru irratti mallattoo (√) kana godhi.

Lakk.	Gaaffilee	Filannoo Deebii
101	Saala	1: Dhi □ 2: Dha □
102	Umurii	--------(waggaa dhaan)
103	Saba	1: Oromoo □ 2: Amara □ 3: Harari □ 4. kan biro--------- (caqasi)
1o4	Amantaa	1: Ortodoksii □ 2: Musliima □ 3: Pirootestaantii □ 4: Kan biro----(caqasi)
105	Haala Maatii	1: kan hin fuune/ hin heerumne □ 2: kan fuudhe/ heerumte □ 3: kan wal hike □ 4: kan jala du'e/duute □
106	Sadarkaa barnootaa	1 kan dubbisuu fi barreessuu hin dandeenye □ 2.kan dubbisuu fi barreessuu danda'u □ 3: Sadarka 1^{ffaa} kan barate/tte (1-8) □ 4. Sadarkaa 2^{ffaa} kan barate/tte (9-10) □ 5. Qopha'in kan barate/tte (11 -12) □ 6.Kolloojjii ykn Yunivarsiitii □
107	Gosa hojii	1: Hojjetaa/ttuu Mootummaa □ 2: Hojjetaa/ttuu guyyaa 3. Daldalaa/ttuu 4. Qotee bulaa/bultuu □ 5.Kan biraa…(caqasi)
108	Iddoo jireenyaa	1: Magaalaa □ 2: Baadiyyaa □
109	Galii ji'a	----------ETB

Kutaa II: Gaffilee Amala Wajjin Wal Qabbattan

Lakk.	Gaaffilee	Filanno Deebbi	Itti fuffinsa
201	Sijaara xuxxanni ni beektuu?	1.Eyye 2.lakki	Lakki yoo jedhaan gara gaaffi 205 ha ce'aan
202	Yeroo hamammif sijaaraa xuxxanni beektuu?	1.Waggaa 1 gaddi 2.Waggaa 1-5 3.waggaa 5 caalaa dha	
203	Hooggayyuu ni xuxxu?	1.Eyye 2.Lakki	
204	Guyyaa tokkotti sijaaraa hammam xuxxu?	---------lakkofsaan	
205	Ji'otta 6 darban kan kessatti dhugaatii alkoolii fayyadmtaani beektuu?	1.eyye 2.lakki	Lakki yoo jedhaan gara gaaffi 209 ha ce'aan
206	Gosa alkoolii isa kam fayyadamtani beektuu?	1.Biiraa2.Farsoo 3.Weeynii4. Araqee 5.kanneen biroo-------	
207	Guyyaa tokkotti alkoolii hammam fayyadamtani beektuu?	--------Qaruuraa biiraa/ birillee/Xaasaa	
208	Torbaniin guyyaa meqaa dhugduu?	_____guyyaa dhan	

209	Ji’otta 6 darban kan kessa hojiin isin hojjettan humna guddaa kan barbaaduu fi dha’ana onnee kan dabaluu akkassumas sirna hargansuu kan dabaluudha? jechuun koo ba’aa guddaa badhachu, qotiisa lafa irratti hirmachuu fi kkk.	1.Eyye 2.lakki	Lakki yoo jedhaan gara 2012 ha ce’aan
210	Torbaniin guyyaa meeqa hojii humna gudda barbaadu hojjettani beektuu?	_____Guyyaa dhan	
211	Guyyaan daqiiqaa/ sa’ati hamam hojii humna guddaa barbaadu hojjechuudhan dabbersittu?	------- sa’ati dhan /daqiiqqaa dhan	
212	Ji’otan 6 darban kan kessatti Iddo garagara deemuuf imala miillan deemtanni beektuu?	1.Eyye 2.Lakki	
213	Torbaniin guyyotta meeqa iddo garagara demmuuf millan imala gottaani beektuu?	--------guyyaa	
214	Guyyaa kessatti sa’ati /daqiiqqaa hamami iddo tokko gara iddo biratti miillan dabbarsitu?	----------sa’ati/daqiqqaa	

Kutaa3: Gosa Qoricha Dhibee Sukkaaraa

Lakk	Gaaffilee	Filanno Deebbi	
301	Insuulini ni fudhaatu?	1. Eyye 2. Lakki	
302	Insuulinni fudhachuu yoom jalqabdan?	_____	
303	Qoricha sukkaaraa isa afaanin fudhatamu ni fudhaatu?	1. Eyye 2. Lakki	
304	Yoo fudhattan gosa qoricha isa fudhattan haa ibsan?	_____	

Kutaa 4፡Hordoffii Dhibee Sukkaaraa Wantoota Ibsan

Lakk	Gaffilee	Filanno deebbi
401	Hordoffii sukkaaraa yeroo hangamin hordoftu?	1 ji'a 1n 2 ji'a 2n 3 ji'a 3n 4 ji'a 4 hanga5 5 Ji'a 6n 6.waggatti yeroo tokko
402	Waggaa isa darbe kan kessatti qorannoo ijaa ademsistani beektuu?	1. Eyye 2. lakki
403	Barumsi dhibee sukkaaraa yeroo kennamu irratti hirmaatani ni beektuu?	1.eyye 2. lakki

Kutta 5: Halla Waliigala Fayyaa

Lakk	Gaffilee	Fillanno Deebbi	
501	Dhibamaa dhibee sukkaaraa egga tattani yeroo hangam ni ta'a?	_____	
502	Kanan dura dhibbaa dhiigaa ni qabduu	1. Eyye 2. lakki	
503	Yoo jiraate qorichi dhiibbaa dhiigaa isin fudhatan maal jedhama?	1.ACE inhibitor 2. calcium channel blocker 3. diuretics 4. combination 5. Hin fudhaatu	
504	Kana dura dhukkuba kalee yeroo dheeraf turee ni qabduu?		
505	Hamma sukkaaraa garaa duwwaatti hojjetammu?		
506	Hamma sukkaaraa kan ji'a 3	_____	
507	Hamma cooma dhiigaa kessatti aragamu?	_____	

508	Kanan durra dhukkubba onnee yeroo dheera ni qabdu?		
509	Tilmaama ulfaatina fi dheerina	_____kg/m2	
510	Maatii kessan kessa dhibee sukkaaraa namni qabuu jira?	1. Eyye 2. Lakki 3. hin bekkamu	