

## FACTORS ASSOCIATED WITH BLINDNESS AMONG DIABETIC PATIENTS ATTENDING MITYANA GENERAL HOSPITAL. A CROSS-SECTIONAL STUDY.

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### Abstract.

#### Background.

Diabetes is on the rise as it is no longer a disease of predominantly rich nations. Diabetic-associated eye disease is steadily increasing everywhere, most markedly in the world's middle-income countries including Uganda. This study assessed the factors associated with blindness among diabetic patients attending Mityana General Hospital.

#### Methodology.

A descriptive cross-sectional study design was adopted using a quantitative method of data collection. The study was conducted in Mityana district at Mityana General Hospital, data was collected using a structured questionnaire among 80 respondents. A probability sampling technique was used.

#### Results.

39 (48%) respondents were between the ages of 41 and 60, and 48 (60%) were females only. Salary was a major economic factor, and 42(52%) of the respondents earned less than UGX 100,000. 46 (57%) of the respondents were farmers by occupation. Physical inactivity was a serious lifestyle factor discussed, with 28 (35%) respondents rarely engaging in physical activities and only 13 (16%) engaging in daily physical activity.

#### Conclusions.

Females were most affected by blindness due to diabetic eye disease and most of the respondents are of ages 41-60 years and many are farmers by occupation. In addition, the results agreed that the highest percentage rarely engaged in physical activity.

#### Recommendations.

The government, through the Ministry of Health, should fund free screening of diabetic patients for diabetic-related eye complications, especially from their communities through outreaches. In addition, sensitization and education on lifestyle modification and behavior can end blindness due to diabetic-related eye disease.

**Keywords:** Diabetes-related Blindness, Diabetic patients, Mityana General Hospital.

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### Background.

Diabetes mellitus is a disorder where the body fails to produce enough insulin or respond to the insulin produced by the cells. It is divided into two major categories, Type 1 diabetes (T1DM); is an autoimmune disease where the body's immune system attacks the cells in the pancreas that produce insulin. Type 2 diabetes (T2DM) is; a metabolic disorder caused by insulin resistance where the body can't make proper use of the insulin (National Institute of Diabetes and Digestive and Kidney Diseases NIDDK).

According to Diabetes Research and Clinical Practice DRCP (2018) of diabetic eye diseases, Diabetic Retinopathy

(DR) takes the lead, imposing the greatest risk of blindness, followed by Diabetic Macular Edema (DME), especially in people with type 2 diabetes, then Diabetic Cataracts (DCs) more common in people who are older, smoke and are both diabetic and hypertensive. Recent estimates from the International Diabetes Federation (IDF) show that DR affects one-third of the population (IDF Diabetes Atlas 9th edition, 2019).

There is a rampant increase in diabetic eye disease globally, approximately 145 million people are affected with DR and these millions are at risk of losing their sight (International Agency for Prevention of Blindness). In Africa, Sub-

Saharan Africa (SSA) is projected to carry the largest burden of diabetes (34.2 million) by 2030. This will inevitably cause a parallel increase in diabetes-associated complications; with the predominant complications being blindness due to diabetic retinopathy and diabetic cataracts. Eye programs in developing countries remain inadequate, existing as stand-alone programs, focused on providing acute symptomatic care at secondary and tertiary health levels (Maseko et al., 2021). Over 60% of people with undiagnosed diabetes report to eye care facilities with already advanced retinopathy. While vision loss due to cataracts is reversible, loss of vision from diabetic retinopathy is irreversible (Maseko et al., 2021). Disparities in access to healthcare services based on socioeconomic status have been documented with individuals of lower income and education levels facing greater barriers to adequate eye care (Zhang et al., 2020).

In Uganda, nonadherence to treatment regimens including medications and lifestyle modifications, can exacerbate the risk of vision loss in diabetic individuals (WHO 2015).

Thus, with this uncertainty of modulation and a few studies done, there stands a great need to make a detailed study to address the factors associated with blindness among diabetic patients.

## Methodology. Study Design.

In this study, the researcher employed a cross-sectional study design that involved a quantitative method to determine the factors associated with blindness among diabetic patients attending Mityana General Hospital (MGH).

## Study Area.

The study was carried out at Mityana General Hospital in Mityana District; 92WV+Q2F Mityana town, central Uganda, 00°23'48''N, 32°03'34'' E located 77km away from Kampala. Mityana General Hospital opened in 1940 and it serves over 600,000 people in Mityana, Mpigi, Kiboga, and Gomba districts. The study was conducted at the ophthalmology department in collaboration with the diabetics' clinic, with a total of about 100 patients that attended to the ophthalmology unit per week and about 300 attending the endocrinology department per week. These units were chosen because the researchers' study was attached to patients from these departments, and have staff skilled in both eye care service and diabetes management that is Ophthalmologists, including Ophthalmic Clinical Officers (OCOs,) and Medical Doctors.

## Study Population

The study was carried out among patients who were present during the period of the study at the ophthalmology department, also Patients from the diabetics' clinic who were diagnosed with diabetes at Mityana General Hospital were the main target of the study.

## Sample size determination

The sample size was calculated using the method below according to Mbuto Samuel (2004)

$$S = GR/O$$

Where s=sample size

Number of days available for data collection.

R=number of hours per day

The maximum time an interviewer spent on each patient

G=10 days, R=4hours, O=30minutes

S= (4\*10)/0.5

S=80 patients

The researcher used 80 patients for the study

## Sampling Technique

A probability sampling process was used since a specific group of patients with diabetes who were present at the ophthalmology department and from the diabetics' clinic with any eye concern were targeted in the study, and this reduced the potential for researcher bias in the selection process.

## Sampling procedure

A probability sampling process was used to access those patients who were willing and within reach. This process involved; defining the population, i.e. diabetic patients at MGH, creating a sampling frame i.e. a list of database of all elements from which the sample was drawn then an appropriate probability sampling method such as simple random sampling was chosen, determining the sample size that was appropriate based on study objectives and population size and random selection and data collection from the selected sample.

All eye health workers, clinical officers, medical officers, and nurses at the ophthalmology department, endocrinology department, OPD, and cardiology department were sensitized about DR, DME & DCs, and other diabetic eye complications then I and my assistant accessed the patients for data collection.

## Data Collection Method.

Data was collected using a questionnaire by the researcher, which is a research instrument consisting of a series of questions used to collect information from respondents.

### **Data Collection Tool (s).**

A questionnaire was used to collect data. The questionnaire was written in English and data was obtained concerning the factors associated with blindness among diabetic patients.

### **Data Collection Procedure**

The researcher, having gotten permission from the hospital superintendent to carry out the research study, commenced by creating rapport with the respondents and assuring them of confidentiality. The questions were read and interpreted by the respondents. Answers given in local languages were recorded in English by a researcher and his assistant. In the end, respondents were appreciated for participating.

### **Study Variables**

#### **Independent Variables**

The independent variables were the factors associated with blindness among diabetic patients.

#### **Dependent variables**

The dependent variables were the diabetic patients who presented at Mityana General Hospital during the time of the study.

### **Quality control**

#### **Pre-testing of the questionnaire.**

The pre-testing was done at Mityana General Hospital, Mityana District among the employed health workers. 20 questionnaires were used. This aimed at evaluating the validity and reliability of the questionnaire. The data tool was therefore revised to suit realities by reconstructing questions and eliminating useless questions.

#### **Training of Research assistants.**

The researcher was assisted by one research assistant who was selected according to his level of education (secondary level-minimum) communication skills, ability to speak the local language and English, and his knowledge about the research topic. He was first trained and then oriented about the data collection process and then was involved in the pre-testing of the questionnaire.

#### **Giving ample time for data collection.**

Prior to the study, the researcher visited the District Health Officer (DHO) Mityana district and obtained permission from the relevant authorities to carry out the study and ascertained that the study was relevant and needed as well as setting enough time for the study.

### **Inclusion Criteria**

Patients that had diabetes between the age of 16-95 years attending eye care services at the ophthalmology and from the diabetic clinic at MGH during the period of the study.

### **Exclusion Criteria**

All patients who were diagnosed with blindness from non-diabetic disease e.g. those from trauma were excluded from the study, and patients who refused consent were also excluded from the study.

### **Adherence to standard operating procedures (SOPs)**

The researcher adhered to all the protective measures that ensured both his and the safety of those who will participate in the study, this included face masks and sanitizers among others.

### **Data Analysis and Presentation**

Data that was obtained and checked for consistency and completeness. Data being quantitative was manually analyzed and computed by means of the descriptive statistical methods and the results were presented in tables and bar graphs for easy interpretation.

### **Study Limitations.**

The researcher was conflicted between attending clinicals and collecting information from patients as the time of the research study coincided with that of clinical practice however the researcher opted for specific days for clinicals and concentrated on research for the period specified. Mityana General Hospital being 200km from the researchers' area of study a lot of time and transport required and is accessed late, however, early engagement of sponsors in this activity helped to solve the study limitations.

### **Ethical Consideration**

Recommendations to carry out the research were obtained from the ophthalmic clinical officers' training school Jinja and the faculty of UAHEB. An introductory letter from the principal of OCO training school was taken to the hospital superintendent who further authorized the research study.

### **Informed Consent**

Verbal consent was sought from the respondents after the explanation of the study topic to them. The respondents were assured of their right to freely consent. Confidentiality was assured to the respondents and the participants in the study. Code numbers were used instead of patient names as an assurance that no one else would know from whom the information was collected.

**Results of the study.** **Socio-demographic factors associated with blindness among diabetic patients.**  
**Table 1: showing socio-demographic factors. N = 80**

Demographic data	Details	Number of respondents	Percentage of respondents (%)	Total
Sex	Female	48	60	80
	Male	32	40	
Age distribution	60+	18	23	80
	41-60	39	48	
	21-40	20	25	
	16-20	03	04	
Level of education	None	21	26	80
	Primary	42	52	
	Secondary	11	14	
	University	06	08	
Family History of diabetes	Has a history of diabetes	51	64	80
	No history of diabetes	21	26	
	Not sure	08	10	
Marital status	Married	33	41.25	80
	Single	47	58.75	

Table 1: indicates that the number of females was 49 (60%) and males was 32 (48%). Respondents between the ages 60 years and above were 18 (23%), ages between 41-60 years were 39 (48%), and ages between 21-41 were 20 (25%) ages between 16-20 years were 03 (04%). Respondents who attained tertiary or university levels of education were 08 (08%), the secondary level was 11 (14%) the primary level

was 42 (52%) and those who never had any education were 21 (26%) respondents. Respondents with a family History of diabetes were 51(64%) and those without any history were 21 (26%), and 08 (10%) were not sure. Respondents that were married were 33 (41.25%) and the unmarried or single were 47 (58.75%)

**Economic Factors associated with blindness among Diabetic patients.**

**Table 2: Showing Economic Factors. N =80**

Economic Factors	Details	Number of respondents	Percentage of respondents (%)	Total
Monthly income	Less than Ush 100,000	42	52	80
	Ush 100,000- Ush 400,000	32	40	
	Above Ush 400,000	06	08	
Job Description	Farmer	46	57	80
	Taxi driver	12	15	
	Miner	10	13	
	Teacher	12	15	
Insurance coverage	Yes	12	15	80
	No	68	85	
Financial burden on DM management	Very High	21	26	80
	High	36	45	
	Moderate	16	20	
	Low	07	09	

Table 2: shows that the number of respondents that were earning less than UGX 100,000 was 42 (52%), those that earned between UGX 100,000- 400,000 were 32 (40%) and those that earned above UGX 400,000 were 06 (08%). 46 (57%) of the respondents were farmers, 12 (15%) were Taxi drivers 10 (13%) were miners and 12 (15%) of the respondents were teachers. 12 (15%) of the respondents had

insurance coverage and 68 (85%) had no insurance coverage. The number of respondents with a very high financial burden on diabetics' management was 21 (26%) high financial burden was 36 (45%) moderate were 16 (20%) and only 07 (09%) of the respondents were not so much financially burdened with diabetes management.

**Figure 1: How financial concerns influence the food purchasing abilities of respondents.**

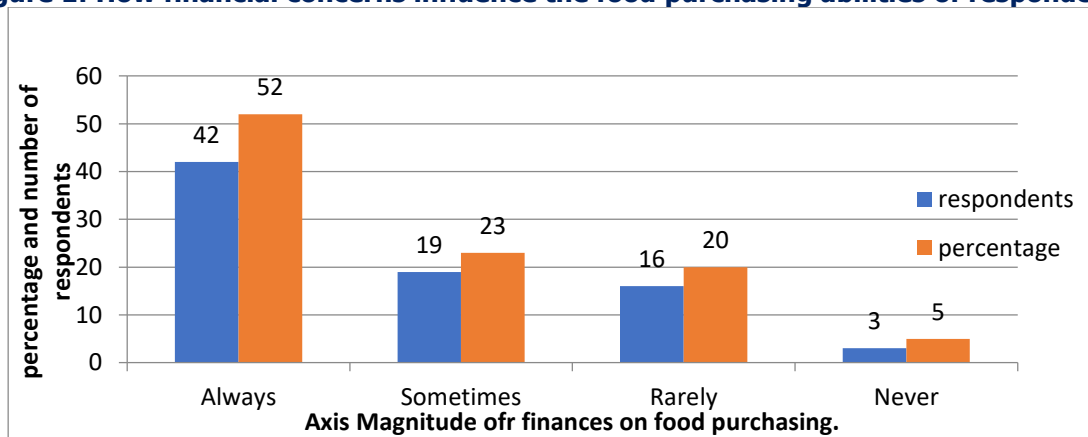


Figure 1: indicates that 42 (52 %) of the respondents always had food purchasing limited by finances, 19 (23%) sometimes, 16 (20%) rarely, and only 03 (05%) never had any financial concern on food purchasing.

**Lifestyle Factors associated with Blindness among diabetic patients**

**Table 3: showing lifestyle factors.**

Lifestyle factor	Details	Number of respondents	Percentage of respondents (%)	Total
Frequency of physical activity	Daily	13	16	80
	3 times a week	06	08	
	Once a week	17	21	
	Rarely	28	35	
	Never	16	20	
Hours spent sitting per day	Less than 1 hour	15	18	80
	1-2hours	11	14	
	3-4 hours	22	28	
	5-6 hours	32	40	
Frequency of taking alcohol	Daily	22	28	80
	Thrice	28	35	
	Once a week	11	14	
	Rarely	11	14	
	Never	08	09	
Do you have fruits and vegetables as part of your daily meals?	Always	08	12	80
	Sometimes	31	38	
	Once a week	26	32	
	Rarely	15	18	
Extent of cigarette/tobacco smoking	Daily	20	25	80
	Thrice a week	32	40	
	Once a week	13	17	
	Never	15	18	

Table 3: shows that the number of respondents engaged in daily physical activity was 13 (16%), 06 (08%) engaged in physical activities 3 times a week, 17 (21%) once a week 28 (35%), and 16 (20%) never engaged in any physical activity 15 (18%) of the respondents spent less than an hour per day sitting while knitting mats or listening to the radio, 11 (14%) of the respondents spent 1-2 hours, 3-4 hours 22 (28%) and most of the respondents spent 5-6 hours sited. The number of respondents who were taking alcohol daily was 22 (28%), three times a day 28 (35%) once a week

coincided with those rarely taking alcohol 11 (14%) and those who never took alcohol at all were 08 (09%). The respondents that always had fruits and vegetables as part of their daily meals were only 08 (12%), sometimes 31 (38%) once a week 11 (14%) those that rarely had were 15 (18%) The number of respondents that were involved in daily cigarette smoking was 20 (25%) three times a week were 32 (40%) once a week were 13 (17%) those that never involved in tobacco smoking were 15 (18%).

**Figure 2: The different foods are mostly eaten by respondents attending Mityana General Hospital.**

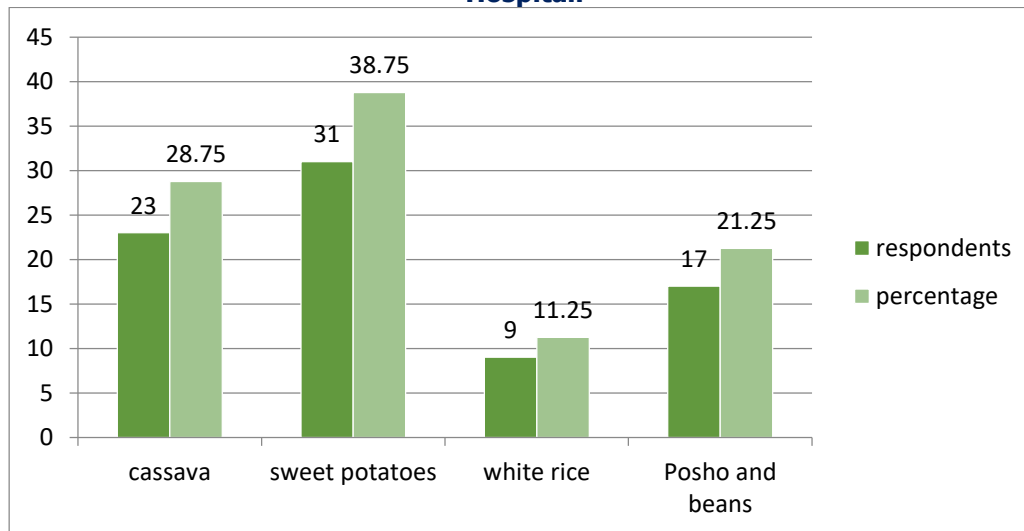


Figure 2: shows that the number of respondents that had cassava as the mostly eaten food was 23 (28.75%), those that had sweet potatoes as their eaten food were 31 (38.75%), white rice 09 (11.25%) and posho and beans were 17 (21.25%)

## Discussions of results.

### Socio-demographic factors associated with blindness among diabetic patients

The objective of the study was to identify socio-demographic factors associated with blindness among diabetic patients. Data analysis and interpretation revealed that the number of females was 48 (60%) and males were 32 (40%). These findings indicate that the number of females was higher as compared to males thus females were more affected with diabetic-related eye disease as compared to males. This is probably because females have better health-seeking behaviors compared to males; this is partly consistent with the results from a study conducted in Embu; which that stated, there is no discernable sex difference for the occurrence of any diabetic retinopathy. However, according to study findings, females were more screened for diabetic eye disease which to a greater extent is inconsistent with the explanation from this study that females may have some form of protection from or resistance to neurodegenerative changes the precede development of background retinopathy compared to males (Ababa, 2014). This shows a greater risk of diabetic eye disease among females compared to males.

The results also showed that the highest number of respondents 42 (52%) were only primary leavers and only

06 (08%) were university/tertiary students showing that a low level of education is directly associated with vision problems this is due to failure to recognize early signs and symptoms like blurry vision and the use of traditional eye medicine. This is consistent and agrees with the study that higher education attainment provides greater knowledge and access to improved eye health (Altindag et al., 2015). This implies that the uneducated are likely to suffer from diabetic eye disease as compared to those with some level of education.

The married people were only 33 (41.25%) and the majorities that is singles were 47 (58.75%) this shows that singles were most screened for diabetic eye disease as compared to males consistent with the study that there is a decreased likelihood of vision difficulties among Togolese and Gambian females who were currently in marriage compared to their counterparts who were never married (Zheng et al., 2014). This is because marriage status provides support in seeking health care as compared to unmarried status.

### Economic factors associated with blindness among diabetic patients

The objective of the study was to establish economic factors associated with blindness among diabetic patients. Data analysis and interpretation revealed that 42 (52%) respondents were earning less than UGX 100,000 and 32 (40%) earned between UGX 100,000-400,000 and only 06 (08%) earned above UGX 400,000 which shows financial constraints regarding the management of diabetic eye diseases, this is consistent and agrees with the studies in

Senegal, Zimbabwe, and Uganda which showed that financial constraints is one of the major barriers of poor glycemic control in most African countries (Bangonza et al.,) and is also consistent with the definition that poverty in absolute terms is income less than US \$2 a day (WHO,2020). This poor status limits many from attaining the costly treatment involved in the management of diabetes which consequently leads to complications such as diabetic retinopathy that causes blindness.

The results showed that the highest 42 (52%) of the respondents had financial constraints influencing their food purchasing abilities which is consistent with the study that economic constraints include lack of access to healthcare and following the diabetic diet recommended by healthcare professionals (Pavlova et al.,2018). This will hinder access to a balanced diet because of the inability to meet costs which is important for adequate management of diabetic eye disease.

Study findings showed that 68 (85%) of the respondents had no insurance coverage and only 12 (15%) were insured. This shows uncertainty when it comes to receiving care in periods of financial constraints. This agrees or coincides with the study that direct DR-related costs increased as the stages of the disease progress with higher costs increasing between severe NPDR and PDR which expenses are easily met by those who are insured (Zhang et al.,2017). This makes it very difficult for those who require constant/daily medication to get these medicines due to lack of a reliable source of income.

### **Lifestyle factors associated with blindness among diabetic patients**

The objective of the study was to find out lifestyle factors associated with blindness among diabetic patients attending Mityana General Hospital. Data Analysis and interpretation revealed that 13 (16%) of the respondents 06 (08%) engaged in physicals three times a day, and most of the respondents that are 28 (35%) rarely engaged in physical exercises whereas 16 (20%) never engaged in any physical activity. This showed that physical inactivity was directly related to acquiring diabetes and consequently diabetic eye disease. This is consistent with the study by Karim et al, (2014) who revealed that physical inactivity often led to obesity and diabetes-related eye conditions especially DR in urban Bangladeshi. This sedentary lifestyle accounts for developing diabetic retinopathy.

The results also showed that 32 (40%) of the respondents daily spend 5-6 hours sitting either listening to radio programs or knitting their mats and only 15 (18%) would sit for less than 1 hour this shows a sedentary lifestyle because of inactivity that slows the rate of metabolism in the body increasing body fat and thus obesity that predisposes to

diabetes. This is consistent with the results from the Beijing eye study that higher physical activity and a less sedentary lifestyle are associated with a lower prevalence of Diabetic Retinopathy (Li et al., 2018). This limits general body activity leading to obesity and its complication which is increased sugars due to fat in the body.

Findings from the study show that only 08 (12%) of the respondents had fruits and vegetables as part of their daily meals, 31 (38%) had these sometimes, 26 (32%) had fruits and vegetables once a week as part of their daily meals and 15 (18%) rarely had fruits and vegetables as part of their daily meals. This showed an unhealthy and unbalanced diet necessary to provide nourishment to major organs of the body especially the eye due to poor consumption of fruits and vegetables. This agrees with the study by Dow et al., (2019) which reveals that the Mediterranean diet one of the healthiest diets in the world is characterized by a high intake of fruits and vegetables, which can protect against the development of Diabetic Retinopathy.

Study findings show that 09 (11.25%) of the respondents ate white rice, 17 (21.25%) ate posho and beans 23 (28.75%) ate cassava, and 31 (38.75%) ate sweet potatoes as their staple meals. The foods mostly eaten by the people of this area have somewhat a high sugar content which on continual increase especially being an elderly population exacerbates diabetes which is responsible for diabetic related eye disease especially diabetic retinopathy which leads to blindness. This agrees with the study by Pregoica et al., (2020), which states that dietary habits to talk of high fat or a combination of high fat and high sugar is a common risk factor for the development of diabetic retinopathy. This implies and explains an increased risk of blindness among this population.

### **Conclusions**

The study specifically sought to: identify the socio-demographic, economic, and lifestyle factors associated with blindness among diabetic patients attending Mityana General Hospital. The study established that there were more females blinded due to diabetic eye disease, the unmarried were also reported to be more affected than marrieds and many of the respondents were primary leavers and a few of them attained secondary/ tertiary education with the most affected group between the ages of 41- 60 years.

It also revealed that poverty or economic constraints were a major factor, limiting many respondents' access to the costly diabetic treatment, it was also established that many of the respondents were farmers and many had no insurance coverage. The study also established that few respondents engaged in daily physical activities with many spending most of their day sitting that is 5-6 hours either listening to



the radio or knitting mats, many of the respondents were alcoholics and the study established that few of them always had fruits and vegetables as part of their daily meals and sweet potatoes was recorded eaten by most respondents for most of the lunch meals.

Given these findings, several factors including age, sex, marital status, occupation, salary levels, insurance policies, physical activities diet, and behavior contributed to eye diseases that cause blindness among diabetic patients attending Mityana General Hospital which addresses the purpose of the study.

### Recommendations

The government and healthcare institutions should work toward reducing the cost of essential diabetes medication, including insulin, and providing affordable or free eye screening for diabetic patients. Mityana General Hospital should enhance community outreach programs focusing on early detection of Diabetic Retinopathy and other eye conditions. Mobile clinics every month could be utilized to provide eye screening in rural areas.

The government and non-government organizations through parish models as early as soon as possible should create financial assistance programs or insurance schemes to support the low-income earners and those without insurance coverage in the management of diabetes and its eye-related complications that can cause blindness.

Education on lifestyle modifications by trained health workers through workshops and community programs should be established every month to educate diabetic patients on healthy lifestyle changes, such as proper diet, physical activity, and the risks of smoking and alcoholic consumption.

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### List of abbreviations.

VA	Visual Acuity
OCO	Ophthalmic clinical officer
CDC	Center for Disease Control
DM	Diabetes Mellitus
DR	Diabetic Retinopathy
DME	Diabetic Macular Edema
DCs	Diabetic Cataracts
PDF	Proliferative diabetic retinopathy
NPDR	Nonproliferative diabetic retinopathy
IDF	International Diabetes Federation
NIDDK	National Institute of diabetes and digestive kidney diseases
MGH	Mityana General Hospital
T1DM	Type 1 Diabetes mellitus
T2DM	Type 2 diabetes mellitus
WHO	World Health Organization
DCRP	Diabetics Research and Clinical Practice.

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There is no source of funding.

### Conflict of interest.

The authors declare no conflicting interest.

### Availability of data.

Data used in this study is available upon request from the corresponding author.

### Authors contribution.

MSYL designed the study, conducted data collection, cleaned and analyzed data, and drafted the manuscript, KS supervised all stages of the study from conceptualization of the topic to manuscript writing and submission, DM & SM supported in study conceptualization general supervision and mentorship

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Michael Kabasa is a research supervisor at Ophthalmic Clinical Officers Training School Jinja.

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