KNOWLEDGE, ATTITUDE AND PRACTICE OF MEDICAL OFFICERS ON DIABETIC RETINOPATHY IN KAMPALA DISTRICT, UGANDA.

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JUNE, 2018
DECLARATION

I hereby declare that the work presented here is my own work and, to the best of my knowledge, has never been submitted for the academic award of a master’s of medicine degree of Ophthalmology in Makerere University or any other University or Institute of higher learning.

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DEDICATION

To my beloved children, Rubangakene Deo, Otim James, Omara Benjamin, Yomcwiny Elisabeth and Mic Joshua for their love and prayers.
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I give thanks to the almighty God for all the blessings and support He has provided me throughout this time.

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<tr>
<td>CME</td>
<td>Continuing Medical Education</td>
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<tr>
<td>DM</td>
<td>Diabetes Mellitus</td>
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<td>DR</td>
<td>Diabetic Retinopathy</td>
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<tr>
<td>KAP</td>
<td>Knowledge attitude and practice</td>
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<tr>
<td>MO</td>
<td>Medical Officer</td>
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<td>MOPD</td>
<td>Medical Out- Patient Department</td>
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<td>MPS</td>
<td>Medical Practitioners</td>
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<td>NPDR</td>
<td>Non proliferative Diabetic Retinopathy</td>
</tr>
<tr>
<td>PDR</td>
<td>Proliferative Diabetic Retinopathy</td>
</tr>
<tr>
<td>SHO</td>
<td>Senior housing officers</td>
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OPERATIONAL DEFINITIONS

**Attitude:** Feeling of medical officers towards diabetic retinopathy.

**Diabetes mellitus:** Chronic metabolic disorder of multiple aetiologies characterised by hyperglycaemia with disturbance of carbohydrates, fats and protein resulting from defect in insulin secretion, insulin action or both.

**Diabetic retinopathy:** Retinal vascular complication of diabetes

**Knowledge:** The understanding of medical officers about diabetic retinopathy

**Medical officers:** Are medical workers, who completed bachelor of human medicine and bachelor of surgery studies, this will include the intern doctors, general medical officers and senior housing officers.

**Medical out patients’ department:** is a medical unit that provides diagnosis and care for patients who do not need to stay overnight, this will include medical casualty.

**Medical ward:** is a unit in the hospital where both adult males and females suffering from all medical conditions are admitted. This will include also the emergency ward and the intensive care unit.

**Practice:** Refer to the way in which medical officers demonstrate their knowledge and attitude through their action.

**Senior housing officers:** are medical officers who are under training to become specialists.
ABSTRACT

Background:
Diabetic retinopathy is a common complication of diabetes mellitus and it is among the preventable causes of blindness. Diabetic patients usually come for eye checkup at a late stage of diabetic retinopathy, when there are visual complaints. Screening and management at an early stage of the disease will prevent diabetic retinopathy or at least delay its progress.
In Uganda medical officers are among the primary care clinicians for diabetic patients and they are at the front line in the management of diabetic patients, yet little is known about their knowledge, attitude and practice concerning diabetic retinopathy.

Aim:
To explore the level of knowledge, attitude and practice of medical officers regarding diabetic retinopathy.

Methods and materials:
This was a cross-sectional study among medical officers in six selected hospitals in Kampala city at medical out-patients’ departments and medical wards from January 2018 to March 2018 using a pre-tested questionnaire designed in knowledge, attitude and practise sections. Purposeful sampling method was used to choose the study hospitals and sample size calculated using modified Kish and Leslie formulae. Data was entered using Epi data version 3.1 and Statistical analysis was done using STATA version 4.0 computer package and results summarized.

Results
The numbers of respondents interviewed in this study were 111, of whom 38.7% were intern doctors, 32.4% were general medical officers and 28.8% were senior house officers. More than a third of the respondents (66.7%) were male and the majority of the respondents were of age group 25-30 years, (70.2%). More than a half, (53.2%) had practiced for less than one year.
Regarding knowledge, the total knowledge level among the respondents was poor. The vast majority of the respondents, (85%) knew that diabetes mellitus(DM) affects the retina, however only a few were aware that DM can affect the iris (5%), retinal vessels (15%) and the cornea (12%). Less than a quarter knew other fundus changes due to diabetes such as micro-aneurysms (28%) and retinal neovascularization (20%) while (20%) did not know any changes that can be seen on fundus examination. The majority of the respondents, (76%)were aware that DR can be treated, only a few mentioned ocular surgeries, 18%, medical treatment, (23%) and Laser photocoagulation (28%)as modes of treatment.
Concerning attitude towards eye examination, (73%) of the participants said that fundus examination by non-opthalmologists would help detect diabetic retinopathy(DR) in diabetic patients.

Regarding practice on eyes examination, only 36% of the respondents had access to an ophthalmoscope at work place and fundus exam was done by less than a third of the respondents (31%). More than a half (58%) of the respondents were able to refer diabetic patients to an eye healthcare worker.

Conclusion
The level of knowledge about diabetic retinopathy is poor, although majority of the respondents were aware of the complications of diabetes, and attitude regarding DR was good. 73% of the medical officers agreed that fundus examination by the non-opthalmologist could help detect DR while practice on referral of DM patients was good and majority refer DM although there was poor practice on fundoscopy.

Recommendations
- Conduct teaching workshop on fundoscopy and continuous medical education on diabetic retinopathy.
- Provide basic screening equipments and screening guideline for diabetic retinopathy at each medical unit.
- Development and dissemination of screening guidelines to the medical officers.
- The training during internship should include rotation of intern doctors in ophthalmology department.
- The curriculum for training senior house officers in internal medicine should include training in ophthalmology to improve on their skills.
CHAPTER ONE
INTRODUCTION

1.1 Background

Diabetes mellitus (DM) is a common metabolic disorder that occurs as a result of diminished efficacy or lack of endogenous insulin. This leads to sustained hyperglycaemia of variable severity. There are two types of DM; type 1, also known as immune mediated diabetes, and type 2. (Association, 2011)

Diabetic retinopathy (DR) is a micro-vascular complication of DM affecting the retina. DR progresses from mild through moderate and severe non-proliferative DR to proliferative DR. Damage to retinal micro vessels eventually leads to blindness. (4th ed. printing 2012).

DR is devastating disease, especially in its advanced stage, when it is associated with loss of vision. Apart from reduced productivity of blind patients, caring for them also puts a huge strain on resources available. Patients also require more physical, social and psychological support which further reduces the productivity of the society as a whole.

Globally, an estimated 422 million adults were living with diabetes in 2014, over the past decade. DM prevalence has risen faster in low- and middle-income countries than in high-income countries. (W.H.Organization, 2016).

There are approximately 93 million people with DR, 17 million with proliferative DR. Longer diabetes duration and poorer glycaemic and blood pressure control are strongly associated with DR. These data highlight the substantial worldwide public health burden of DR. (Yau et al., 2012)

In sub-Saharan Africa, proportions of patients with diabetic complications ranged from 7-63% for retinopathy (Hall, Thomsen et al. 2011)

In East Africa, a study done in Tanzania in Kilimanjaro among 3187 DM patients screened for DR shows a prevalence of DR to be 27.9% (Cleland et al., 2016)

In Uganda, a study done on causes of visual impairment among 318 DM patients at Mbarara Regional Referral Hospital showed that the prevalence of DR was 16.8% (Seba, Arunga, Bwonya, & Twinamasiko, 2016) whereas Dr. Kahigi at Mulago national referral hospital in 2016 found a prevalence of 32.6% among 350 DM patients. (Kahige, 2016 #28)
Diabetic retinopathy in Uganda is not among the common complications of DM screened for in medical out-patient department (MOPD)

Kibirige et al in his study at St. Raphael Hospital Nsambya, found Hypertension and diabetic neuropathy as the complications mostly screened for (hypertension – 100% and diabetic neuropathy – 47.2%).(Kibirige, Atuhe, Sebunya, & Mwebaze, 2014).

The best way to curb the visual loss due to DR is by preventing the development or progression of DR. This role may be significantly played by the primary clinician of diabetic patients. In Uganda, these primary clinicians include medical officers. It is not certain how knowledgeable medical officers in Kampala district are since neither their attitude nor practice is known. This study sought to assess the knowledge, attitude and practices of medical officers regarding diabetic retinopathy in Kampala district.

1.2 Statement of the problem
Diabetic retinopathy is one of the leading causes of preventable blindness. Diabetic patients presenting with ocular complaints usually do so because of sight threatening complications of DR and yet when these patients are screened, diagnosed and referred early, the development of ocular complication is prevented or delayed.

Even though the ophthalmologist could provide specialized care for the diabetic retinopathy patients, screening, control and referral to an ophthalmologist largely depends on the primary care clinicians.

In Uganda medical officers are among the primary care clinicians to receive these patient, screen, detect and treat yet their knowledge, attitude and practise is not known.

Diabetes is on a rise, about 50 to 100 patients are seen in MOPD per week in the government and non-profit private hospitals in Kampala. Studies done on DR in Uganda shows high prevalence of diabetic retinopathy. In a study done in Mulago national referral hospital by Dr Nabatanzi (unpublished dissertation, 1999) on ocular findings in patients with DM, the prevalence of DR was 35.2% while Dr. Kahigi in his study on prevalence and factors associated with DR among 350 patients attending diabetic clinic at Mulago hospital in 2016 found a prevalence of 32.3%(unpublished, dissertation 2016).
1.3 Study justification
As primary care clinicians, medical officers are at the frontline of diabetes and DR management. Assessment of their knowledge, attitude and practice is therefore important in the management of DR. There are no studies of this kind reported in Uganda, therefore the information acquired from this study will therefore add to the data available on DR and thus will help in awareness creation, policy and guideline development as well as advocacy in improving knowledge, attitude and practice of eye care which is vital towards achieving VISION 2020 goals for eliminating avoidable blindness.

Studies done in Africa and worldwide about clinician’s KAP have shown gaps and Uganda’s status on the same is unknown. The aim of this study is to explore the level of knowledge, attitude and practice of medical officers about diabetic retinopathy, this will help us know the services offered to diabetic patients regarding the management of diabetic retinopathy.

1.4 Research questions
1. What did the medical officers know about the ocular complication of DM?
2. What was the attitude of medical officers towards screening and referral of patients with DR?
3. What was the practice of medical officers on DR?
4. What were the factors affecting the screening of patients for diabetic retinopathy by the medical officers?

1.5 Objectives
1.5.1. Broad Objective
To assess the knowledge, attitude and practices of medical officers regarding diabetic retinopathy.

1.5.2. Specific Objectives
1. To assess the knowledge of medical officers about diabetic retinopathy.
2. To assess the attitude of medical officers towards screening and referral of patients with diabetic retinopathy.
3. To assess the practice of medical officers in screening for diabetic retinopathy.
4. To evaluate the factors affecting the screening of diabetic retinopathy by the medical officers.
2.1 Diabetes mellitus
Diabetes mellitus (DM) affects the blood vessels leading to macro-vascular and micro-vascular complications which manifest in the eyes, kidneys, brain, extremities and other parts of the body. The exact cause of diabetic micro-vascular disease is not known. It is however believed that prolonged exposure to hyperglycaemia results in a number of biochemical and physiological changes that finally result in endothelial damage. Some of the retinal capillary changes include selective loss of pericytes and thickening of the basement membrane which favour capillary occlusion and retinal non-perfusion, as well as decomposition of the endothelial barrier function. This allows serum leakage and retinal oedema to occur. (Comer and Ciulla 2005).

A community based survey done in Accra, Ghana, revealed that out of 300 subjects diagnosed with diabetes, 209 (69.7%) had no prior history of the disease. (Nyenwe, 2003)

2.2 Diabetic retinopathy
Diabetic retinopathy (DR) is a micro vascular complication of Diabetes Mellitus (type 1 and 2) affecting the retina. DR progresses from mild through moderate and severe non proliferative diabetic retinopathy (NPDR) to proliferative diabetic retinopathy (PDR). NPDR is characterized by retinal vascular abnormalities such as micro-aneurysms, intra-retinal haemorrhages, and cotton-wool spots. Increased vascular permeability leads to retinal thickening and exudates. In severe NPDR there is vascular closure leading to retinal ischemia characterized by venous loops, beading, intra retinal micro-angiopathy, extensive haemorrhages and exudates.

In PDR, there is neovascularisation caused by capillary non-perfusion as a result of retinal Hypoxia. The neovascularisation may extend into the posterior vitreous (pre-retinal) and Intra-retinal. Advanced diabetic eye disease is characterized by traction retinal detachment, significant persistent vitreous haemorrhage and neovascular glaucoma. (Comer & Ciulla, 2005).

Diabetic maculopathy refers to the presence of any retinopathy at the macular especially vision threatening oedema or ischemia. Clinically significant macula oedema, a term used to describe macular thickening and or exudates at or encroaching on the macula can develop at any stage from leaky vessels. This is cited from American academy, retina and vitreous practical guide (4th ed. printing 2012).
2.3 Risk factors of diabetic retinopathy

Risk factors for developing DR include,

Raised level of serum cholesterol. Patients with elevated total serum cholesterol are likely to develop hard exudates. The risk of losing visual acuity is associated with the extent of hard exudates even after adjusting for the extent of macular oedema. (Haddad and Saad 1998).

Duration of Diabetes is another important risk factor. According to the Wiscons in epidemiological study of diabetic retinopathy, the duration of diabetes is directly associated with an increase in the prevalence of diabetic retinopathy (DR) in patients with both types of diabetes. After 20 years of having the disease, almost 99% and 60% of patients with types 1 and 2 respectively have some degree of retinopathy. Also, 3.6% of type 1 patients and 1.6% of type 2 patients were legally blind with 86% and 33% of the blindness attributable to retinopathy in type 1 and 2 diabetes respectively. Poor glycaemic control is a key risk factor for the development of DR. (Klein, Klein, Moss, Davis, & DeMets, 1984).

High blood pressure which is poorly controlled has been strongly associated with DR. (Yau et al., 2012).

Other risk factors for DR in multiple regression analysis include smoking and being male sex.

Diabetic retinopathy is associated with hyperglycaemia, and there is convincing evidence that oxidative stress is related to the severity of diabetic complications. Also, reducing such stress by various means, including drugs and reducing hyperglycaemia, decreases the rate of development of DR. It is therefore supposed that oxidative stress causes DR. (Mathers and Loncar 2006)

2.4 Epidemiology of diabetic retinopathy

There are 4 million cases of blindness due to diabetic retinopathy (Vision 2020); this is expected to increase enormously in the coming years with the increase in the prevalence of DM. The visual loss and the blindness due to diabetic retinopathy can be prevented or at least delayed with early detection and timely intervention. Effective management of diabetic retinopathy needs multidisciplinary approach and participation of the community, paramedical personnel and medical practitioners.

Their knowledge is referred to as their understanding of diabetes and DR, their attitude is referred to as their feelings and any preconceived ideas toward diabetes and DR, and their practice is referred to as the ways in which they demonstrate their knowledge and attitude. Their actions have very important role in increasing awareness of the disease prevention and health promotion among the diabetic population. (Pizzarello, Abiose, Ffytche, & et al., 2004).
In a study done on 83 registered patients with type 2 diabetes in Luganville, the prevalence of registered patients with diabetes in adult population was 1.07%. Diabetic retinopathy was highly prevalent in the sample (in 36, 52.9%), and in 15 (22.1%) there was a significant threat to sight, with up to 25% of the sample possibly already affected by decreased VA or blindness resulting from diabetes-related eye disease. (Smith, Szetu, & Bourne, 2007).

Anti-oxidant therapy is beneficial in treatment of DR, a cohort study done in southern Sweden on children diagnosed with type 1 DM showed that the cumulative proportion of severe retinopathy had declined (p=0.006). After 25 years it was 47 % (95% CI 34–61), 28% (15–40) and 24% (12–36) in the cohorts 1961 to 1965, 1966 to 1970 and 1971 to 1975 respectively. After 30 years it was 53% (40–66). Modern diabetes care markedly reduced the incidence of severe retinopathy and nephropathy(Klein et al., 1984)

2.5 Screening

Appropriate screening of DR patients will prevent blindness; this involves visual acuity, pupil dilation and fundus examination. Retinopathy and Maculopathy should be assessed independently. Patients with mild NPDR and no maculopathy should be screened annually. Refer diabetic patients with any of the following: visual acuity 6/12 or worse of uncertain cause, diabetic maculopathy , moderate diabetic retinopathy or worse.(Unuigbe, 2001)

Various methods of detecting DR include direct and indirect ophthalmoscopy, stereoscopic color film fundus photography and mydriatic or non-mydriatic digital color photography. The role of direct ophthalmoscopy in a screening has been evaluated in several studies. With an undilated direct ophthalmoscopy, the sensitivity has been reported to be less than 80% and it varied with the type of retinopathy lesions. A lower sensitivity makes it less than ideal technology for screening. In addition, images from both techniques cannot be saved and therefore, a reference is unavailable during follow-ups. (Raman, Srinivasan, & Roy, 2015)

A non-mydriatic eye examination at the time of a routine clinic appointment is convenient and can provide the opportunity to involve patients effectively in their care and educate them about their disease. The examination takes about 15–20 min, the flash used to acquire images does not cause discomfort, and the patient’s eyes do not need to be dilated. These features help overcome related barriers such as shortage of caregivers, geographic isolation, socioeconomic challenges, and cultural patterns. Non mydriatic digital stereoscopic retinal imaging is a sensitive and
specific method for the screening and diagnosis of diabetic retinopathy, which may help improve compliance with the standards of eye care for patients with diabetes.(Gupta, Bansal, Gupta, & Bhansali, 2014).

Systematic screening programs for diabetic eye disease have been developed in many countries. The main aim of these services is to reduce diabetic related blindness and ease the burden of illness on the patients and their family. In United Kingdom diabetic eye screening program offers annual digital fundus photography for all DM patients over the age of 12 years. In 2010 - 2011 a nationwide uptake of 79% was achieved, if disease was identified referral to specialized eye unit for further assessment and treatment was recommended.(Sopharak, Uyyanonvara, & Barman, 2009).

Dilated eye examinations and retinal photography should be included in the routine management of type 1 diabetes during the first 5 years to identify the individuals at greatest risk for vision-threatening problems.(Gautam, Bhatta, & Aryal, 2015).

The Ophthalmology Society of South Africa screening programme has systematically risen the level of knowledge of DR among patients and their caregivers. This system makes the most of the current resources by providing immediate access to a common platform and communication methods. The involvement of all levels of healthcare practitioner makes access to screening much easier for patients. Appropriate, timely referral give patients the best possible opportunity to retain their sight.(Cook, 2013).

A study done in South Africa showed that the use of mobile fundus cameras to screen for diabetic vision impairment is a paradigm of an innovative approach to achieve economies of scale to reduce preventable blindness effectively on a national level. This would interface well with the screening strategy recommended by Ophthalmology Society of South Africa.(Hofman, Cook, & Levitt, 2014).

Systematic screening of diabetic population has been shown to greatly reduce prevalence and incidence of blindness within the population. Many national screening programs have digital fundus photography as their basis, using smart phones(Bolster, Giardini, & Bastawrous, 2015).

Traditional mydriatic fundus photography involves capturing images on 35 mm transparencies or films. Modern day cameras capture digital images of the fundus that aid in easy storage and
transfer of images and are reported to have better sensitivity in identifying DR lesions, especially with mydriasis and is comparable to the traditional ophthalmoscopy (Bragge, Gruen, Chau, Forbes, & Taylor, 2011).

A free screening test was performed on a random population including 178 eyes from 89 patients with confirmed DM diagnosis, 30% of the patients had never participated in any ophthalmological screening, while 25.7% had DR of some grade based upon a standard fundus camera examination. Large majority of the patients were satisfied with the screening and found it reliable and acceptable to undertake examination under pupil dilation; 67.3% were willing to undergo non mydriatic fundus camera examination again. Telemedicine can be a strong tool, supporting eye care professionals and allowing for faster and more comfortable DR screening. (Eszes et al., 2016).

2.6 Treatment and prevention

Treatment modalities exist that can prevent or delay the onset of diabetic retinopathy, as well as prevent loss of vision, in a large proportion of patients with diabetes. Glycaemic and blood pressure control can prevent and delay the progression of diabetic retinopathy in patients with diabetes. Timely laser photocoagulation therapy can also prevent loss of vision in a large proportion of patients with severe NPDR and PDR and/or macular oedema. (Klein et al., 1984)

Lowering elevated serum lipid levels has been shown to decrease the risk of cardiovascular morbidity. The observational data from the Early Treatment Diabetic Retinopathy Study suggest that lipid lowering may also decrease the risk of hard exudate formation and associated vision loss in patients with diabetic retinopathy. Preservation of vision may be an additional motivating factor for lowering serum lipid levels in persons with diabetic retinopathy and elevated serum lipid levels. (Haddad & Saad, 1998).

Good glycaemic control and non-smoking can reduce the prevalence of DR. These data reinforce the validity of multifactorial concepts for morbidity protection in type 1 diabetes. (Danaei et al., 2011).

Laser photocoagulation has led a revolution in the management of diabetic retinopathy. Scatter photocoagulation and focal photocoagulation have been shown to be effective in reducing vision loss. Just as dramatic as laser photocoagulation, medical treatment has led another
revolution in the treatment of diabetic retinopathy. Good glycaemic, blood pressure, and lipid control have contributed to further reduce vision loss and less use of laser photocoagulation. In the very near future, there will be significant advances in pharmacologic treatment of diabetic retinopathy. Treatment with antioxidants, agents inhibiting hyperglycaemia-induced protein kinase activity, and other agents will likely prevent the development/progression of retinopathy. Because pharmacologic agents are aimed at the prevention of retinopathy, patients with retinopathy will need to be examined earlier to diagnose retinopathy at earlier stages. To maximize the opportunity for earlier diagnosis, ophthalmologist may need to adopt screening strategies to identify patients most likely to benefit from these new treatments. (Fong, 2002).

As a mode of prevention, health workers including physician needs to educate their diabetic patients about the importance of setting an annual eye examination routinely before the development of vision loss. (Datti, Mahajan, & Chakrabarty, 2014).

2.7 Studies on knowledge, attitude and practice
In Uganda, diabetic patients are primarily attended to by medical officers, therefore they should be knowledgeable about diagnosis and management of DR, thus if they are knowledgeable about the micro vascular complications of DM affecting organs, especially the eyes, it will improve their ability to detect DR early for early referral and management. They should also have some examination skills to be able to detect abnormalities in the eye as a consequence of DR. No study on knowledge, attitude and practise [KAP] of clinicians have been reported in Uganda. However, studies done in other various parts of the world show inadequate KAP on DR.

A study done in Brazil among 168 physicians to find out their experience and management of patients with diabetes mellitus and the ophthalmological examination found out that only 36.9% correctly referred patients with diabetes type 1 to an ophthalmologist, whereas 86.9% referred patients with the type 2 disorder as recommended by the American Academy of Ophthalmology. Regarding the correct indication for screening for diabetic retinopathy, more physicians who had received their degrees less than 5 years previously implemented this practice (54.8%), as opposed to those who had received their degrees 20 years or more earlier (22.6%). Regarding their experience in fundoscopy during their specialty training, 52.4% claimed to have experience, but only 21.4% of those interviewed performed this examination on their patients. According to 84.5% of the interviewees, the fundus examination influenced their
clinical treatment program, therefore the study demonstrates that medical knowledge among medical practitioners on preventive measures and periodicity of diabetic retinopathy examinations appears to be far from ideal. (Preti, Saraiva, Trein Junior, Takahashi, & Silva, 2007).

Ghosh et al ascertained the knowledge among 242 physicians and 36 optometrists regarding diabetic retinopathy in government health units of West Bengal and found knowledge of 74 - 78% among physicians and 83 - 86% among optometrists and this was graded as not acceptable knowledge therefore existing lack of knowledge among physicians and optometrists regarding diabetic retinopathy needs correction. (Ghosh, Mukhopadhyay, Maji, & Halder, 2007).

Wadaai et al assessed the knowledge, attitude and practice of the final year medical students of king Faisal university medical college towards diabetes and diabetic retinopathy and found out that gaps in knowledge as well as follow up for screening of DR exist, this predict on the gap of future MPs. (Wadaani, 2013).

Khandekar et al assessed the KAP of physicians concerning retinal examination of diabetic Patients in Oman. They found that “knowledge about different parts of the eye was satisfactory in only 58% of physicians and knowledge about method of fundus examination for diabetic retinopathy was poor in 40% (Khandekar, Shah, & Al Lawatti, 2008).

Oenga et al also found that attitudes towards screening for DR was good with 87.9% of the study participants strongly disagreeing with the statement that diabetic patients required eye examination only when their vision is affected. (Oenga, 2012 #35).

In Nigeria Kebbi State, a KAP study on ophthalmoscopy among 70 Medical Practitioners (MPs) attending Continuing Medical Education (CME) in 2012 was done and it showed that only 74.3% of MPs use ophthalmoscope, 52.9% had never conducted ophthalmoscopy in diabetics, while 35% thought referring diabetics for eye consultations was unnecessary. This showed that many MPs never do ophthalmoscopy in diabetics and only few referred them for eye specialists’ assessment. (A. Ayanniyi, K. Monsudi, A. Balarabe, & A. Isa, 2014).

Datti et al highlighted some of the lacunae in the knowledge about referral system of the general physicians and identified the need for improvement in awareness regarding the management of
the patients with diabetic retinopathy in a study done among 38 physicians and 2 general practitioners in rural Kolar district towards diabetes and diabetic retinopathy. It was found out that satisfactory score was attained by only 55% (22/40) practitioners. Nearly 62.5% of physicians refer the diabetics to ophthalmologists only when they develop significant vision problems,(Datti et al., 2014).

In East Africa, a study done in Kenya, at a tertiary referral centre among medical staff, found out that management outcomes for DM and DR may be improved by implementing integrated service provision, direct ophthalmological involvement in diabetic clinics, endorsement and effective distribution of guidelines, an increase in screening capacity, and the introduction of on-going medical education covering DM and DR.(Khaw et al., 2004).

Niyonsavye noted that participants generally had a poor knowledge on DR in a study done among general practitioners in Burundi. Knowledge about relationship between DR and other end organs which can be affected by micro-vascular complication of diabetes mellitus like kidney was good (76.5%) but Participants had very poor practice on screening for DR, with only 22.2% testing the vision in a year and only 5(6.2%) attempted fundus examination on their diabetic patients. (Niyonsavye, 2015 #39).
CHAPTER THREE
METHODS

3.1 Study design
This was a cross-sectional study which employed quantitative method of data collection among medical officers in Kampala district. It was conducted from January 2018 to March 2018.

3.2 Study setting
The study was conducted in Kampala, the Capital City of Uganda. Kampala consists of five Divisions which are Kawempe, Rubaga, Nakawa, Central and Makindye. Data collection was carried out in all the five divisions at government and non-profit private hospitals, in medical outpatient departments and medical wards. The government hospitals included Kiruddu and Naguru with 50 and 6 medical officers respectively while the non-profit private hospitals included Mengo hospital with 15 medical officers, Nsambya - 13, Rubaga -10 and Kibuli -7. These hospitals were chosen because they treat a larger number of DM patients and they have outpatient department, inpatients wards, emergency and intensive care units so the doctors there are exposed to the DM patients and the care given to them.

3.3. Target population
All medical officers in the selected government and non-profit private hospitals in Kampala district.

3.4. Study population
Medical officers working in medical outpatient department and medical wards of the selected hospitals.

3.5 Selection criteria
3.5.1 Inclusion criteria
All the medical officers who work in medical outpatient departments and medical wards in the selected government and non-profit private hospital in Kampala district from January 2018 to march 2018 and had consented to the study. These included the intern doctors, general medical officers and senior house officers.
3.5.2 Exclusion criteria
Medical specialists, medical officers who declined to consent for the study and medical officers who are on sick leave were excluded from the study.

3.6 Sampling method
3.6.1 Sampling procedure
This was a quantitative study. Purposifull sampling was used to select two government hospitals (Kiruddu and Naguru) and four non-profit private hospitals (Mengo, Nsambya, Rubaga and Kibuli). All the medical officers who agreed to participate in the study and who work in medical outpatient department and medical wards in the selected health were included in the study.

3.6.2 Sample size estimation
The Sample size was calculated using Kish and Leslie (1965) for cross sectional studies. The variable used for sample size was knowledge of DR with a 95% confidence interval, a 5% margin of error and based on the data from the previous study carried out among general practitioners in Burundi by Niyonsavye in 2015 where 76.5% had knowledge on diabetic retinopathy. The required minimal sample size was:

\[ N = \frac{Z^2 \times Q \times P}{d^2} \]

\( N \) – Actual number of medical officers.
\( Z \) – Standard normal variant corresponding to 95% interval confidence level (1.96)
\( P \) – Prevalence of knowledge about DR among general practitioners in Burundi (76.5%)
\( Q \) – (100 - P) %
\( d \) – Required precision of the estimate (0.05)

\[ N = \frac{1.96^2 \times 0.235 \times 0.765}{0.05^2} \]

Therefore, \( N = 276 \)
Since the actual sample size of 276 was bigger than the population of medical officers available, modified Kish and Leslie formulae (Wayne W. Daniel; 1998) was used to arrive at the required sample size.

\[ n = N \times \frac{Z^2 \times Q \times P}{d^2(N-1) + Z^2 \times Q} \]

\( n \) - Sample size
\( N \) – Actual number of medical officers (127)
\( Z \) – Standard normal variant corresponding to 95% interval confidence level (1.96)
P – Prevalence of knowledge about DR among general practitioners in Burundi (76.5%)
Q – (100 - P) %
d – Required precision of the estimate (0.05)
N – The actual number of medical officers (127)
\[ N = \frac{127 \times 1.96^2 \times 0.235 \times 0.765}{0.05^2 \times (127 -1) + 1.96^2 \times 0.235 \times 0.765} \]
Therefore \( n = 121 \)

3.7. Data collection procedure
Data was collected using coded questionnaire administered by the principal investigator and two trained research assistants who are doctors. The questionnaire was designed in three sections focusing on knowledge, attitude and practice. Letters were written and addressed to all the directors of the selected hospitals requesting to be allowed to conduct research in their hospitals, copies of proposal was submitted for approval and research fee paid. All the participants were asked to cooperate and participate in the study. This was done one week prior to the onset of the study. List and contacts of the medical officers got from the head of clinicians, medical departments and those who were on leave or off duty at the time of data collection, appointment was made for the interview.

3.8 Data management
3.8.1. Data entry
Data collected was entered into the computer software using Epi-Data. Data version 3.1 was cleaned and exported to STATA software version 14.0 for analysis.

3.8.2 Data analysis
Statistical analysis was done using STATA version 14.0 and results summarised. Categorical variables were summarised in frequency and percentage while continuous variables were summarized in the forms of mean, percentile, range, and standard deviation.
In determining the overall level of knowledge, correct responses from knowledge section was considered and then scored in percentage, a cut-off point of 50% was used to grade, above 50% was considered as satisfactory knowledge and below 50% was considered poor knowledge. For analytical statistics, chi square test statistics was used to assess the relationship between two categorical variables. Significant differences and associations were determined by p-values of less than 0.05, variables with P-value of \( \leq 0.05 \) at bivariate were taken for multivariate analysis.
3.9 Quality control
This was ensured by the following:
Pre-testing of the questionnaire which was conducted by the principal investigator on five medical officers who were not in the inclusion criteria.
Research assistants were trained for two days.
Data collection was done by the principal investigator and two trained research assistants.
Data collected was cleaned and validated that same day of data collection by principal investigator.
The data collected was written in ink to avoid alteration.
Regular meeting with the trained research assistants was conducted.
The data was presented to the supervisor.

3.10 Ethical considerations
Permission to carry out the study was obtained from the Department of Ophthalmology Makerere University College of Health Sciences, the School of Medicine, Research and Ethics Committee, the hospital directors of the selected hospitals and the Uganda National Council for Science and Technology.
Informed consent was obtained from the participants. Only consented participants were involved in the study and the participants were given codes for purposes of confidentiality.

3.11 Dissemination of results
The study results will be disseminated to directorate of research and graduate training Makerere university, department of ophthalmology, Sir Albert cook library, International peer reviewed health journals and at National and international conferences.
CHAPTER FOUR
RESULTS

4.1 Introduction
A total of one hundred and eleven respondents from six health facilities in Kampala district participated in this study that was conducted from January 2018 to March 2018.

The results were reported in four sections, section on social demographic characteristics of the respondents, knowledge, attitude and practice of the respondents regarding diabetic retinopathy.

4.2 Characteristic of the study respondents

Table 1: Findings on social demographic characteristics of respondents

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Frequency (n-111)</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td></td>
<td></td>
</tr>
<tr>
<td>25-30</td>
<td>78</td>
<td>70.2</td>
</tr>
<tr>
<td>31-35</td>
<td>21</td>
<td>18.9</td>
</tr>
<tr>
<td>&gt;35</td>
<td>12</td>
<td>10.8</td>
</tr>
<tr>
<td>Sex</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>74</td>
<td>66.7</td>
</tr>
<tr>
<td>Female</td>
<td>37</td>
<td>33.3</td>
</tr>
<tr>
<td>Position</td>
<td></td>
<td></td>
</tr>
<tr>
<td>General medical officer</td>
<td>36</td>
<td>32.4</td>
</tr>
<tr>
<td>Senior house officers</td>
<td>32</td>
<td>28.8</td>
</tr>
<tr>
<td>Intern doctors</td>
<td>43</td>
<td>38.7</td>
</tr>
<tr>
<td>Duration of practice</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt; 1 year</td>
<td>59</td>
<td>53.2</td>
</tr>
<tr>
<td>1-5 years</td>
<td>41</td>
<td>36.9</td>
</tr>
<tr>
<td>&gt;5 years</td>
<td>11</td>
<td>9.9</td>
</tr>
<tr>
<td>Facility of practice</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Government</td>
<td>56</td>
<td>50.5</td>
</tr>
<tr>
<td>Private</td>
<td>55</td>
<td>49.5</td>
</tr>
</tbody>
</table>

The majority of the respondents (70.2%) were in the age group 25-30 years. Two thirds (66.7%) of the respondents were male and about a half, 53.2% had practiced for less than one year. The intern doctors comprised of 38.7% of the respondents. A half of the respondents were in private health facilities and the other half in government health facilities.
4.3 Knowledge of respondents on diabetic retinopathy

Figure 1: Awareness of medical officers on micro vascular complications of diabetes mellitus.

The most commonly known microvascular complications of diabetes were of the eyes (91%), followed by kidneys (69%) and peripheral nerves (66%). The least commonly known complications being those of the stomach (7.0%).
Figure 2: Awareness of medical officers on factors that influence presence or severity of diabetic retinopathy

The major factors that the respondents perceived to influence the severity or occurrence of diabetic retinopathy were poor glucose control, 87(78%), hypertension 45% and duration of diabetes 39%, less than a quarter of the respondents were aware of the other risk factors such as smoking 17(15%), obesity (20%) and high lipid profile 23(21%).
Figure 3: Awareness of medical officers on parts of the eye that can be affected by diabetes

The vast majority of the respondents, (85%) knew that DM affects the retina, more than quarter were aware of the lens 31% and the optic nerve 27%, although only a few were aware that DM can affect the iris 5%, eye vessels 15% and the cornea 12%.
Figure 4: Awareness of medical officers on parts of the eye that should be examined for changes due to diabetic retinopathy in percentage (%)

The majority of the respondents (68%) were aware that the retina should be examined for changes due to diabetes, the least mentioned parts of the eye to be examined were the pupil (7%), iris (7%) and the lens (17%).
Figure 5: Awareness of medical officers on changes due to DM that can be seen on fundus exam

As shown in the figure 5 above, the majority of the respondents did not know the changes due to diabetes that should be examined for, the least mentioned changes were beading 13 (12%), macular degeneration (15%) and retinal detachment (17%). Less than a quarter knew other fundus changes due to diabetes such as micro-aneurysms (28%), retinal neovascularisation (20%) while (20%) did not know any changes that can be seen on fundus examination.
Table 2: Awareness of medical officers on when and how often to do eye checkup.

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Frequency</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consultation with eye health worker after diagnosis</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>99</td>
<td>89</td>
</tr>
<tr>
<td>No</td>
<td>12</td>
<td>11</td>
</tr>
<tr>
<td>Consultation with eye health worker on a regular basis</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>90</td>
<td>81</td>
</tr>
<tr>
<td>No</td>
<td>21</td>
<td>19</td>
</tr>
<tr>
<td>Frequency of eye health worker consultation on a regular basis per year</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Once</td>
<td>30</td>
<td>33</td>
</tr>
<tr>
<td>2-3 times</td>
<td>49</td>
<td>54</td>
</tr>
<tr>
<td>4-5 times</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>&gt;5 times</td>
<td>7</td>
<td>8</td>
</tr>
</tbody>
</table>

The majority of respondents, (89%) were aware that a person with diabetes should visit a health eye worker after diagnosis. (81%) knew that diabetic patients should continue regular eye check-up after diagnosis. More than a half of the respondents (54%) opted for 2-3 visits per year.
Figure 6: Awareness of medical officers on prevention of development or progression of DR among DM patients

From figure 6, blood glucose control, 78%, hypertension control 47% and early diagnosis and referral 36% were the main methods mentioned by the respondents as a way of preventing the development or the progression of diabetic patients, less than a third of the respondents were able to mention avoiding alcohol (8%), control of obesity (11%) lowering elevated serum lipid level (12%), and avoiding smoking (20%), as methods of prevention.
Table 3: Knowledge of medical officers on treatment of diabetic retinopathy

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Frequency (n=111)</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Whether diabetic retinopathy can be treated</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>84</td>
<td>76</td>
</tr>
<tr>
<td>No</td>
<td>27</td>
<td>24</td>
</tr>
<tr>
<td>Treatment modalities for DR known</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Laser photocoagulation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>31</td>
<td>28</td>
</tr>
<tr>
<td>No</td>
<td>80</td>
<td>72</td>
</tr>
<tr>
<td>Medical treatment</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>26</td>
<td>23</td>
</tr>
<tr>
<td>No</td>
<td>85</td>
<td>87</td>
</tr>
<tr>
<td>Ocular surgery</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>20</td>
<td>18</td>
</tr>
<tr>
<td>No</td>
<td>91</td>
<td>82</td>
</tr>
<tr>
<td>Normalisation of blood sugar level</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>36</td>
<td>32</td>
</tr>
<tr>
<td>No</td>
<td>75</td>
<td>68</td>
</tr>
<tr>
<td>Normalisation of blood pressure level</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>46</td>
<td>41</td>
</tr>
<tr>
<td>No</td>
<td>65</td>
<td>59</td>
</tr>
<tr>
<td>Other</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>11</td>
<td>10</td>
</tr>
<tr>
<td>No</td>
<td>100</td>
<td>90</td>
</tr>
<tr>
<td>No response</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>22</td>
<td>20</td>
</tr>
<tr>
<td>No</td>
<td>89</td>
<td>80</td>
</tr>
</tbody>
</table>

The study revealed that the majority of the respondents, (76%) were aware that diabetic retinopathy can be treated, however few respondents knew of the interventional treatment modalities for diabetic retinopathy and only a few mentioned ocular surgeries, (18%), medical treatment, (23%) and Laser photocoagulation (28%).
A few of the respondents, less than a half (42%) had satisfactory knowledge regarding diabetic retinopathy. The level of knowledge was based on the sum of correct responses given regarding diabetic retinopathy and a 50% cut off point was used to grade the level of knowledge, above 50% was considered satisfactory knowledge while below 50% was considered poor knowledge.
### 4.4 Attitude of medical officers on diabetic retinopathy

#### Table 4: Attitude of medical officers on diabetic retinopathy

<table>
<thead>
<tr>
<th>Variables</th>
<th>Agree (n, %)</th>
<th>Neutral (n, %)</th>
<th>Disagree (n, %)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eye examination is only required in DM Patients when vision is affected.</td>
<td>27(24)</td>
<td>16(14)</td>
<td>68(61)</td>
</tr>
<tr>
<td>Ophthalmology training in medical school adequately equips the MO to manage patients with eye complaints.</td>
<td>35(32)</td>
<td>37(33)</td>
<td>39(35)</td>
</tr>
<tr>
<td>Fundus examination should be done by ophthalmologist.</td>
<td>41(37)</td>
<td>26(23)</td>
<td>44(40)</td>
</tr>
<tr>
<td>Fundus examination by non-ophthalmologist could help detect DR in diabetic patients.</td>
<td>81(73)</td>
<td>17(15)</td>
<td>13(12)</td>
</tr>
<tr>
<td>Pregnant women with diabetes require more frequent check-up than non-pregnant ones.</td>
<td>80(73)</td>
<td>24(22)</td>
<td>7(6)</td>
</tr>
<tr>
<td>The presence of diabetic retinopathy may be indication of the presence of other micro-vascular complications.</td>
<td>90(81)</td>
<td>16(14)</td>
<td>5(5)</td>
</tr>
<tr>
<td>Good lipid profile is essential for preventing vision loss in retinopathy.</td>
<td>93(84)</td>
<td>16(14)</td>
<td>2(2)</td>
</tr>
</tbody>
</table>

Concerning attitude towards eye examination, majority of the respondents, (61%) disagreed that eye examination is only required in diabetic patients when vision is affected, most of the respondents (44%) disagreed that fundus examination should be done by ophthalmologists only and (73%) of the participants agreed that fundus examination by non-ophthalmologists would help detect DR in diabetic patients.

The majority of the respondents, 84% were positive about good lipid profile being essential for preventing vision lost among diabetic patients and 81% agreed that presence of DR indicates presence of other microvascular complication of diabetes.
### Practice of medical officers on diabetic retinopathy.

**Table 5: Practice of medical officers on eye examination of diabetic patients**

<table>
<thead>
<tr>
<th>Practice</th>
<th>N=111</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fundoscopy</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Have access to an ophthalmoscope at work place</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>40</td>
<td>36</td>
</tr>
<tr>
<td>No</td>
<td>71</td>
<td>64</td>
</tr>
<tr>
<td>Does fundus exam of DM patients</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>34</td>
<td>31</td>
</tr>
<tr>
<td>No</td>
<td>76</td>
<td>69</td>
</tr>
<tr>
<td>Attempted fundus exam in any DM patients over the past six months</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>26</td>
<td>23</td>
</tr>
<tr>
<td>No</td>
<td>85</td>
<td>77</td>
</tr>
<tr>
<td>Able to appreciate the details of the retina</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>16</td>
<td>62</td>
</tr>
<tr>
<td>No</td>
<td>10</td>
<td>38</td>
</tr>
<tr>
<td>Dilated the pupil</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>30</td>
<td>27</td>
</tr>
<tr>
<td>No</td>
<td>81</td>
<td>73</td>
</tr>
<tr>
<td><strong>Reason for not dilating</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lack of time</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>Didn’t see the significance</td>
<td>69</td>
<td>85</td>
</tr>
<tr>
<td>Lack of dilating drops</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Others</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td><strong>Frequency of fundoscopy</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>After diagnosis</td>
<td>15</td>
<td>45</td>
</tr>
<tr>
<td>Three months after diagnosis</td>
<td>2</td>
<td>11</td>
</tr>
<tr>
<td>Six months after diagnosis</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>At every clinic visit</td>
<td>5</td>
<td>14</td>
</tr>
<tr>
<td>Annually</td>
<td>4</td>
<td>11</td>
</tr>
<tr>
<td>If patient has visual complaints</td>
<td>6</td>
<td>17</td>
</tr>
<tr>
<td><strong>Frequency of testing vision</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>After diagnosis</td>
<td>17</td>
<td>15</td>
</tr>
<tr>
<td>Three months after diagnosis</td>
<td>19</td>
<td>17</td>
</tr>
<tr>
<td>Six months after diagnosis</td>
<td>5</td>
<td>4.5</td>
</tr>
<tr>
<td>At every clinic visit</td>
<td>8</td>
<td>7.2</td>
</tr>
<tr>
<td>Annually</td>
<td>14</td>
<td>12.6</td>
</tr>
<tr>
<td>If patient has visual complaints</td>
<td>39</td>
<td>35.1</td>
</tr>
<tr>
<td><strong>Referral of diabetic patients</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Refer DM for eye examination</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>64</td>
<td>58</td>
</tr>
<tr>
<td>No</td>
<td>47</td>
<td>42</td>
</tr>
</tbody>
</table>
Regarding practice on fundus examination, less than a third (36%), of the respondents had access to an ophthalmoscope at work place, only (31%) were able to do fundoscopy on diabetic patients. (23%) attempted fundus examination in the past six months and of those, (73%) did not dilate the pupil and the reasons for not dilating the pupil were lack of time (7%), lack of dilating drops (5%), while (85%) did not see the significance of dilatation.

The majority of the participants, (39%) tested vision only if patient has visual complaints. Regarding practice on referral, more than half (58%) of the respondents were able to refer diabetic patients to an eye health care worker.

**Figure 8: Factors hindering the Screening of diabetic patient by the medical officers**

Factors that were found to hinder the screening of diabetic patient for diabetic retinopathy by the respondents were lack of skills in conducting fundoscopy (39%), no ophthalmoscope (31%), too many patients (25%) and lack of dilating drops (5%), respectively.
Concerning fundoscopy, good practice was considered as the respondents who performed fundoscopy while bad practice was considered as those who did not perform fundoscopy.

Table 6: Bivariate analysis of association between social demographic characteristics and fundus examination

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Practice of fundoscopy (111)</th>
<th>Odds ratio (95% CI)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Good practice n (%)</td>
<td>Poor Practice n (%)</td>
<td></td>
</tr>
<tr>
<td>Age group</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>25-30</td>
<td>20 (59)</td>
<td>58 (75)</td>
<td>0.48 (0.14-1.69)</td>
</tr>
<tr>
<td>31-35</td>
<td>9 (16)</td>
<td>12 (16)</td>
<td>1.05 (0.25-4.42)</td>
</tr>
<tr>
<td>&gt;35</td>
<td>5 (15)</td>
<td>7 (9)</td>
<td>1</td>
</tr>
<tr>
<td>Sex</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>23 (68)</td>
<td>51 (66)</td>
<td>1</td>
</tr>
<tr>
<td>Female</td>
<td>11 (32)</td>
<td>26 (34)</td>
<td>0.94 (0.40-2.22)</td>
</tr>
<tr>
<td>Position of respondent</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intern doctors</td>
<td>7 (20)</td>
<td>36 (47)</td>
<td>1</td>
</tr>
<tr>
<td>General medical officers</td>
<td>8 (24)</td>
<td>28 (36)</td>
<td>1.47 (0.48-4.54)</td>
</tr>
<tr>
<td>Senior house officers</td>
<td>19 (56)</td>
<td>13 (17)</td>
<td>7.52 (2.57-22.00)</td>
</tr>
<tr>
<td>Duration of practice</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt; 1 year</td>
<td>14 (41)</td>
<td>45 (59)</td>
<td>0.83 (0.19-3.56)</td>
</tr>
<tr>
<td>1-5 years</td>
<td>17 (50)</td>
<td>24 (31)</td>
<td>1.89 (0.44-8.18)</td>
</tr>
<tr>
<td>&gt;5 years</td>
<td>3 (9)</td>
<td>8 (10)</td>
<td>1</td>
</tr>
<tr>
<td>Facility of practice</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Private</td>
<td>14 (41)</td>
<td>41 (53)</td>
<td>0.61 (0.28-1.39)</td>
</tr>
<tr>
<td>Government</td>
<td>20 (59)</td>
<td>36 (47)</td>
<td>1</td>
</tr>
</tbody>
</table>

Bivariate analysis to assess the relationship between social demographic characteristics and practice on fundoscopy showed that there was significant association between position of the respondents and good practice of fundoscopy where by the senior house officers were 7.5 times more likely to perform fundoscopy than the intern doctors (p-value = 0.00, OR=7.52). There was no association between age, sex, duration of practice and facility of practice with performing fundoscopy.

Concerning referral of diabetic patients for eye check-up, good practice was considered as the respondents who referred their diabetic patients for eye check-up while bad practice was considered as those who did not refer diabetic patients.
Table 7: Bivariate analysis on social demographic characteristics and referral of DM patients

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Practice of referral of diabetics (111)</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Good Practice</td>
<td>Poor practice</td>
<td>Odds ratio (95%CI)</td>
<td>P-value</td>
<td></td>
</tr>
<tr>
<td>Age group</td>
<td>n (%)</td>
<td>n (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>25-30</td>
<td>40(63)</td>
<td>38(81)</td>
<td>0.10(0.01 – 0.78)</td>
<td>0.028</td>
<td></td>
</tr>
<tr>
<td>31-35</td>
<td>13(20)</td>
<td>8(17)</td>
<td>0.15(0.02 – 1.37)</td>
<td>0.093</td>
<td></td>
</tr>
<tr>
<td>&gt;35</td>
<td>11(17)</td>
<td>1(2)</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sex</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>40(63)</td>
<td>34(72)</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>24((37)</td>
<td>13(28)</td>
<td>1.57(0.69 – 3.55)</td>
<td>0.279</td>
<td></td>
</tr>
<tr>
<td>Position of respondent</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intern doctors</td>
<td>19(30)</td>
<td>24(51)</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>General medical officers</td>
<td>23(36)</td>
<td>13(38)</td>
<td>2.23(0.9 – 5.54)</td>
<td>0.083</td>
<td></td>
</tr>
<tr>
<td>Senior housing officers</td>
<td>22(34)</td>
<td>10(21)</td>
<td>2.78(1.06 – 7.26)</td>
<td>0.037</td>
<td></td>
</tr>
<tr>
<td>Duration of practice</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt; 1 year</td>
<td>24(38)</td>
<td>35(74)</td>
<td>0.07(0.01 - 0.57)</td>
<td>0.013</td>
<td></td>
</tr>
<tr>
<td>1-5 years</td>
<td>30((47)</td>
<td>11(23)</td>
<td>0.27(0.3-2.39)</td>
<td>0.240</td>
<td></td>
</tr>
<tr>
<td>&gt;5 years</td>
<td>10(16)</td>
<td>1(2)</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Facility of practice</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Private</td>
<td>22(34)</td>
<td>34(72)</td>
<td>4.99(2.20 – 11.35)</td>
<td>0.000</td>
<td></td>
</tr>
<tr>
<td>Government</td>
<td>42(66)</td>
<td>13(28)</td>
<td>1</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Statistically, there was significant relationship between practice of referral of DM patients and age group, position of the respondents, duration of practice and facility of practice. There was association between practice of referral and age group 25 -30years, (P-value=0.028, OR=0.01), the younger respondents were 10 times less likely to refer diabetic patients than the older age group. Other significant association was noted between practice of referral and SHO (P-value = 0.037, OR=2.78), private health facility (P- value=0.00, OR=4.99) and duration of practice of less than a year (P-values = 0.013, OR=0.07). More referral was noted among SHO where they are about three times more likely to refer diabetic patients than the intern doctors. The respondents who have been in practice for less than a year were 14 times less likely to refer diabetic patients than those who have been in practice for more than 5 years. The respondents in private health facilities were five times more likely to refer diabetic patients than those in government facilities.
### Table 8: Multivariate analysis for the association of referral of DM patients among 111 participants

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Adjusted OR</th>
<th>95% C.I</th>
<th>P-value*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age group</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>25-30</td>
<td>0.207</td>
<td>0.020 - 2.142</td>
<td>0.186</td>
</tr>
<tr>
<td>31-35</td>
<td>0.235</td>
<td>0.020 - 2.835</td>
<td>0.255</td>
</tr>
<tr>
<td>&gt;35</td>
<td>1.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sex</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>1.208</td>
<td>0.458 - 3.184</td>
<td>0.702</td>
</tr>
<tr>
<td>Male</td>
<td>1.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Position of respondent</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intern doctors</td>
<td>1.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>General medical officers</td>
<td>0.690</td>
<td>0.216 – 2.208</td>
<td>0.532</td>
</tr>
<tr>
<td>Senior house officers</td>
<td>0.947</td>
<td>0.257 – 3.488</td>
<td>0.935</td>
</tr>
<tr>
<td>Duration of practice</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt; 1 year</td>
<td>0.082</td>
<td>0.008 - 0.842</td>
<td><strong>0.035</strong></td>
</tr>
<tr>
<td>1-5 years</td>
<td>0.293</td>
<td>0.029 - 2.938</td>
<td>0.296</td>
</tr>
<tr>
<td>&gt;5 years</td>
<td>1.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Facility of practice</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Private</td>
<td>5.124</td>
<td>1.910 – 13.749</td>
<td><strong>0.001</strong></td>
</tr>
<tr>
<td>Government</td>
<td>1.00</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

From table 8 above, multivariate analysis was done to rule out any confounding factors in the relationship between social demographic characteristics and practice of referral of diabetic patients by the respondents, statistically significant association was noted between duration of practice for less than a year and practice of referral (OR=0.082, P-value=0.035). The respondents who had practiced for less than a year were 12 times less likely to refer diabetic patients than those who have been in practice for more than 5 years. Further, there was also statistically significant association between working in private facilities and practice of referral of diabetic patients (OR=5.124, P-value=0.001). The respondents in the private facilities were 5 times more likely to refer diabetic patients than those in government facilities.
CHAPTER FIVE
DISCUSSION

5.1 Population characteristics
The total number of respondents in this study were 111 and of whom 74 (76%) were male while 37 (33%) were female. This was similar to a study done in referral hospital in Burundi which had male (82.7%) and female (17.3%), a ratio of 4.8:1 (Niyonsayye, 2015 #39).

The majority of the participants were of age group 24 – 30 years, which was comparable with a study by Elnagieb et al in Khartoum, Sudan where more than a half of the respondents age ranged from 26-30 years (Elnagieb, 2017).

A third of the respondents were intern doctors (39%) and more than a half of them had practiced for less than a year thus the majority are young doctors who have recently graduated from medical schools. This could be because the study hospitals are training centers for internship and postgraduate, this being in line with the findings by Oenga, in Kenya who found that the duration of practice of majority of the respondents was one year (Oenga 2012).

5.2 Knowledge regarding diabetic retinopathy
This study showed that the respondents generally had poor knowledge regarding diabetic retinopathy, satisfactory knowledge level was found to be 42%. This is below average and could affect management of diabetic retinopathy because management depends on knowledge. This finding is different from a study done among the primary care physicians in Saudi Arabia where overall knowledge was found to be 57%. This difference could be because the respondents in this study were junior doctors with less experience regarding diabetic retinopathy (Al Rasheed, 2017 #62).

More than a half (58%) of the respondents in this study had poor overall knowledge level regarding diabetic retinopathy. This finding was similar with findings in a study done in Khartoum Sudan among two hundred and twenty doctors and the participants generally had poor knowledge regarding diabetic retinopathy though no percentage on the overall level of knowledge was determined (Elnagieb & Saleem, 2017).

The respondents in this study had good knowledge on eye complications of diabetes mellitus, majority of the respondents, (91%) mentioned the eyes as one of the organs affected, followed by the kidney, 77(69%). This is comparable to a study done among general practitioners in
Burundi where they found knowledge of complication of diabetes on the eyes to be 92.5% and kidney (76.5%), (Niyonsavye, 2015 #39).

When asked about parts of the eye to be examined for in diabetic patients, though more than half of the participants mentioned the retina (68%), knowledge on other parts of the eye that was affected by diabetes was poor. Few of the participants knew that diabetes can affect the lens (17%), cornea (17%), iris (7%) retinal vessel (25%) and optic nerve (27%). Concerning knowledge on changes due to diabetes that can be seen on fundus examination, the participants mentioned micro-aneurysms 28%, beading 12%, retinal hemorrhage 33%, retinal neovascularization 20%, cotton wool spots 38%, retinal detachment 17% and macular degeneration 15%. 20% of the participants did not know of any changes. This is consistent with findings in a study carried out at district and regional hospitals in the North Region of Burundi where knowledge on fundus changes due to diabetes was cotton wool spot (3%), macular degeneration (3.7%) and retinal detachment (6.2%), (Niyonsavye, 2015 #39).

5.3 Attitude towards diabetic retinopathy

In this study, the respondents showed positive attitude towards screening of diabetic retinopathy. When asked about eye examinations, more than a half (61%) agreed with the statement that eye examination is not only required in diabetic patients when vision is affected, and (73.0%) participants agreed that fundus examination done by none-opthalmologist could help detect early DR, this is good because if the primary care clinician who are the first contact of diabetic patients know that they are important in early detection of DR then prevention or delay in development of DR may be achieved. Eighty (73%) of the participants agreed that pregnant women with DM require frequent eye check-ups than non-pregnant women and majority of the participants 93 (84%) felt that good lipid profile is essential for preventing vision loss in DR. This study is comparable with a study done among general practices in the City of Tshwane (Pretoria) Metropolitan Municipality of South Africa where the practice of eye specialists referrals was found to be adequate (Nkombua, 2012).

Oenga et al found good attitudes toward screening for DR, (87.9%) respondent disagreed with the statement that diabetic require eye examination only when their vision is affected (Oenga 2012).
Niyonsavye et al similarly found good attitude, (92.6%) disagreed that eye examination is required when vision is affected and (79%) were positive that fundoscopy by non-ophthalmologists could help detect diabetic retinopathy. (Niyonsavye, 2015 #39)

5.4 Practice towards screening and referral of patients with diabetic retinopathy

Testing vision is important in assessment of sight and usually diabetic patients come for assessment late when there are visual complaints. This study found out that majority of the participants, (39%) test vision for diabetic patients when there are visual complaints, which is poor practice because by the time the patient has visual symptoms, much damage would have occurred. Only 17% test vision immediately after diagnosis while 8% test vision at every clinic visit. In this study, more than half of the participants, (58%) refer diabetic patients for further evaluation. This is good practice because the patients will be evaluated and treated better, however in this study, more than a quarter did not refer diabetic patients to eye health workers. This is comparable with findings in Kenya where 51.6% general practitioners referred diabetic patients appropriately and 38.5% referred when there are visual complaints (Oenga 2012).

Fundoscopy is fundamental for medical officers, as it may help to confirm or exclude the diagnosis of many common diseases including diabetic retinopathy. This study found that majority of the participants (69%) never do fundoscopy while assessing diabetic patients and only 31% of the participants did. 77% of the participants had never performed fundoscopy on diabetic patients in the past six months of their practice . 20% did not know of any changes due to diabetetes that can be seen on fundus examination.. This could be due lack of access to ophthalmoscope at work place which was reported by 63% of the participants. The study done in kibbi state of Nigeria also found a similar finding where many general practitioners 52.9% never conducted fundoscopy in diabetics.(A. A. Ayanniyi, K. F. Monsudi, A. H. Balarabe, & A. F. Isa, 2014).

Though 63% of medical officers who did fundoscopy in their diabetic patients appreciated the details of the retina, many 38% did not, Onua etal also demonstrated that knowledge and practice of fundoscopy among medical practitioners in Port Harcourt in Nigeria is poor and far from ideal, only 28%had good knowledge on fundoscopy and 15% had good practice on fundoscopy,(Onua & Fiebai, 2016).
Knowledge on factors that may hinder the medical officers from screening for diabetic retinopathy, were lack of skills in fundoscopy (39%), no ophthalmoscopes (31%) too many patients (25%) and lack of dilating drops 5% respectively.

Raman et al found a similar finding where barriers for doing diabetic retinopathy screening by general practitioners were only 1.3% did fundoscopy and reason for not doing fundoscopy were lack of time, lack of ophthalmoscopes and lack of training (Raman et al., 2006).

Niyonsave et al also found a similar finding where only 4.9% of the general practitioners had access to ophthalmoscope in Regional Referral Hospitals of Burundi. (Niyonsaye, 2015 #39)

The study sought association between practice of referral and social demographic characteristics, significant association was found between duration of practice for less than a year and practice of referral (OR=0.082, P-value=0.035). The respondents who had practiced for less than a year were 12.2 times less likely to refer diabetic patients than those who have been in practice for more than 5 years. This could be because they are junior doctors who have newly graduated from the university and have less experience about the management of DM and DR. This is in line with a study conducted among intern doctors at a tertiary hospital where practice of referral was improper where, 61.2% only referred patients with uncontrolled blood sugar and overall score on attitude was 20.2 out of 35, (Singh, #63).

This study revealed lack of skills as well as lack of equipment for screening. This can be addressed by training medical officers in fundoscopy. This is in line with the program being undertaken by national program for control of blindness in India where they are training health workers including, medical offers in prevention of blindness and among the blinding conditions being trained for is diabetic retinopathy (Verma, Khanna, Prinja, Rajput, & Arora, 2011)

Further, there was also statistically significant association between practice in private facilities and practice of referral of diabetic patients (OR=5.124, P-value=0.001), the respondents in the private facilities were 5 times more likely to refer diabetic patients than those in government facilities. No similar study has been conducted to compare the practice of referral of diabetic patients in private and government health facilities, however a number of literatures have shown that the quality of services in private health facilities is better than services in government health facilities (Doris, 2010 #12).
5.5 Study Limitation

- The study may not be a representation of all the general health workers of Uganda since it was conducted only in Kampala.

- The participants were very busy during conduction of the study and not all were interviewed. This study was ten respondents short of the sample size.
CHAPTER SIX
CONCLUSION AND RECOMMENDATION

6.1 Conclusion

- There was general poor knowledge on diabetic retinopathy, although majority of the respondents were aware of the complications of diabetes.

- The attitude regarding diabetic retinopathy was good, 73% of the participants agreed that fundus examination by the non-ophthalmologists could help detect diabetic retinopathy.

- The practice regarding screening for diabetic retinopathy was generally poor, majority of respondents only tested vision when sight was affected, more than a half of the participants do not do fundus examination and almost a half (42%) did not refer diabetic patients to eye health worker.

- The practice of referral of diabetic patients was good, majority referred diabetic patients to eye health care worker.

- Major factors hindering screening of diabetic retinopathy were lack of skills in doing fundoscopy, too many patients at the clinic and lack of ophthalmoscopes, (more than half of the respondents did not have access to an ophthalmoscope at work place).

6.2 Recommendations

- Conduction of refresher workshops with emphasis on acquisition of skills on fundoscopy and continuous medical education on diabetic retinopathy should be done to all medical officers.

- Provision of basic screening equipment for diabetic retinopathy eg ophthalmoscopes and vision testing charts at each health facility.

- Development and dissemination of screening guide lines to medical officers.

- Ministry of Health to review internship training program to include rotation of intern doctors in Ophthalmology Department.

- The Universities to include rotation time of Senior House Officers in Ophthalmology to improve on their skills.
REFERENCES


APPENDICES

APPENDIX I: PATIENT INFORMATION AND CONSENT FORM

Title of the study
Knowledge, attitude and practice of medical officers on diabetic retinopathy.

Principal Investigator.
Dr Akun Vicky
Ophthalmology Department,
Makerere University, College of Health Sciences.

Introduction.
This form explains the details of the study that you should know before you decide whether or not to participate; you need to understand its purpose, benefit, risk and what is expected of you if you decide to participate.

Background.
Diabetic retinopathy is one of the leading causes of preventable blindness, diabetic patients presenting with ocular complaints usually do so because of sight threatening complications of DR and yet when these patients are screened, diagnosed and referred early, the development of ocular complication is prevented or delayed. Medical officers are at the frontline of diabetes and DR management. Assessment of their knowledge, attitude and practice is therefore effective in the management of DR. The information acquired from this study will therefore add to the data available on DR and thus will help in awareness creation, policy and guideline development as well as advocacy in improving knowledge, attitude and practice of eye care which is vital to towards achieving VISION 2020 goals for eliminating avoidable blindness.

Purpose of the study
By participating in this study, you will help us to generate information that will act as baseline evidence for guideline and policy formation on diabetic retinopathy management.

Procedure.
If you decide to participate in the study, you will be requested to sign a consent form. I will then have an interview with you where I will be asking you for information about diabetic retinopathy; this may take about 10 – 15 minutes of your time.
Participants of the study.
All the medical officer who work in medical out patient’s department and medical wards of the study hospitals which are, Nsambya, Mengo, Rubaga, Kibuli, Naguru and Kiruddu will be requested to participate in the study a total of 121 medical officers will be enrolled in this study from February to March 2018.

Risk
Participation in this study will carries minimal risk to you.

Potential benefits
There will be no direct individual benefit from the study, however information from this study will be used as baseline evidence and thus will assist in strengthening health policies and valuation of diabetic retinopathy program in Uganda.

Alternatives.
Your participation in this study is entirely voluntary, you may decide to withdraw from the study any time and such a decision will not affect your work or any possible participation in future studies.

Costs/compensations
There will be no compensation for participating in this study.

Confidentiality.
A study number only known to the principle investigator and yourself will be used. Your name as well as the name of the hospital you work in, will not appear on any of the study documents. You will not be identified in any of the publication or presentations about this study.

Questions about the study
If you have any question at any time about this research study, you may contact the principal investigator.
Dr Akun Vicky, Department of Ophthalmology Makerere University.
Tel.0782551626
Questions about participants right.
If you have any question concerning your rights as a participant you can contact the chairman school of medicine research ethics committee, Prof. Ponsiano Ocama on Tel.0772421190 Your

Statement of voluntariness.
This consent form gives you information about the study, and if you agree to participate, you will be asked to sign a consent form. Your participation in this study is entirely voluntary, you may decide to withdraw from the study any time and such a decision will not affect your work or any possible participation in future studies.

Declaration of the volunteer.
I have understood the purpose of the study that is being conducted. I have had the opportunity to ask questions about it and any questions that I have asked have been answered to my satisfaction. I consent voluntarily to participate as a subject in this study.

____________________ ______________ _________________
Participant’s name                  Signature                  Date

____________________ ______________ _________________
Investigator/interviewer          Signature                 Date
APPENDIX II: QUESTIONNAIRE
Knowledge, attitudes and practices of diabetic retinopathy among medical officers in Kampala government hospital.

Date: Study NO.

Demographics
1. Age in years
   1)25-30  2)31-35  3)36-40  4)41-41-45  5)46-506) 51+
2. Gender:
   1) Male  2) Female
3. Title
   1) Principal Medical officer 2) Senior house officer  3) Intern doctor
4. Duration of practise
   1) Less than a year  2) 1 – 5 years  3) More than 5 years
5. Hospital
   1) Government  2) Private

Questions on knowledge
1. What are some of the microvascular complications of Diabetes mellitus?
   1) Eye  3) Kidney  5) Foot  7) Brain
   2) Genital organs  4) Peripheral nerves  6) Heart  8) Stomach
2. What factors influence the presence or severity of diabetic retinopathy?
   1) Poor glucose control  4) Hypertension  7) Duration of DM
   2) Alcoholism  5) Smoking  8) Obesity
   3) Lipid profile  6) Other  9) No response

3. Which parts of the eye can be affected by Diabetes Mellitus?
   1) Retina  3) Optic nerve  5) Cornea  7) Vessel  2) Lens  4) Iris
   6) Pupil

4. Which parts of the eye should be examined for changes due to diabetic retinopathy?
   1) Retina  3) Cornea  5) Retinal Vessels  7) Lens  9) Pupil
   2) Optic nerve  4) Iris  6) Others  8) No response
5. What are some of the changes due to diabetes mellitus that can be seen on fundus exam?
   1) Micro-aneurysms  4) Retinal haemorrhage  7) Retinal neovascularization
   2) Beading  5) Retinal detachment  8) Cotton wools
   3) Macular degeneration  6) Don’t know  9) Others

6. Is it essential to dilate the pupils before fundoscopy?
   1) Yes  2) No

7. Should a person with diabetes mellitus visit an eye worker after diagnosis?
   1) Yes  2) No

8. If answer in Q7 above is “Yes”, how soon after diagnosis should that person visit the eye worker?
   1) Immediately  4) After 1 month  6) After 6 months  2) 6 months – 1 year  5) After 1 year
   3) 10 years of diagnosis

9. Should a person with diabetes mellitus visit an eye worker on a regular basis after diagnosis?
   1) Yes  2) No

10. If yes to question 9 above, how often?
    1) Once  2) 2 – 3 times  3) 4 – 5 times  4) 5 times +

11. How can you prevent the development or progression of DR in a patient with DM?
    1) Blood glucose control  5) Lowering elevated serum lipid levels
    2) Hypertension control  6) Avoiding Alcohol
    3) Early diagnosis and referral to ophthalmologist  8) No Response  4) Avoiding Smoking
    7) Control Obesity  9) Others

12. Are there any modes of treatment for diabetic retinopathy?
    1) Yes  2) No

13. If your answer in Q12 above is “Yes”, please name the treatment modalities that you know
    1) Laser photocoagulation  3) Normalization of blood sugar level
    2) Ocular surgery  4) Normalization of blood pressure
    5) Medical treatment  6) Others  7) No Response
Questions on attitude
For the questions below, please indicate whether you:
Agree, Neutral, Disagree

1. Eye examination is only required in diabetic patients when vision is affected.
   1) Agree  2) Neutral  3) Disagree

2. Ophthalmology training in medical school adequately equips the MO to manage patients with eye complaints.
   1) Agree  2) Neutral  3) Disagree

3. Eye examination is only required in diabetic patients when vision is affected.
   1) Agree  2) Neutral  3) Disagree

4. Fundus examinations should be done by ophthalmologists only.
   1) Agree  2) Neutral  3) Disagree

5. Fundus examination by non-ophthalmologists could help detect DR in diabetic patients.
   1) Agree  2) Neutral  3) Disagree

6. Pregnant women with diabetes require more frequent check-up than non-pregnant ones.
   1) Agree  2) Neutral  3) Disagree

7. The presence of diabetic retinopathy may be indication of the presence of other Micro vascular complications of DM.
   1) Agree  2) Neutral  3) Disagree

8. A good lipid profile is essential for preventing vision loss in diabetic retinopathy.
   1) Agree  2) Neutral  3) Disagree
Questions on practice

1. How often do you test the vision of your diabetic patients?
   1) immediately after diagnosis  
   2) Three months after diagnosis  
   3) six months after diagnosis 
   4) At every clinic visit 
   5) Annually 
   6) If patient has visual complaints 
   7) Do not test 

2. Do you examine the fundi (retinae) of your patients?
   1) Yes  
   2) No 

3. If yes, to question 2 above how often?
   1) After diagnosis  
   2) Three months after diagnosis  
   3) Six months after diagnosis 
   4) At every clinic visit 
   5) Annually 
   6) If patient has visual complaints 

4. Do you refer diabetic patients for eye examinations?
   1) Yes  
   2) No 

5. Do you always have access to an ophthalmoscope at your work place?
   1) Yes  
   2) No 

6. Have you attempted fundus examination in any of your diabetic patients over the past six Months?
   1) Yes  
   2) No 

7. If yes to question 6 above, were you able to appreciate details of the retina?
   1) Yes  
   2) No 

8. Did you dilate the pupil?
   1) Yes  
   2) No 

9. If ‘No’ to question 8 above, why?
   1) Lack of time  
   2) Didn’t see the significance of pupil dilation  
   3) Lack of dilating drops  
   4) Other (specify) 

10. Mention factors that may hinder the screening of DM patients for diabetic retinopathy.

THANK YOU.