

**KNOWLEDGE, ATTITUDES AND PRACTICES ON DIABETIC
RETINOPATHY AMONG GENERAL PRACTITIONERS IN DISTRICT
AND REGIONAL HOSPITALS IN THE NORTHREGION OF BURUNDI**

A Thesis Submitted in partial fulfilment for the Degree of Masters in Medicine
(Ophthalmology), Faculty of Medicine, Department of Ophthalmology
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2015

DECLARATION

I declare that this thesis is my original work and has not been presented for the award of a degree in any other university.

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DEDICATION

To my wife NKURUNZIZA Angelique, my children NIYONSAVYE Raiy Easter and NIYONKURU Jodi Ornan for their love and the many sacrifices they made in this special time during my studies.

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LIST OF ABBREVIATIONS

DM	–	Diabetes Mellitus
DR	–	Diabetic Retinopathy
ETDRS	–	Early Treatment Diabetic Retinopathy Study
NPDR	–	Non-Proliferative Diabetic Retinopathy
UKPDS	–	United Kingdom Prospective Diabetes Study

ABSTRACT

Background: Despite the growing diabetic retinopathy (DR) burden, the disease continues to receive a relatively low public health priority in the Burundi. It is the fourth cause leading to blindness in Burundi.

Objective: To establish the knowledge, attitude and practice on diabetic retinopathy among general practitioners working in District and Regional Hospitals in the North Region of Burundi.

Methodology: The study was a descriptive cross-sectional study. It targeted General Practitioners working at District and Regional Hospitals in the North Region of Burundi. The sample size was 86 General Practitioners. A self-administered questionnaire was used to collect data. The data collected was analysed using Statistical Program for Social Science (SPSS). Significant differences and associations were determined by p values of less than 0.05.

Results: Eighty one (81) General Practitioners participated in the study with a male to female ratio of 4.8:1. The mean duration of practice for respondents was 2.4 years. General Doctors are allowed to enter residency programs after two years of practice while others are promoted into central administration, thus leaving the Regional and District Hospitals. Participants had good knowledge of systemic implications of diabetic mellitus with 76.5% who were aware that kidney could be affected by microvascular complications of diabetes mellitus. Participants had poor knowledge about risk factors for DR with only 24.7% and 16.1% mentioning hypertension and duration. However, poor glycaemic control was mentioned by 69.1% of participants. Laser photocoagulation and ocular surgery were mentioned by 43.2% and 11.1% participants successively as treatment modalities available for DR.

Participants had good attitude toward screening for DR with 92.6% who disagreed that eye examination is indicated when vision is affected and 79% agreed that Fundoscopy done by General Practitioner can help to detect early DR. Fundus examination of diabetic patients was poorly done by 6.2% of General Practitioners and 4.9% had access to an ophthalmoscope. Only 22.2% of participants were testing the vision of Diabetic patient in a year.

Conclusion: Participants had poor knowledge but good attitudes toward screening for DR which was not expressed in practice unfortunately.

INTRODUCTION AND LITERATURE REVIEW

1.1 Introduction

This chapter presents the background to diabetic retinopathy. It highlights the risk factors, characteristics and mode of treatment for diabetic retinopathy. The chapter also presents the literature review of the study.

1.1.1 Diabetes Mellitus

This is a group of metabolic diseases in which a person has high blood sugar, either because the pancreas does not produce enough insulin, or because cells do not respond to the insulin that is produced. This high blood sugar produces the classical symptoms of polyuria, polydipsia, and polyphagia. There are two main types of diabetes mellitus (DM).¹

Diabetes mellitus Type 1 (DM1)

Results from the body's failure to produce insulin, and currently requires the person to inject insulin or wear an insulin pump.

Diabetes mellitus Type 2 (DM2)

This type results from insulin resistance, a condition in which cells fail to use insulin properly, sometimes combined with an absolute insulin deficiency. Other forms of diabetes mellitus are recognized, including a genetically mediated form secondary to endocrinopathies and drug- or chemical-induced diabetes mellitus. Diabetes mellitus affects the blood vessels leading to microvascular and macrovascular complications which manifest in the eyes, kidneys, brain, extremities and other parts of the body.²

1.1.2 Characteristics of Diabetic Retinopathy

Diabetic Retinopathy (DR) is caused by complications of diabetes mellitus which can eventually lead to blindness especially in its advanced stage. Diabetic Retinopathy is the commonest cause of visual impairment among persons of working age in the developed world.^{3,1} It is predominantly a microangiopathy in which small blood vessels are particularly vulnerable to damage from hyperglycemia. Direct hyperglycemic effects on retinal cells are also likely to play a role.⁴ It progresses from mild, moderate and severe non-proliferative diabetic retinopathy (NPDR) to proliferative diabetic retinopathy (PDR).⁵

Retinal microvascular changes that occur in non-proliferative diabetic retinopathy are limited to the confines of the retina and do not extend beyond the internal limiting membrane (ILM). Characteristic findings in non-proliferative diabetic retinopathy include microaneurysms, areas of capillary non perfusion, nerve fibre layer (NFL) infarcts (cotton wool), intra retinal microangiopathy (IRMAs), dot-and-blot Intraretinal haemorrhages, retinal oedema, hard exudates, arteriolar abnormalities, dilation and beading of retinal veins. In proliferative diabetic retinopathy, there is neovascularisation caused by capillary non perfusion as a result of retinal hypoxia.⁵

By definition, the localization of neovascular proliferations is categorized to be either on the disc (NVD), or elsewhere (NVE). Advanced diabetic eye disease is characterized by tractional retinal detachment, significant persistent vitreous haemorrhage and neovascular glaucoma.⁵

The diagnosis of Diabetic Macular Oedema (DME) refers to the presence of any retinopathy on the macula such as: retinal thickening to the foveal centre, presence and location of the exudates and presence of cystoid macular oedema (CME). Clinical significant macula oedema (CSME), refers to the presence of macular thickening within 500µm, exudates at or within 500µm of the centre of the macula if associated with thickening of adjacent retina and a zone of thickening 1 disc area or larger if located within 1 disc diameter of the centre of the macula.^{2,5}

1.1.3 Risk Factors for Diabetic Retinopathy

1.1.3.1 Duration of Diabetes

Duration of diabetes is the most important risk factor. In patients diagnosed with diabetes before the age of 30 years, the incidence of diabetic retinopathy after 10 years is 50%, and after 30 years 90%. Diabetic retinopathy rarely develops within 5 years of the onset of diabetes or before puberty, but about 5% of type 2 diabetes has diabetic retinopathy at presentation. It appears that duration is a stronger predictor for proliferative disease than for maculopathy.^{5,6} Wisconsin epidemiological study of Diabetic Retinopathy (WESDR) found that duration of diabetes was directly associated with an increased prevalence of diabetic retinopathy in people with both type 1 and type 2 diabetes.

After 20 years of diabetes, nearly 99% of patients with type 1 and 60% with type 2 had some degree of diabetic retinopathy. 3.6% of younger-onset patients (aged <30 years at diagnosis, an operational definition of type 1DM) and 1.6% of older onset patients (aged \geq 30 years at diagnosis, an operational definition of type 2 DM) were found to be legally blind. In the younger-onset group, 86% of blindness was attributable to diabetic retinopathy. In the older-onset group, where other eye diseases were more common, one third of the cases of legal blindness were the result of diabetic retinopathy.²

1.1.3.2 Poor Glucose Control

Studies have shown that those people with poor control of their diabetes are more likely to develop all complications, including retinopathy. The Diabetes Control and Complications Trial (DCCT) investigated the effect of hyperglycemia in type 1 diabetic patients, as well as the incidence of diabetic retinopathy, nephropathy, and neuropathy and reported that Intensive therapy reduced the mean risk of retinopathy by 76% (95% CI 62–85) and reduce the risk of progression by 54% (95% CI 39–66).^{7,8}

The United Kingdom Prospective Diabetes Study (UKPDS) demonstrated that improved blood glucose control reduces the risk of developing microvascular complications.²

1.1.3.3 High Blood Pressure

The UKPDS investigated the influence of tight blood pressure control (<150/85 mmHg) and found that were 37% reduction in microvascular changes, and a 34% reduction in risk in the proportion of patients with deterioration of retinopathy and 47% reduced risk of deterioration in visual acuity of three lines compared with patient with less tightly controlled blood pressure.⁹

1.1.3.4 Other Risk Factors

Nephropathy: Nephropathy, if severe is associated with worsening of diabetic retinopathy. Conversely, treatment of renal disease (for example, renal transplantation) may be associated with improvement of retinopathy and a better response to photocoagulation.⁵

Pregnancy: Being pregnant may make retinopathy worsen, especially if blood sugar is poorly controlled. Poor pre-pregnancy control of diabetes, control exerted too rapidly during the early stages of pregnancy and development of pre-eclampsia and fluid imbalance.

Other risk factors include: hyperlipidemia, smoking, cataract surgery, obesity and anemia.⁵

1.1.4 Treatment of Diabetic Retinopathy

Diabetic retinopathy has few visual or ophthalmic symptoms until visual loss develops. Treatment strategies for diabetic mellitus encompass lifestyle modification, exercise, smoking cessation, as well as better control of blood sugar, blood pressure, blood lipids, and body mass index.⁵

Patient with mild non-proliferative diabetic retinopathy require strict control of blood sugar only. No other treatment required.⁵

Laser treatment showed its importance in reducing the risk of visual loss in severe non-proliferative diabetic retinopathy and proliferative diabetic retinopathy. The Diabetic Retinopathy Study (DRS) demonstrated that both argon and xenon photocoagulation reduced the risk of severe visual loss by more than 50% in patient with proliferative diabetic retinopathy.²

The Early Treatment Diabetic Retinopathy Study (ETDRS) demonstrated scatter photocoagulation is deferred in eyes with mild-to-moderate non-proliferative diabetic retinopathy because visual loss was low with either treatment applied early or delayed.

In addition, Early Treatment Diabetic Retinopathy Study demonstrated that eyes with Clinical Significance macula Oedema benefited from focal argon laser photocoagulation treatment reduce the risk of microvascular lesions (MVL), increase the chance of visual improvement, and is associated with only minor losses of visual field (12%).¹⁰

Parsplana Vitrectomy is the common indication if severe persistent vitreous haemorrhage that precludes adequate PRP. It is also indicated in progressive tractional retinal detachment threatening the macula, combined tractional and rhegmatogenous retinal detachment and also in premacular subhyaloid haemorrhage if dense and persistent.⁵ The Diabetic Retinopathy Vitrectomy Study was a prospective, randomized clinical trial investigating the role of Vitrectomy in managing 3 eyes with severe proliferative diabetic retinopathy and have showed an advantage of early Vitrectomy over conventional management for eyes with very severe proliferative diabetic retinopathy.²

The Diabetic Retinopathy Research Network Laser-Ranibizumab-Triamcinolone Study showed that intravitreal injection of 0.5mg of ranibizumab initially given monthly for 3 months, with prompt or deferred (≥ 24 weeks) macular laser had significantly superior visual and Optical Coherence Tomography (OCT) outcomes to laser alone in eyes with diabetic macular oedema involving the fovea.⁵

The above study also found that intravitreal triamcinolone injection followed by prompt laser may be as effective as ranibizumab at improving vision and reducing retinal thickening in pseudophakic eyes.

However, there was a significant risk of an elevation of intraocular pressure in phakic eyes and increased rate of cataract surgery by 2 years.⁵

1.1.5 Screening and Prevention of Diabetic Retinopathy

Early detection and treatment of diabetic retinopathy can prevent nearly all associated severe vision loss; but current methods of screening fail to identify a sizable number of high-risk patients.¹¹

Quality screening procedures are crucial to ensure timely detection of retinopathy and intervention to prevent or minimise visual loss. The gold standard for diabetic retinopathy is stereoscopic fundus photography through dilated pupils, using seven standard fields. Others Screening options include direct and indirect ophthalmoscopy or slit lamp biomicroscopy. In the absence of a dilated fundus examination by a trained examiner, non-mydratic photography can be used.¹²

American Academy of Ophthalmology (AAO) has developed screening guidelines based on studies that demonstrated that blindness secondary to diabetic retinopathy could be prevented. The findings at this first examination will determine the frequency of subsequent examinations. Table1 shows the recommended eye examination schedule for patients with diabetes.

Table 1: Screening Guidelines

Diabetes Type	Recommended time of first eye examination	Routine Minimum Follow-up Interval
Type 1	Within 3-5 years after diagnosis	Yearly
Type 2	At time of diagnosis of DM	Yearly
Type 1 or 2 Pregnancy in pre-existing DM	Prior to conception and during 1 st trimester	No retinopathy to mild or moderate NPDR: every 3–12 months Severe NPDR or worse: every 1–3 months

In the study by Verma L, et al conclude that the provision of appropriate screening protocols and follow-up parameters can enable primary care physicians and support personnel to reliably screen individuals for retinopathy in diabetes. This will reduce the workload of tertiary hospitals, and provide optimal services to the huge majority of the Indian population that has limited access to eye care services.¹³

1.2 Literature Review

The best way to manage diabetic retinopathy is to prevent it and diabetic patients are primarily managed by General Practitioners and Physicians. Therefore, if these General Practitioners and Physicians have enough knowledge on microvascular complications of diabetes mellitus if their skills toward eye examination are enough, they will be able to detect early microvascular complication due to diabetes mellitus; hence the blindness caused by diabetic retinopathy should be reduced.

A study done in the North Sharqiya region of OMAN by Khandekar et al on Knowledge, Attitude and Practice (KAP) of physicians concerning retinal examination of diabetic patients found that Knowledge about different parts of the eye was satisfactory in only 58% of physicians, knowledge about method of fundus examination for diabetic retinopathy was poor in 40%, the knowledge of eye parts involved in diabetes and components that could be examined by ophthalmoscope was limited. Just over half of the participants (23, 58%) correctly gave the name of one eye part that is usually affected by diabetes. Only 43% of staff knew that the lens could be affected in diabetes.⁴

Mahesh et al in India assessed the Knowledge, Attitude and Practice pattern among health care Providers regarding diabetic retinopathy and found that: 29 (100%) of physician are of the opinion that DR is blinding disease, 27 (93.10%) are of opinion that duration is a risk factor for DR, 29 (100%) agree that hypertension and renal disease can influence diabetic retinopathy, 20 (68.97) are of the opinion that pregnancy can worsen diabetic retinopathy, 22 (75.86%) opined that laser treatment is a curative for diabetic retinopathy, 27 (93.1%) agree that serum lipid profile is related to the severity of diabetic maculopathy, 22 (55.86) think that fundus fluorescein angiography (FFA) is required for evaluation of all diabetic retinopathy cases.¹⁴

Mensah et al assessed Knowledge, Attitude and Practice of diabetic retinopathy among medical officers in regional hospitals of Ghana and found that participants had poor knowledge about risk factors for diabetic retinopathy with only 46.2% and 28.6% mentioned hypertension and duration of diabetes mellitus as factors, although 86.8% knew of the level of glycaemic control. In that study, 55% knew about laser photocoagulation while 12.1% and 27.5% mentioned surgical and medical modalities respectively.¹⁵

Oega et al assessed the Knowledge, Attitude and Practice of diabetic retinopathy among general practitioners in Kenya and found 95.6% knew that glycaemic control affected presence and severity of diabetic retinopathy, 89% and 84.6% indicated duration and hypertension as risk factors respectively. 56% were aware of effect of lipid profile in relation to diabetic retinopathy, 33% knew pre-existing diabetes mellitus in pregnant women was a risk factor for progression of diabetic retinopathy. In the same study 33% were not aware that diabetic retinopathy is treatable and a significant proportion were not aware of modes of treatment available.¹⁶

Attitude toward eye examination by no-ophthamologist at primary level was positive in the study by Khandekar et al 20 (50%) physicians, but only 9 (22.5%) could see the details of the retina.⁴

Conversaly, Rajiv et al found that ophthalmoscopy was done in 1.3% (2/159) of the general practitioners . Of the two, one general (GP) performed ophthalmoscopy with dilatation while the other performed it without dilatation.The reason stated for not dilating was lack of time.¹⁷

17 (87.62%) did direct ophthalmoscopy to examine diabetic patients in the study done by Mahesh et al ⁽¹⁴⁾ and Mensah et al demonstrated in her study that 17.6% did retinal examination, only 33% had access to an ophthalmoscope and respondents who had access to ophthalmoscopes were more likely to do retinal examinations.¹⁵

Regarding attitude for screening for diabetic retinopathy, Mahesh et al found that, 24 (82.76%) advice diabetic patient an eye examination as soon as diabetes is detected, 26 (89.66%) will advise another eye check-up after one year if no retinopathy at initial examination, 16 (55.17%) advice retinal evaluation every trimester for diabetic pregnant patients.

Oega *et al* found that attitudes toward screening for diabetic retinopathy were good in 87.9%. The participants disagree with the statement that diabetic patients required eye examination only when their vision is affected.¹⁶

Mensah *et al* found that about 92% of respondents agreed that fundus examination by non-ophthalmologist could help to detect diabetic retinopathy.¹⁵

Rajiv *et al* found that 31.3% (n=50) feel that diabetics should undergo an eye examination every six months and 53.3% (n=85) feel that diabetics should undergo eye examination every year. 15.4 per cent felt that eye examination every two years is sufficient for diabetics.¹⁷

In term of practice, a study done in the State of Indiana by Yung CW et al found that 35% of respondents stated that they never refer patients for ocular examination while 26% refer all patients. The remainder refer on a case-by-case basis. Patients who are not referred have their fundus examined only 70% of the time by the primary care physician and 96% of these examinations are performed with an undilated pupil.

When referred, 20% of Type I patients are referred at the time of diagnosis and 50% by one year. Of the Type II patients, only 2% are referred at the time of diagnosis and 70% by one year.¹⁸

Mensah et al found that only 34% of doctors tested the vision of their diabetic patients within a year.¹⁵

Oega et al found that 37.4% of the general practitioners assessed vision for their diabetes patients. Majority of general practitioners never assess vision (26.4%) or only did so when a patient complained of visual disturbance (34.1%). 51.6% of general practitioners never do fundus examination for their diabetic patients. Also, 51.6% refer and advise yearly eye examination of diabetic patients while 38.5% referred only when the patient complained of visual disturbance.¹⁶

The sheer volume of patients, compounded by the inability of health care providers to detect diabetic retinopathy by direct ophthalmoscopy, hampers effective screening. The present practice of only ophthalmologists and physicians examining the fundus of diabetic patients in hospitals is unsatisfactory, since it will only reach a small percentage of diabetics.

Studies have shown that undergraduate training in ophthalmology is often inadequate to equip general practitioners in the management of patients. In a study conducted in Canada among first year residents who had graduated from medical school, when asked whether sufficient ophthalmology knowledge and skills had been obtained during medical school, only 42.9% and 25.9% agreed, respectively.¹⁹

General practitioners are important members of the diabetic care network. Awareness levels of general practitioners are vital in planning strategies to prevent diabetic blindness. Screening is an effective way of detecting diabetic retinopathy as early as possible and is provided in a variety of location including general practitioners. Population based studies depicting the knowledge, attitude and practice on diabetic retinopathy among general practitioners in Burundi is non-existent. A program needs to provide basic eye screening to patients with diabetes as well as other patients with an aim to provide services as well as gather information on diabetic retinopathy. Thus, the study will examine the knowledge, attitude and practice on diabetic retinopathy among general practitioners working at Regional and District Hospitals in Burundi.

STATEMENT OF THE RESEARCH PROBLEM & RATIONALE

2.1 Statement of the Problem

According to Yang,²⁰ patients with diabetes Type I and Type II can develop diabetic eye disease. The longer an individual has diabetes, the more likely it is to develop for example, diabetic retinopathy. Lawrence²¹ point out that no country and no sector of any society are immune to diabetes. People with diabetes are at risk for developing diabetic eye disease especially diabetic retinopathy, which can cause vision loss. The challenge however, is to reduce the human and financial costs through early diagnosis and effective management and to prevent new cases of diabetes developing in so far as this is possible. In Burundi, diabetic retinopathy is yet to be recognised as an important public health problem even if it is the fourth course leading to blindness.²² Priority is given to infectious diseases such as malaria, tuberculosis, diarrheal diseases, acute respiratory infections and HIV/AIDS all of which have preventive and management strategies. However, there is no study which was done to establish the magnitude of DR.

In addition, there is poor knowledge of diabetic retinopathy. Poor knowledge is not limited to patients alone, studies evidenced that health care workers who are supposed to be better informed do not have good knowledge of the disease either. Despite the growing diabetic retinopathy burden, the disease continues to receive a relatively low public health priority in the country.

2.2 Study Rationale

The WHO goal of eliminating avoidable blindness due to DR cannot be achieved without involvement of the general practitioners since they are the primary care givers for patients with DM. This study takes into consideration the knowledge, attitude and practice on DR among general practitioners in Burundi. The significance of this study also lies in the fact that although there is considerable information and knowledge about DR, a critical need exists for a comprehensive study in this area. In addition, the results of this study are expected to create awareness among the general practitioners as to the existence of DR as a potential disease leading to blindness but preventable by early detection with screening and treatment.

2.3 Broad and Specific Objectives of the Study

2.3.1 Broad Objective

The broad objective was to establish the knowledge, attitudes and practices on diabetic retinopathy among General Practitioners working in District and Regional Hospitals in the North Region of Burundi.

2.3.2 Specific Objectives

The specific objectives were to:

1. Establish the current knowledge on diabetic retinopathy among the general practitioners in the North Region of Burundi.
2. Assess the attitudes towards screening for diabetic retinopathy among the general practitioners in the North Region of Burundi.
3. Establish and evaluate the practices among the general practitioners in the North Region of Burundi, regarding screening for diabetic retinopathy.
4. Establish factors that affect the knowledge, attitudes and practices of the general practitioners in the North Region of Burundi, with regards to screening for diabetic retinopathy.

MATERIALS AND METHODS

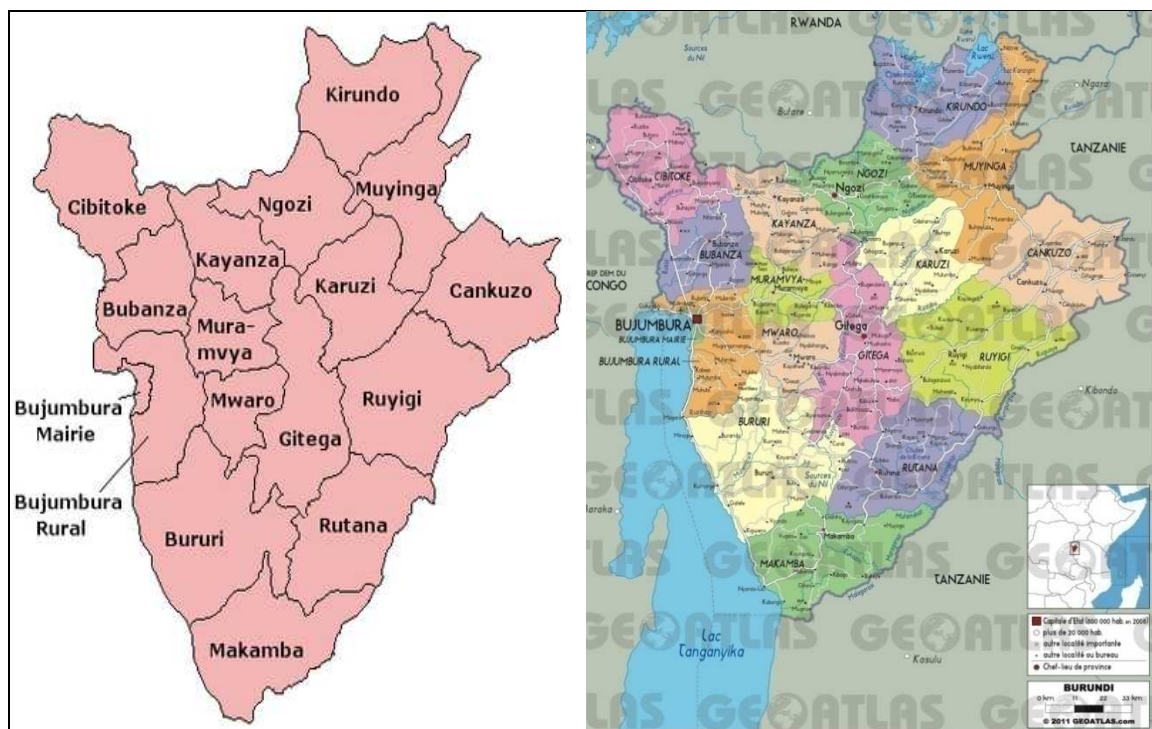
3.1 Study Design

This was a cross-sectional study.

3.2 Study Setting

The study was carried out at District and Regional Hospitals in the North Region of Burundi. Burundi is a country located in East Africa, bordering in East and South by Tanzania, West by Lake Tanganyika and Democratic Republic of Congo (DRC) and North by Rwanda. The country is divided in seventeen (17) health provinces and forty five (45) health districts grouped in four (4) regions: North, South, Central and West. Each region has a Regional Hospital, Urban and Rural District Hospitals and Health centres. Health care in Burundi is organized by hierarchy starting by health centres, district hospitals, regional hospitals and teaching hospital. The referral of patients respects this hierarchy.

Figure 1: Map of Burundi



District and Regional Hospitals were appropriate for this study because they are referral hospitals which offer specialized care like specialist consultation, intensive care and life

support. General practitioners provide care and treatment to diabetic patients in these health facilities.

3.3 Study Population

The study targeted general practitioners working in District and Regional Hospitals in the North Region of Burundi. Two rural district hospitals from Central Region (KIBIMBA and BUHIGA) were added in place of District VUMBI and BUSONI which do not have hospitals. A general practitioner is a doctor who has finished five years of theory and two years of internship and has presented the thesis for graduation as general doctor in Medicine. Data from Ministry of Public Health and Fight against HIV indicated that the number of general practitioners working in the study area by December 2013 was seventy four (74).²³

3.4 Inclusion Criteria

The study targeted all general practitioners working at district or regional hospital in the North Region of Burundi.

3.5 Exclusion Criteria

The study excluded specialist or doctors in specialty training.

3.6 Study Period

The study was conducted from 21 January 2014 to 28 February 2015

3.7 Sampling Procedures

3.7.1 Sample Size

All the general practitioners (86) working in District Hospitals (DH) and Regional Hospital (RH) in the study area were included in the study.

According to Gilbert it is recommended that at least a minimum of 80% the sample population as the response rate.²⁴

3.7.2 Selection of the Participants

A detailed list of all the general practitioners working in North Region of Burundi (sampling frame) was acquired from the Ministry. Then a letter was written and addressed to all the Directors in the respective hospitals in regard to the current study, informing all the general practitioners of their expected cooperation. A follow-up was done through phone call to ensure that all participants were aware of the study and confirmed their participation.

3.8 Data Collection Tool

The questionnaire was written in English (Appendix 1) and then translated into French. It mainly consisted of closed ended questions with a few open ended questions. It had four sections (A - D). Section A contained demographic data and general questions about the respondents. Section B contained questions on knowledge and awareness levels. Section C contained the practices towards screening diabetic retinopathy. Section D contained questions on attitudes toward diabetic retinopathy.

3.9 Data Collection Procedure

The participants received prior notification of data collection. Clear instructions on how to complete the questionnaire were given in the questionnaire and instructions were clarified by the researcher. A self-administered questionnaire was given section by section and participants were requested to complete the questionnaire without consulting any document.

3.10 Quality Assurance Procedures.

The questionnaire was piloted on 4 General Practitioners who were not working in the study area and modifications made based on the recommendations prior to commencement of the study.

3.11 Data Analysis

Data were coded and entered into a Microsoft excel spreadsheet. Statistical analysis was done using Statistical program for social sciences (SPSS) program version 20. Categorical variables were analysed using frequencies and percentage. Continuous variables were summarized using mean, percentile, range, and standard deviation, where appropriate.

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.

3.12 Ethical Considerations

Ethical approval was sought from the Kenyatta National Hospital/ University of Nairobi Ethics and Research Committee. In Burundi, ethical approval was sought from the Ministry of Public Health and Fight against HIV. Clearance to administer the questionnaire was sought from the administration of the Regional hospital and District Hospitals.

The participants were informed about the study and requested to participate. Those who agreed were requested to sign a written consent. They were also given the option of withdrawing from the study at any time during the study without giving reasons.

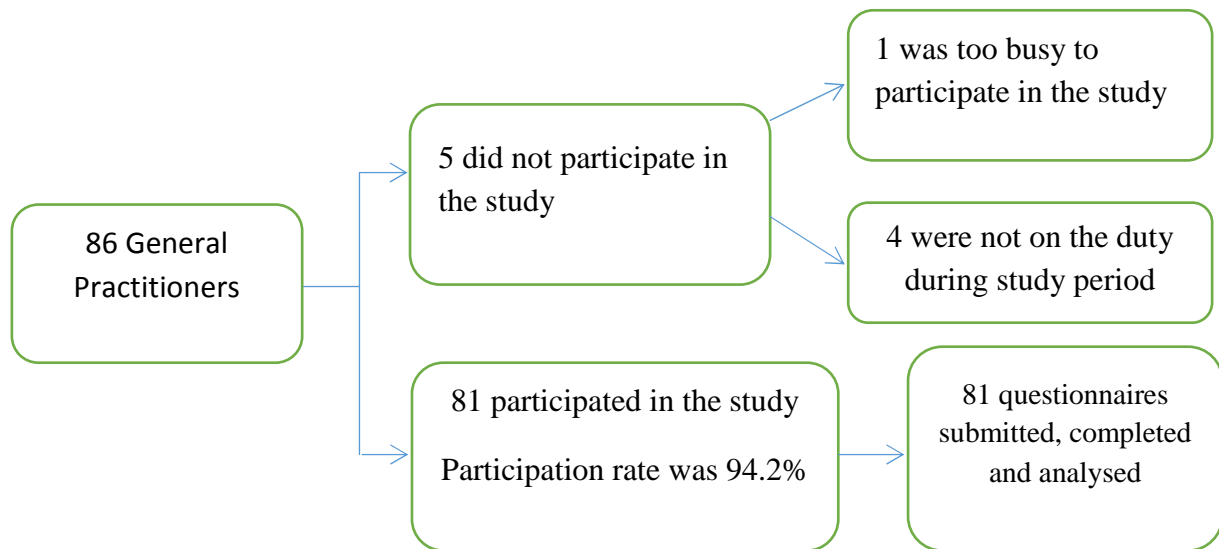
Anonymity of research subjects and confidentiality were maintained.

4. RESULTS

Eighty six doctors were available in the study area. One doctor was too busy to participate in the study. Four doctors were not on duty during the study period. The response rate was 94.2%.

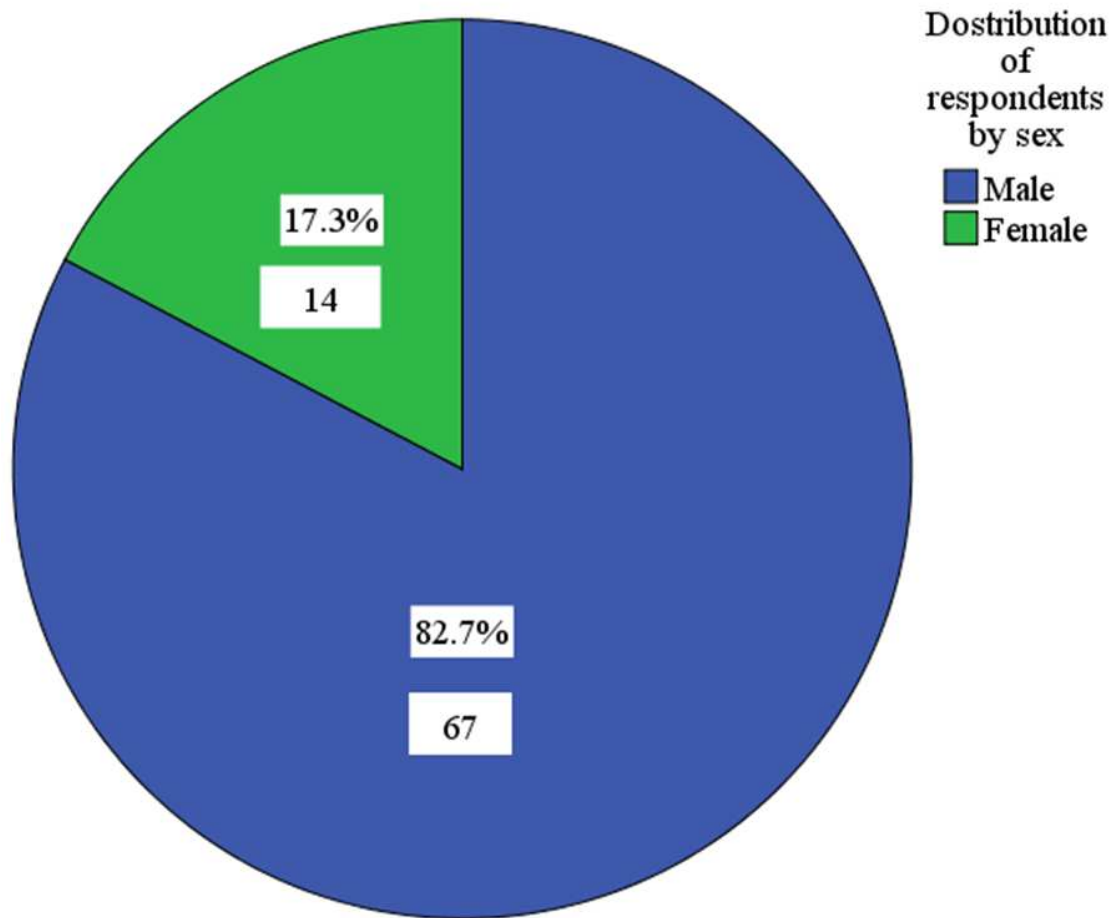
Eighty one questionnaires were submitted, completed and analysed.

Figure 2: Flow chart of data collection



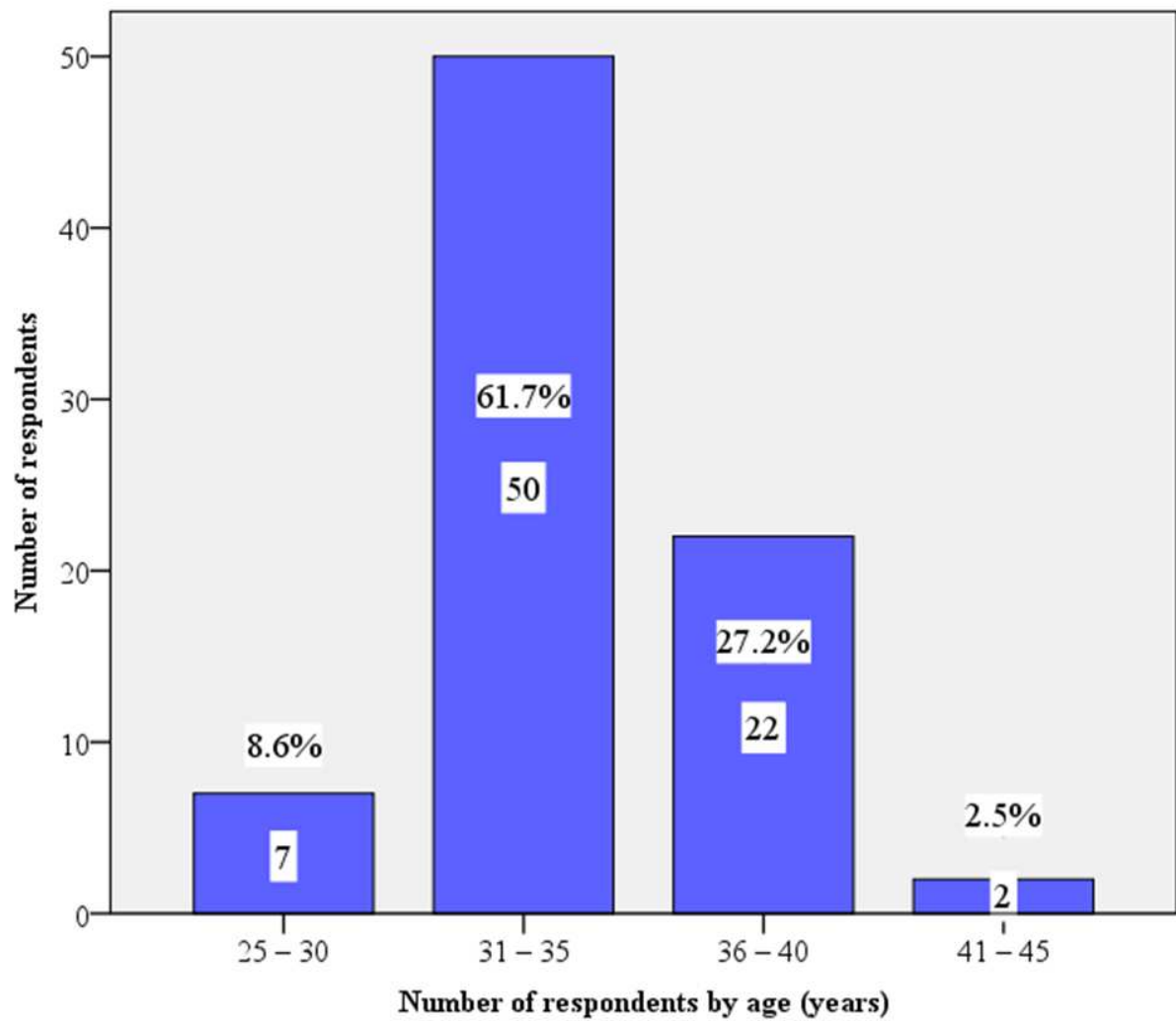
4.1 Demographic Data

Figure 3: Distribution of respondents by sex(n=81)



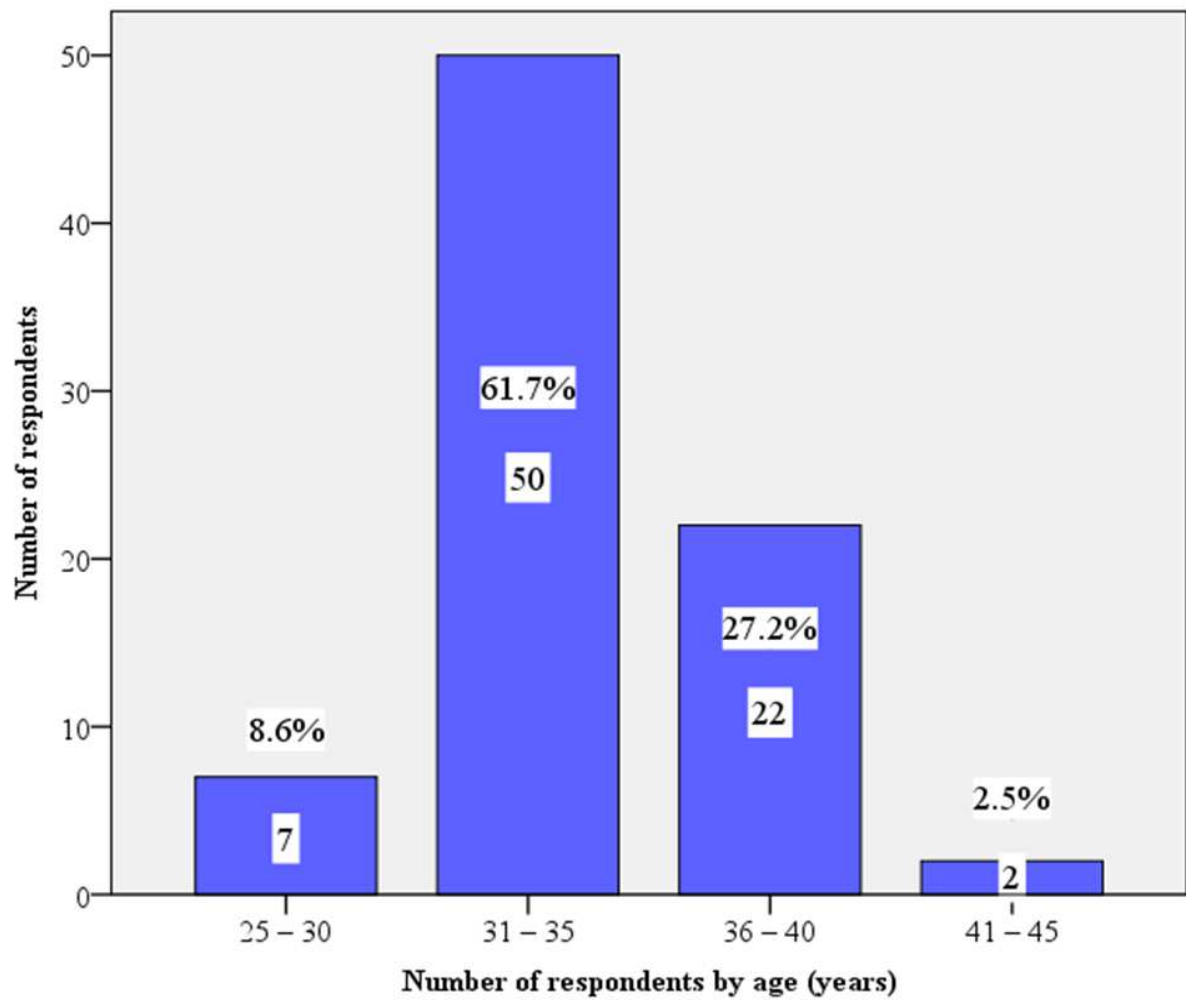
The male to female ratio was 4.8:1

Figure 4: Distribution of respondents by age (n=81)



The mean age of respondents was 34.1 years (SD = 3.121). The minimum age was 28 years and the maximum age was 44 years.

Figure 5: Distribution of respondents by duration of practice in years(n=81)



The mean duration of practice for respondents was 2.4 years (SD = 2.03). The minimum duration of practice was 0.08 year and the maximum duration of practice was 7.5 years.

4.2 Knowledge

Table 2: Respondent's response on organs affected by microvascular complications in a person with diabetes mellitus(n=81)

Organs	Number of Respondents	Percentage
Eye	75	92.6
Kidney	62	76.5
Foot	30	37.0
Heart	27	33.3
Brain	20	24.7
Genital organs	7	8.6
Peripheral nerves	6	7.4
Stomach	1	1.2

Data shows that most of the respondents, 75(92.6%) and 62(76.5%) mentioned eye and kidney respectively as the organs affected by microvascular complications in a person with diabetes mellitus.

Table 3: Respondent's response on parts of the eye that can be affected by diabetes mellitus(n=81)

Parts of the eye	Number of Respondents	Percentage
Retina	77	95.1
Optic nerve	17	21.0
Cornea	14	17.3
Vessels	11	13.6
Lens	8	9.9
Iris	4	4.9
Pupil	2	2.5

Most of the respondents 77(95.1%) mentioned retina as the part of the eye that can be affected by diabetes mellitus.

Table 4: Respondent's response on factors that influence the presence or severity of diabetic retinopathy(n=81)

Responses	Number of Respondents	Percentage
Poor glucose control	56	69.1
Hypertension	20	24.7
Duration	13	16.1
Alcoholism	12	14.8
Smoking	9	11.1
Obesity	3	3.7
Diet	3	3.7
HIV/Aids	3	3.7
Inactivity	2	2.5
Lipids profile	2	2.5
No Response	7	8.6

Most of the respondents, 56 (69.1%) mentioned poor glucose control as the factor that influence the presence or severity of diabetic retinopathy.

Table 5: Respondent's response on parts of the eye that should be examined for changes due to diabetic retinopathy (n=81)

Parts of the eye	Number of Respondents	Percentage
Retina	59	72.8
Cornea	16	19.8
Retinal vessels	12	14.8
Lens	11	13.6
Pupil	10	12.4
Optic nerve	8	9.9
Iris	4	4.9
Others	3	3.7
No response	7	8.6

Most of the respondents, 59(72.8%) mentioned retina as the part of the eye that should be examined for changes due to diabetic retinopathy.

Table 6: Respondent's response on changes due to diabetes mellitus expected to be found on Fundoscopy(n=81)

Responses	Number of Respondents	Percentage
Retinal vascular anomalies	12	14.8
Retinal haemorrhage	8	9.9
Retinal neovascularization	7	8.6
Microaneurysms	5	6.2
Retinal detachment	5	6.2
Retinal ischemia	4	4.9
Retinal vessels dilatation	4	4.9
Retinal discoloration	3	3.7
Mydriasis	3	3.7
Cotton wools	3	3.7
Macular degeneration	3	3.7
Don't know	17	21.0
Others	33	40.7

Seventeen (21%) of the GPs did not know what changes are expected on Fundoscopy and others 33(40.7) GPs did not answered.

Table 7: Respondent's response on visiting an eye worker following diagnosis

Response	Number of Respondents	Percentage
Diabetic person should visit an eye worker following diagnosis (n = 81)		
Yes	80	98.8
No Response	1	1.2
After how long should a diabetic person visit an eye worker following diagnosis (n = 81)		
Immediately	65	80.3
After 1 month	1	1.2
After 6 months	4	4.9
Between 6 months – 1 year	1	1.2
After 1 year	4	4.9
10 years after diagnosis	1	1.2
After blood sugar is at the normal level	3	3.7
Don't know	5	6.2

One respondent did not know whether or not a diabetic person should visit an eye worker following diagnosis.

Majority of the respondents 65 (80.3%) mentioned that a diabetic person should visit an eye worker immediately after diagnosis.

Table 8: Respondent's response on whether a person with diabetes mellitus should visit an eye worker on a regular basis, and how often in a year(n=81)

Response	Number of Respondents	Percentage
Once	25	30.9
2 – 3 times	28	34.6
4 – 5 times	12	14.8
6 times and more	3	3.7
Depending on first exam findings by ophthalmologist	3	3.7
Once yearly, if no ocular symptoms	1	1.2
Other	4	4.9
No response	9	11.1

Only 3(3.7%) respondents mentioned that the frequency for visiting the eye worker depends on first exam findings by ophthalmologist.

Table 9: Respondent's response on treatment and treatment modalities that are available for DR (n=81)

Response	Number of Respondents	Percentage
Diabetic Retinopathy is treatable		
Yes	61	75.3
No	11	13.6
Don't Know	9	11.1
Treatment modalities that are available		
Laser photocoagulation	35	43.2
Normalization of blood sugar level	31	38.3
Ocular surgery	9	11.1
Normalization of blood pressure	2	2.5
Medical treatment	2	2.5
Others	5	6.2
No Response	24	29.6

Eleven (13.6%) respondents believe that diabetic retinopathy is not treatable with additional 9(11.1%) respondents who don't know that it is treatable.

Table 10: Respondent's response on diagnostic test/equipment that are used for detection of diabetic retinopathy

Diagnostic test/equipment	Number of Respondents	Percentage
Direct ophthalmoscope	9	11.1
Slit lamp	3	3.7
CT Scan	2	2.5
Others	68	84
Don't Know	4	4.9
No response	5	6.2

Data shows that majority of participants are not aware of diagnostic test/equipment that are used for detection of DR. Others are answers which are not related to ophthalmology.

Table 11: Participants' attitude towards screening for diabetic retinopathy

Variables	1 = Strongly Disagree			5 = Strongly Agree		Mean	SD
	Strongly Disagree	Moderately Disagree	Neutral	Moderately Agree	Strongly Agree		
Eye examination is only required in diabetic patients when vision is affected	75 (92.6)	0	0	3 (3.7)	3 (3.7)	1.26	0.932
Pregnant woman with DM require frequent eye check-ups than woman who are not pregnant with DM	32 (39.5)	5 (6.2)	5 (6.2)	16 (19.8)	23 (28.4)	2.91	1.733
Fundoscopy done by a General Practitioner can help to detect early DR	8 (9.9)	3 (3.7)	6 (7.4)	24 (29.6)	40 (49.4)	4.05	1.274
Good lipid profile is essential for preventing vision loss in DR	53 (65.4)	10 (12.3)	1 (1.2)	15 (18.5)	2 (2.5)	1.80	1.269
Ophthalmology training in medical school was enough to detect patients with DR	12 (14.8)	2 (2.5)	9 (11.1)	21 (25.9)	37 (45.7)	3.85	1.415

Majority of the respondents 75 (92.6%) disagree that eye examination is only required in diabetic patients when vision is affected. Most of the respondents 58(71.6%) agree that ophthalmology training in medical school was enough to detect patients with diabetic retinopathy.

4.3 Practice

Table 12: Respondents' practice on testing the vision of diabetic patient

Response	Number of respondents	Percentage
Test the vision of diabetic patients (n = 81)		
Yes	23	28.4
No	58	71.6
How often do you test the vision of diabetic patient (n=81)		
After diagnosis	2	2.5
At every clinic visit	12	14.8
3 months after diagnosis	1	1.2
6 months after diagnosis	3	3.7
Annually	2	2.5
If patient has visual complaints	3	3.7

Twenty three (28.4%) respondents were testing the vision of diabetic patients

Table 13: Respondents' practice on fundus examination

Response	Number of Respondents	Percentage
Do you examine the fundus (retina) of diabetic patient (n= 81)		
Yes	5	6.2
No	76	93.8
How often do you examine the fundus (retina) of diabetic patient (n = 5)		
Every clinic visits	1	20.0
Weekly (admitted)	1	20.0
After every 6 months	1	20.0
Annually	1	20.0
Appreciate details of the retina during Fundoscopy (n = 5)		
Yes	1	20.0
No	4	80.0
Dilate the pupils before Fundoscopy (n = 5)		
Yes	2	40.0
No	3	60.0
Why you do not dilate the pupils before Fundoscopy(n=3)		
Lack of time	1	33.3
No response	2	66.7
Always have access to an ophthalmoscope at work (n = 81)		
Yes	4	4.9
No	77	95.1

Five (6.2%) respondents were examining the fundus of diabetic patient. 1 (20%) respondent among the 5 respondents examined the fundus of diabetic patient at every clinic visits.

Table 14: Respondents' practice on referral of diabetic patients

Response	Number of Respondents	Percentage
Refer diabetic patients for eye examination (n = 81)		
Yes	66	81.5
No	15	18.5
How often do you refer diabetic patients for eye examination (n = 66)		
After diagnosis	37	56.1
If patient has visual complaints	29	43.9

Twenty-nine (43.9%) respondents referred diabetic patients for an eye examination only when the patient had visual complaints.

Table 15: Association between respondents' duration of practice and practice on referring diabetic patients for eye examination

Variable	Refer diabetic patients for eye examination		Chi square test (95% CI)	P value
	Yes	No		
Respondents' duration of practice (n = 81)				
0 – 4, n = 66	55 (83.3)	11 (16.7)	0.810	0.368
> 4 and more, n = 15	11 (73.3)	4 (26.7)		

There is no statistical significant association between duration of practice and practice of referring diabetic patient for eye examination.

Table 16: Association between respondents' practice on examining the fundus of their diabetic patient and practice on having access to an ophthalmoscope at work

Variables	Always have access to an ophthalmoscope at work		Chi square test (95% CI)	P value
	Yes	No		
Examine the fundus (retina) of your diabetic patient (n = 81)				
Yes, n = 5	4 (80.0)	1 (20.0)	63.958	0.000
No, n = 76	0 (0.0)	76 (100.0)		

Respondents' who examined the fundus of their diabetic patient were more likely to always have access to an ophthalmoscope at work.

5. DISCUSSION, CONCLUSIONS, RECOMMENDATIONS AND STUDY LIMITATIONS

5.1 Discussion

The participants in this study were recruited from the different District Hospitals and one Regional Hospital in the North Region of Burundi. The participation rate was high (94.2%). It is only five participants who could not be interviewed. Four were on off-duty and one was too busy to participate in the study. This high participation rate is due to the notification of study and date of data collection in advance and the fact that the participants were filling the questionnaire in the presence of the researcher.

Eighty two point seventy percent (82.7%) of the participants were males. The mean age of respondents was 34.1 years, ranging from 28 years to 44 years. This is because the majority of females General Practitioners are married and established in Capital of the country or at provincial capitals, hence don't leave their families to go to work in rural areas. The mean duration of practice for respondents was 2.4 years. This is because General Doctors are allowed to enter residency programs after two years of practice while others are promoted into central administration, thus leaving the Regional and District Hospitals.

This study shows that participants have good knowledge of relationship between DR and other end organs affected by microvascular complications of DM. Hence, they are likely to refer all patients with renal disease or diabetic foot for eye examination because their presence could indicate the presence of DR and vice versa. Mensah *et al.* found almost similar results, where 91.2% and 80.2% of participants knew that retinopathy and nephropathy respectively are microvascular complications in patients with DM.¹⁵

This result shows that participants have poor knowledge on different parts of the eye that can be affected by diabetic retinopathy and that could be examined for change due to DR except the retina which was largely mentioned. In addition, the participants don't know which changes are expected to be found on fundus examination. That means that participants are not able to assess a diabetic patient and hence contribute to screening for diabetic retinopathy. These results are similar to other findings in other studies

Study by Mensah *et al.* found that majority of respondents mentioned retina 86 (94.5%) as part of the eye involved by microvascular complications of DM. Only 46 (50.6%) and 23 (25.3%) participants knew that the Lens and Iris respectively could be involved. In this study and the study done by *Mensah et al.*, majority of participants mentioned retina; but this don't show the knowledge because as the study is on diabetic retinopathy, it is simple to mention the retina as part of the eye involved. For changes that could be seen on fundus, 63.7% respondents mentioned cotton wools, 42.9% participants mentioned dot blot haemorrhages and 36.3% mentioned new vessels as well¹⁵. Study by Khandekar *et al.* found that the knowledge of eye parts involved in diabetes and components that could be examined was limited. Just over half the participants 23 (58%) correctly gave the name of one eye part that is usually affected by diabetes. Only 43% of staff knew that the lens could be affected in diabetes.⁴

The results are very poor comparatively to other findings in others studies. General Practitioners need to be taught about Diabetic retinopathy that way they could contribute to screening for DR .

About the factors which affected the presence or severity of DR, most of the respondents, 56 (69.1%) mentioned poor glucose control as the factor that influences the presence or severity of diabetic retinopathy. Hypertension, duration and lipids profile were mentioned by 20 (24.7%), 13 (16%) and 2 (2.5%) respondents respectively. Study done in Kenya by Oega *et al.* found out that participants were aware that glycaemic control (95.6%), hypertension (84.6%) and duration of diabetes (89.0%) influence the severity of DR.¹⁶ Mensah *et al.* found out that 86.8% of participants mentioned the level of glycaemic control, 46.2% mentioned hypertension, and 28.6% mentioned the duration of the disease as factors that influence the severity of DR. Renal disease and pregnancy were mentioned respectively by 4.4% respondents.¹⁵ In another study by Mahesh *et al.* in India, 100% of physicians recruited in the study agreed that hypertension and renal disease can influence DR, 93.1% and 68.97% were of the opinion that the duration of DM and pregnancy respectively can affect DR, 93.1% agree that serum lipid profile is related to the severity of diabetic maculopathy.¹⁴

In our study, participants did not know that pregnancy was risk factor that influences the presence or severity of diabetic retinopathy. Women with pre-existing diabetes who are planning a pregnancy should have a comprehensive eye examination and be counselled on the risk of development and/or progression of diabetic retinopathy. These women should be

counselled by general practitioners because they are the one who are first in contact with them and then referred for an eye check-up by an eye worker.

General practitioners need to be aware that pregnancy is also a risk factor for progression for DR. This could prompt practitioners to counsel diabetic women in childbearing years, especially those with pre-existing diabetic retinopathy, about the risk of progression of their disease while pregnant. In addition, general practitioners should refer diabetic women for eye check-up before and during pregnancy as well.²⁵

Participants in this study had poor knowledge in general compared to the study done by Mensah *et al.* in Ghana in which the questionnaire was self – administered and made of open ended question as well. In this study however, the researcher was administrating the questionnaire and correcting them later after being filled. In our study, the questionnaire was administered section by section separately and was filled in the researcher presence. This may explain the different findings in these two studies. In addition, the wide difference between our study and study done by Oega *et al*¹⁶ in Kenya and Mahesh *et al*¹⁴ in India may be attributed to the fact that the questionnaire in our study was made of open ended questions whilst that the other studies were given options to choose from.

Only 1 respondent did not know whether a diabetic person should visit an eye worker following diagnosis. About the timing for visiting that eye worker, the majority of the respondents 65 (80.3%) mentioned that a diabetic person should visit an eye worker immediately after diagnosis. All general practitioners are aware that diabetic patient should visit an eye worker following a regular basis but only 3 (3.7%) respondents mentioned that the frequency for visiting the eye worker depends on first exam findings by ophthalmologist.

In the study by Mensah *et al*, all respondent are aware that a person with DR needed to visit an eye worker for review and 92.3% respondents of them suggested the visit to be made as soon as possible after diagnosis.¹⁵ In the study by Oega *et all* 85.2% of participants thought that the eye review should be done immediately after diagnosis.¹⁶

Mahesh *Get all* found that 82.76% of the study participants would advise diabetic patients to have eye examination soon after diagnosis.¹⁴

In our study, participants are aware that newly diagnosed diabetic patient should visit eye workers immediately for eye check-up. This finding give a hope that they should refer patient for eye check-up by an eye worker and that should reduce the prevalence of sight loss due to DR because early diagnosis and management of DR. However, the participants had poor knowledge on the frequency of visiting eye-worker. That showed that general practitioners need to be taught on how a diabetic patient should receive follow-up. By doing so, it is hoped that practitioners could advice their diabetic patients to follow all recommendations given by eye workers regarding their follow-up.

On knowledge about the treatment of DR, majority of participants 61 (75.3%) were aware that DR is treatable. Regarding the treatment modalities, 35 (43.2%) respondents mentioned laser photocoagulation, only 9 (11.1%) respondents mentioned ocular surgery and 2 (2.5%) respondents mentioned medical treatment modalities as the forms of treatment modalities of diabetic retinopathy. Respondents had general poor knowledge of treatment modalities for DR that is available. Thus, general practitioners need to be aware of these treatment modalities for DR so as to refer diabetic patients for screening and management. That should encourage diabetic patients to go for eye check-up once they are referred to an eye worker.

Study by Oega *et al.* found out that 67% of participants said that DR was treatable, 47.3% mentioned laser photocoagulation and 11% surgery as treatment modalities for DR.¹⁶ Other study by Mensah *et al.* found out that 78% participants said that DR was treatable, 55% mentioned laser photocoagulation, while 12.1% and 27.5% mentioned surgical and medical modalities respectively as the forms of treatment for DR.¹⁵ Yet another study Mahesh *et al.* found out that 75.86% participants believed that laser treatment is curative for DR and 62.07% said surgical treatment was available for advanced DR.

Only 9 (11.1%) and 3 (3.7%) respondents, mentioned direct ophthalmoscope and Slit lamp respectively as diagnostic test/equipment that used for detection of DR. These results showed that general practitioners were probably not taught about diagnostic test/equipment used for detection of DR. In addition, they were not trained to do fundus examination with direct ophthalmoscope during undergraduate training in medical school. Thus, undergraduate ophthalmology training needs to be reviewed to make it more knowledgeable and skills oriented.

This study showed that attitudes toward eye examinations were positive, 75 (92.6%) disagree with the statement that eye examination is only required in diabetic patients when vision is affected, and 64 (79.0%) participants agreed that fundus examination done by a General Practitioner can help to detect early DR. Thirty nine (48.2%) participants agreed that pregnant woman with DM require frequent eye check-ups than woman who are not pregnant with DM. Also 63 (77.7%) participants felt that good lipid profile is essential for preventing vision loss in DR. These findings showed a good will among respondents but demonstrated a poor attitude toward screening for DR because they have poor knowledge of risks factors that influence the progression or worsening for DR. Thus, a need exist for training general practitioners and being involved in screening for DR.

Study by Oega *et al* found out that good attitudes toward screening for DR were good with 87.9% participants disagreed with the statement that diabetic require eye examination only when their vision is affected.¹⁶ Mensah *et al.* also found out that the attitudes toward eye examinations were positive with 98.9% of respondents disagreeing with the statement that eye examinations should be done in diabetic patients only when their vision is affected. Additionally, 92.3% respondents agreed that fundus examinations by non-ophthalmologists could help to detect DR in diabetic patients¹⁵.

In this study, most of the respondents 58 (71.6%) agreed that ophthalmology training in medical school was enough to detect patients with diabetic retinopathy. However, it is evident from this study that the knowledge on diabetic retinopathy among the respondents was poor. That means that during undergraduate training, they were likely to perceive that they were able to detect patient with DR. But practically on the field, they are not even trying to do eye examination of diabetic patient to see how it is difficult. Study by Mensah *et al.* found out that 52.8% disagree with the statement that ophthalmology training in medical school was enough to detect patients with diabetic retinopathy¹⁵. In other study conducted in Canada among first year residents who had just graduated from medical school. They were asked whether sufficient Knowledge and skills had been obtained during medical school, only 42.9% agreed that ophthalmology knowledge was sufficient and 25.9% agreed that skills in ophthalmology were enough.¹⁹

In term of practice of testing vision, the majority of respondents never tested the vision of their diabetic patients 58(71.6%); only 22.2% of them would test the vision of their patient within a year. This study finding reflects poor practice of testing vision of diabetic patients.

Through observation, the charts for testing vision were not seen in all the General Practitioners' offices. In addition, 92.6% of respondents disagreed with the statement that eye examination is only required in diabetic patients when vision is affected, it means that if the charts for testing vision were available, possibly the General Doctors could test the vision of diabetic patients. Hence contribute to screening for DR.

Study by Oega *et al.* found that less than half (37.4%) of the general practitioners assessed vision for their diabetes patients in a year. Majority of general practitioners never assessed vision (26.4%) or only did so when a patient had visual complaints (34.1%).¹⁶ Study by Mensah *et al.* in Ghana found out that 17 (18.7%) out of 91 respondents tested the vision of diabetic patients every 6 months, 11 (12.1%) did so every year. Three (3.3%) respondents tested the vision at every visit and admission and 12 (13.2%) accepted never testing the vision of their patient. Within a year, 34.1% respondents would test the vision of their patients.¹⁵ Study by Rajiv *et al.* found out that 31.3 % (n=50) feel that diabetics should undergo an eye examination every six months, 53.3 % (n=85) feel that diabetic patients should undergo eye examination every year and 15.4% felt that eye examination every 2 years was sufficient for diabetics¹⁷.

Fundus examination is poorly done by General Practitioners in this study as it is in others studies. Seventy six (93.8) of participants did not do fundus examination, only 5 (6.2%) were attempting to do the fundus examination for their diabetic patients and 1 (20%) was appreciating the details of the retina. Two respondents were dilating the pupils before Fundoscopy and 1 stated lack of time as the reason for not dilating the pupils before Fundoscopy. Only 4 (4.9%) respondents had access to an ophthalmoscope in their work place.

These results demonstrate clearly very poor practice of fundus examination among general practitioners. That may be explained by the scarcity of direct ophthalmoscope at work place as showed by the study and poor training in terms of doing of Fundoscopy. However, even in experienced ophthalmologist, it is difficult to appreciate the details of the retina on undilated pupil because it will block the view. General practitioners need to be taught how to do the fundus examination that way they can contribute in screening for DR.

Oega *et al.* found out that 51.6% of general practitioners never did fundus examination for their diabetic patients¹⁶. Mensah *et al.* found out that 16 (17.6%) of participants practice it,

11% could appreciate the details of the retina, 50% of funduscopy was performed without dilatation of the pupil and only 33% had access to an ophthalmoscope¹⁵. Rajiv *et al.* found out that ophthalmoscopy was done by 2 (2/159) of the general practitioners. Of the two, one general practitioner performed ophthalmoscopy with dilatation while the other performed it without dilatation. The reason stated for not dilating was lack of time.¹⁷ Khandekar *et al.* reported that 20 (50%) physicians had attempted to do fundus examination, but only 9 (22.5%) could see the details of the retina.⁴

This study found out that 66 (81.5%) respondents referred diabetic patient for eye examination with 29 (43.9%) respondents who referred when patient had visual complaints. This is a good practice because if the patients would report to an eye worker for screening, the detection and management of DR will be early and hence prevent the loss of sight. An important number of general practitioners 15 (18.5%) did not refer their diabetic patients. This could be the origin of sight loss for diabetic patients because they should visit an eye worker when they presented visual complaints and it could be already at stage of complications with irrecoverable sight. Hence, general practitioners need to be aware of referral of diabetic patients after diagnosis even if the patient does not have any visual complaints for eye check-up.

Different studies revealed varied results. Study by Oega *et al.* found out that 51.6% respondents referred and advised diabetic patients for eye examination yearly while 38.5% respondents referred patients only when they had visual complaints.¹⁶ Study by Mensah *et al.* found out that 92.3% respondents referred their diabetic patients.¹⁵ Yet other study done in the State of Indiana by Yung *et al.* found out that 35% of respondents stated that they never refer patients for ocular examination while 26% refer all patients.¹⁸

This study found no statistical significant association between duration of practice and practice of referring diabetic patient for eye examination. However, there was a strong statistical significant association between having access to an ophthalmoscope and practice of fundus examination. This implies that if ophthalmoscopes were available it is expected that General Practitioners would attempt to practice fundus examination. However, there is need for training in the use of funduscopy in order to be able to identify the fundus changes in DR.

In the study done by Mensah *et al.* found that participants who had access to ophthalmoscopes were more likely to do fundus examination of their diabetic patients.¹⁵

5.2 Conclusion

1. The study participants generally had a poor knowledge on DR.
2. Participants had good knowledge about relationship between DR and others end organs which can be affected by microvascular complication of diabetes mellitus like kidney 62 (76.5%).
3. 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.
4. The participants had good practice in referral of diabetic patients 66(81.5%).
5. The majority of general practitioners did not have access to an ophthalmoscope at their work place 77(95.1%).
6. Undergraduate ophthalmology training in medical school is adequate according to the participants. But, my results had revealed that participants generally had a poor knowledge, attitude and practice on DR.

5.3 Recommendations

1. Continuous medical education and workshops could be organized to refresh doctors' knowledge about DR and how to screen for it.
2. Research study on the undergraduate training program is necessary in order to reassess the effectiveness of the program and possible improvement.
3. Ophthalmoscopes and charts for testing vision should be available in the different District hospitals.
4. General Practitioners should emphasize on the importance of eye check-up and refer all diabetic patients as soon as possible.

5.4 Study Limitations

1. This study was conducted in the North region of Burundi and did not reach all General Practitioners in the entire country. Results may not reflect the reality for the entire country.
2. All General Practitioners did not participate in the study because of lack of time and unavailability during study period.

REFERENCES

1. Goldhaber-Fiebert J., Jeon C., Cohen T. Diabetes mellitus and tuberculosis in countries with high tuberculosis burdens: individual risks and social determinants. *Int J Epidemiol.* 2011; 40 (2): 417-428.
2. American Academy of Ophthalmology 2012-2013, section 12, Retina and Vitreous.
3. Shrestha R. Ocular manifestations in diabetes, a hospital based prospective study. *Nepal Med Coll J.* 2011; 13(4): 254-256.
4. Khandekar R, Shah S, Al Lawatti J. Retinal examination of diabetic patients: knowledge, attitudes and practices of physicians in Oman. *East Mediterr Health J.* 2008;14 (4):850-7.
5. Kanski J. J., Bowling B. *Clinical Ophthalmology, a systemic approach*, 7th edition. Elsevier Saunders; 2011.
6. Rizyal A. Ocular manifestations in diabetes mellitus: an experience at Nepal Medical College Teaching Hospital. *Nepal Med Coll J.* 2004; 6:136-8.
7. Javadi M., Katibeh M. , Rafati N. Prevalence of diabetic retinopathy in Tehran province: a population-based study. *BMC Ophthalmol.* 2009; 9: 12.
8. Bamashmus MA, Gunaid AA, Khandekar RB. Diabetic retinopathy, visual impairment and ocular status among patients with diabetes mellitus in Yemen: a hospital-based study *Indian J Ophthalmol.* 2009; 57:293-8.
9. United Kingdom Prospective Diabetes Study Group: Tight blood pressure control and risk of macrovascular and microvascular complications in type 2 diabetes: UKPDS 38. *BMJ.* 1998; 317:703-713.

10. Early Treatment Diabetic Retinopathy Study Research Group. Early photocoagulation for diabetic retinopathy. ETDRS report number 9. *Ophthalmology*. 1991; 98(5suppl):766-85.
11. Ciulla T.A., Amador A.G., Zinman B. MDCM, FRCP(C), FACP3 (2003). Diabetic Retinopathy and Diabetic Macula Edema, Pathophysiology, screening and novel therapies.
12. International Diabetes Federation, 2012. Clinical Guidelines Task Force; Global Guideline for Type 2 Diabetes.
13. Verma L, Prakash G, Tewari HK, Gupta SK, Murthy GV, Sharma N. Screening for diabetic retinopathy by non-ophthalmologists: an effective public health tool. *Acta Ophthalmol Scand*. 2003 Aug; 81(4):373-7
14. Mahesh G, Giridhar A., Saikumar S. J., Kumar R., Bhat S. Knowledge, Attitude and Practice Pattern among Health Care Providers Regarding Diabetic Retinopathy
15. Mensah V et al. Knowledge, Attitude and Practices of Diabetic Retinopathy among officers in the Regional Hospitals of GHANA. Mmed dissertation; 2013.
16. Oega R.B et al. Diabetic Retinopathy: knowledge, attitude and practice among General Practitioners in provincial hospitals in Kenya. Mmed Dissertation; 2012.
17. Rajiv R., Pradeep G., Padmajakumari R., Tarun S. Knowledge and attitude of general practitioners towards diabetic retinopathy practice in South India. *Community Eye Health*. 2006 March; 19(57):13 - 14.

18. Yung CW, Boyer MM, Marrero DG, Gavin TC. Patterns of diabetic eye care by primary care physicians in the state of Indiana. *Ophthalmic Epidemiology*. 1995 Jun; 2(2): 85-91.
19. Nobel J, Somal K, Gill HS, Lam WC. An analysis of undergraduate ophthalmology training in Canada. *Canadian Journal of Ophthalmology*. 2009 October; 5(44): 513-518. Department of Ophthalmology and Vision Sciences, University of Toronto, Ont, Canada.
20. W Yang. Prevalence of diabetes among men and women in China. *N Engl J Med*. 2010 Mar 25; 362(12):1090-101.
21. Lawrence V. 2009 Diabetes. Part 1. Definition, Diagnosis and Prevention.
22. Republic of Burundi, Action Plan 2010-2014: Vision 2020 Initiative for the Elimination of Avoidable Blindness in Burundi. Republic of Burundi; 2010.
23. Ministry of Public Health and Fight against HIV. Post and profile description of workers of Ministry of Public Health and Fight against HIV in Burundi. Republic of Burundi; 2013.
24. Gilbert, N. *Researching Social Life*. Sage Publication; 2005.
25. Praveen Vashist, Sameeksha Singh, Noopur Gupta and RohitSaxena. Role of Early Screening for Diabetic Retinopathy in Patients with Diabetes Mellitus: An Overview. *Indian J Community Med*. 2011 Oct-Dec; 36(4): 247–252.

Appendices

Appendix I: Informed Consent and Consent Form

Informed Consent

I am Dr. Niyonsavye Léopold, from Burundi. I am currently a postgraduate student at the Department of Ophthalmology, School of Medicine, University of Nairobi, Kenya. I am conducting a study on “**Knowledge, Attitude and Practice on Diabetic Retinopathy among General Practitioners working at District and Regional Hospitals in the North Region of Burundi.**” I am carrying out a study as part of the requirements for my course.

My objective is to establish the knowledge, attitude and practice on diabetic retinopathy among general practitioners working in District and Regional Hospitals in the North Region of Burundi.

Doctors in Regional and District Hospitals have been chosen for this study because they are involved in the treatment of diabetic patients and they could playing a significant role in the preventing of blindness as a result of diabetes mellitus.

The results of this study will form a basis on which intervention can be planned, and the recommendations when implemented would go a long way in helping Burundi reduce the incidence of preventable blindness as well as other organ damage.

My Supervisors are:

Dr. Kariuki M. M.

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Dr. Lévi Kandeke

MBCChB, M.MED (Ophthalmology), FEACO

Senior Lecturer

University of Burundi

Phone number: +25779987087

I respectfully request your participation in this study as general practitioner working at Regional and District Hospital in the North Region of BURUNDI.

Your participation is voluntary. You are free to decline or withdraw from the study at any time and refusal to take part will not attract any penalty. You retain the right to withdraw without risking any consequence from any authority. No names are necessary on questionnaire. Any information you provide will be treated as confidential.

There are no perceived risks for your participation. The findings of this study will be published in national and International scientific journals.

Procedure: I will inform you of the study being performed and seek an informed consent. Once granted, I will administer a questionnaire section by section and ask you to complete it. This should take approximately 20 to 30 minutes to complete. You are free to ask questions and seek clarifications about the study now and any time. I will be available to answer any questions that will help you to understand the nature of the study.

Benefit: Participation or non-participation does not come with any financial costs. Equally, no compensation will be provided for participation in the study.

If you need to seek clarification, you can contact

Dr. Léopold NIYONSAVYE

Department of ophthalmology

University of Nairobi

P.O. Box 19676 – 00202

Nairobi, Kenya. Phone number: +254711514419

Consent Form

I.....having received adequate information regarding the study research, risks, benefits hereby AGREE / DISAGREE (Cross out as appropriate) to participate in the study. I understand that my participation is fully voluntary and that I am free to withdraw at any time. I have been given adequate opportunity to ask questions and seek clarification on the study and these have been addressed satisfactorily.

General Practitioner’s Signature..... Date

I.....declare that I have adequately explained to the above participant, the study procedure, risks, benefits and given him / her time to ask questions and seek clarification regarding the study. I have answered all the questions raised to the best of my ability.

Interviewers Signature Date.....

Annexe I: consentement éclairé

Je suis Dr Niyonsavye Léopold, Burundais. Je suis actuellement un résident au département d'ophtalmologie, faculté de médecine, Université de Nairobi au Kenya. Je suis entrain de conduire une étude sur « **la Connaissance, Attitude et Pratique sur la Rétinopathie diabétique parmi les Médecins Généralistes qui travaillent dans les Hôpitaux de district et l'Hôpital régional dans la Région Nord du Burundi** ». Je suis entrain de faire cette étude comme partie exigée de mes études.

Mon objectif est d'établir la connaissance, attitude et pratique sur la rétinopathie diabétique parmi les Médecins Généralistes qui travaillent dans les Hôpitaux de district et l'Hôpital Régional dans la zone d'étude.

Les médecins généralistes, dans les Hôpitaux de district et Régionaux ont été choisis pour cette étude parce qu'ils traitent les diabétiques et pour cela pourraient jouer un rôle important dans la prévention de la cécité liée au diabète. Les résultats de cette étude serviront de base sur laquelle l'intervention pourra être planifiée, et les recommandations qui seront formulées aideront le Burundi à réduire l'incidence de la cécité évitable ainsi que la destruction d'autres organes liée au diabète.

Mes superviseurs sont:

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Avec tout mon respect, je sollicite votre participation dans cette étude comme Médecin Généraliste qui travaille dans l'Hôpital Régional et les Hôpitaux de District dans la Région Nord du Burundi. Votre participation est volontaire. Vous êtes libre de décliner ou de vous retirer de cette étude à n'importe quel moment et votre refus de participer n'entraînera aucune pénalité pour vous. Vous avez le droit de vous retirer sans risquer aucune conséquence de la part de n'importe quelle autorité. Vos noms ne sont pas nécessaires sur le questionnaire. N'importe quelle information que vous donnez sera traitée confidentiellement. Votre participation ne vous entraînera aucun risque. Les résultats de cette étude seront publiés dans les journaux scientifiques nationaux et internationaux.

Procédure: Je vais vous informer de l'étude en cours d'exécution et vous demander de signer le formulaire de consentement. Si vous acceptez, je vais vous donner le questionnaire section par section et vous demander de le compléter. Cela vous prendra environ 20 à 30 minutes pour le compléter. Vous êtes libre de poser des questions pour l'éclaircissement à n'importe quel moment. Je serai disponible à répondre toutes les questions qui vous aideront à comprendre la nature de cette étude.

Intérêt: La participation ou la non-participation ne sont pas venues avec aucun moyen financier. Egalement, il n'ya pas de compensation qui est prévue pour avoir participé dans cette étude.

Si vous avez besoin de chercher l'éclaircissement, vous pouvez contacter

Dr. Léopold NIYONSAVYE

Département d'Ophtalmologie

Université de Nairobi

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Formulaire de consentement

Moi.....ayant reçu l'information adéquate en ce qui concerne cette étude de recherche, les risks, les bénéfices, par la présente **d'accord/désaccord** (crocher là où c'est approprié) à participer dans cette étude. Je comprendre que ma participation est entièrement volontaire et que je suis libre à me retirer à n'importe quel moment. J'ai reçu l'opportunité de demander des questions de clarifications sur cette étude et j'ai été satisfait.

Signature du Médecin Généraliste.....date

Moi.....déclare que j'ai suffisamment expliqué au participant déçu, la procédure de l'étude, les bénéfices, et lui avoir donné le temps de poser les questions d'éclaircissement à propos de l'étude. J'ai répondu toutes les questions soulevées au meilleur de ma capacité.

Signature de l'enquêteur.....Date.....

Appendix II: Questionnaire

Department of Ophthalmology, School of Medicine, University of Nairobi

Diabetic Retinopathy: Survey of Knowledge, Attitude and Practice on Diabetic Retinopathy among General Practitioners working at District and Regional Hospitals in Burundi.

Date __/____/_____

Thank you dear colleagues to participate in this health survey

Remember this is not an exam; there is no right or wrong answers.

We appreciate your time in completing this questionnaire.

DEMOGRAPHICS DATA:

1. Age: _____

2. Gender: Male { } Female{ }

3. How long have you been practicing as medical doctor?

Answer: Years: _____ Months: _____

KNOWLEDGE:

4. Mention the organs which can be affected by microvascular complications in a person with diabetes mellitus

5. Which parts of the eye can be affected by Diabetes Mellitus?

6. What factors influence the presence or severity of diabetic retinopathy?

7. Which parts of the eye should be examined for changes due to diabetic retinopathy?

8. What changes due to diabetes mellitus do you expect to find on Fundoscopy?

9. A diabetic person should visit an eye worker following diagnosis.

Yes { } No { }

10. If yes to question 9, after how long should he/she visit that eye worker?

11. Do you think that a person with diabetes mellitus should visit an eye worker on a regular basis following diagnosis?

Yes { } No { }

12. If you answered 'Yes' to Question 11 above, then how often should that person visit the eyeworker?

13. Is Diabetic Retinopathy treatable?

a. Yes { } b. No { }

14. If yes to question 13 above, name treatment modalities that are available.

15. What diagnostic test/equipment are used for detection of Diabetic Retinopathy?

Practices

16. Do you test the vision of your diabetic patients?

a. Yes { } No { }

17. If yes on question 16, how often?

18. Do you examine the fundus (retina) of your diabetic patient?

Yes { } No { }

19. If yes to question 18, how often?

20. Are you able to appreciate details of the retina during your Fundoscopy?

Yes { } No { }

21. Do you dilate the pupils before Fundoscopy?

Yes { } No { }

22. If you answer no to question 21, why?

a. lack of time { }

b. lack of dilating drops { }

c. not important to dilate { }

23. Do you always have access to an ophthalmoscope at your work?

Ye { } No { }

24. Do you refer diabetic patients for eye examination?

Yes { } No { }

25. If yes to question 24, how often?

Attitude

For the following questions, indicate whether you:

- a. Strongly disagree
- b. Moderately disagree
- c. Neutral
- d. Moderately agree
- e. Strongly agree

26. Eye examination is only required in diabetic patients when vision is affected

- a. Strongly disagree { }
- b. Moderately disagree { }
- c. Neutral { }
- d. Moderately agree { }
- e. Strongly agree { }

27. Pregnant woman with diabetes mellitus require frequent eye check-ups than no pregnant woman with diabetes mellitus.

- a. Strongly disagree { }
- b. Moderately disagree { }
- c. Neutral { }
- d. Moderately agree { }
- e. Strongly agree { }

28. Fundoscopy done by a General Practitioner can help to detect early diabetic retinopathy.

- a. Strongly disagree { }
- b. Moderately disagree { }
- c. Neutral { }
- d. Moderately agree { }
- e. Strongly agree { }

29. A good lipid profile is essential for preventing vision loss in diabetic retinopathy

- a. Strongly disagree { }
- b. Moderately disagree { }
- c. Neutral { }
- d. Moderately agree { }
- e. Strongly agree { }

30. The Ophthalmology training in medical school was enough to detect patients With Diabetic Retinopathy.

- a. Strongly disagree { }
- b. moderately disagree { }
- c. Neutral { }
- d. moderately agree { }
- e. strongly agree { }

Thank you.

Annexe II: Questionnaire

Département d'ophtalmologie, Faculté de Médecine, Université de Nairobi.

Rétinopathie Diabétique: Connaissance, Attitude et Pratique sur la Rétinopathie Diabétique parmi les médecins généralistes qui travaillent dans les hôpitaux de district et régionaux au Burundi.

Date... /.... /

Merci chers collègues de participer à cette enquête de santé.

Souvenez-vous, ceci n'est pas un examen et il n'y a pas de mauvaise ou bonne réponse.

Nous vous remercions de votre temps pour remplir ce questionnaire.

Données démographiques :

1. Age:.....

2. Genre: Masculin { } Féminin { }

3. Pour Combien de temps pratiquez –vous comme médecin?

Réponse: Année.....Mois.....

Connaissance:

4. Citer les organes qui peuvent être affectés par des complications microvasculaires chez un diabétique.

5. Quels sont les parties de l'œil qui peuvent être affectées par le diabète ?

6. Quels sont les facteurs qui influencent la présence ou la sévérité de la Rétinopathie Diabétique?

7. Quelles sont les parties de l'œil qui pourraient être examinées pour voir les changements liés à la Rétinopathie Diabétique?

8. Quels sont les changements liés au diabète attendez-vous retrouver en faisant le fond d'œil?

9. Une personne chez qui on vient de faire le diagnostic du diabète pourrait par la suite consulter un ophtalmologiste.

Oui { } No { }

10. Si oui à la question 9, après combien de temps pourrait-il (elle) consulter cet ophtalmologiste?

11. Pensez-vous qu'une personne atteinte de diabète sucré doit visiter un ophtalmologiste sur une base régulière suivant le diagnostic de son diabète?

Oui { } Non { }

12. Si vous répondez "oui" à la question 11, à quelle fréquence devrait-il (elle) visiter cet ophtalmologiste?

13. Est-ce que la Rétinopathie Diabétique est traitable?

Oui { } No { }

14. Si oui à la question 13, citer les modalités thérapeutiques qui sont disponibles.

15. Quels sont les tests diagnostiques/instruments qui sont utilisés pour la détection de la Rétinopathie Diabétique?

Pratique

16. Testez-vous la vision de vos patients diabétiques?

- a. Oui { } b. Non { }

17. Si oui à la question 16, combien de fois?

18. Est-ce que vous examinez la rétine en faisant le fond d'œil de vos patients diabétiques?

- Oui { } Non { }

19. Si vous répondez oui à la question 18, combien de fois vous lui faites ce fond d'œil?

20. Etez-vous à mesure de voir les détails de la rétine quand vous faites le fond d'œil?

- Oui { } Non { }

21. Est-ce que vous dilatez la pupille avant le fond d'œil?

- Oui { } Non { }

22. Si vous répondez non à la question 21, quelle est la cause?

- a. Manque de temps { }
b. Manque des produits pour dilater { }
c. Ce n'est pas important de dilater la pupille avant le fond d'œil { }

23. Avez-vous toujours l'accès à un ophtalmoscope à votre lieu de travail?

- Oui { } Non { }

24. Est-ce que vous transférer les patients diabétiques pour faire l'examen de l'œil?

- Oui { } Non { }

25. Si vous répondez oui à la question 24, combien de fois vous transférer les diabétiques?

Attitudes

Pour les questions ci- dessous (26 à 30), répondez que vous êtes:

- a. En désaccord
- b. Modérément en désaccord
- c. Neutre
- d. Modérément d'accord
- e. Très d'accord

26. L'examen de l'œil chez un diabétique est uniquement recommandé quand la vision est affectée.

- a. En désaccord
- b. Modérément en désaccord
- c. Neutre
- d. Modérément d'accord
- e. Très d'accord

27. Une femme enceinte, diabétique, nécessite fréquentes examens oculaires par rapport à une femme diabétique non enceinte.

- a. En désaccord
- b. Modérément en désaccord
- c. Neutre.
- d. Modérément d'accord
- e. Très d'accord

28. Le fond d'œil fait par un médecin généraliste peut aider à détecter tôt la rétinopathie diabétique.

- a. En désaccord
- b. Modérément en désaccord
- c. Neutre
- d. Modérément d'accord
- e. Très d'accord

29. Le cours d'ophtalmologie fait dans l'université est suffisant pour prendre en charge les patients avec les problèmes oculaires.

- a. En désaccord
- b. Modérément en désaccord
- c. Neutre
- d. Modérément d'accord
- e. Très d'accord

30. Un bon contrôle du profile lipidique est essentiel pour prévenir la perte de la vision chez les diabétiques.

- a. En désaccord
- b. Modérément en désaccord
- c. Neutre
- d. Modérément d'accord
- e. Très d'accord

Merci

