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# DIABETIC RETINOPATHY IN A COHORT OF PERSONS LIVING WITH DIABETES AT THE OUTPATIENT OPHTHALMOLOGY CLINIC OF A TERTIARY HEALTH FACILITY, SOUTHEAST NIGERIA

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***Keywords:***
*Diabetic Retinopathy, Persons Living With Diabetes Mellitus, Southeast Nigeria*

***Abstract:*** *Background and objectives: Diabetic retinopathy (DR), the primary retinal vascular complication of diabetes mellitus, is a leading cause of visual impairments and blindness. The risk factors for DR include poor glycaemic control, longer duration of illness and comorbid hypertension, These factors are common in our diabetic populations but the burden of DR is largely unknown. This study, therefore, set out to bridge this gap in knowledge.*
*Subjects and Methods: This was a cross- sectional study in which persons living with diabetes mellitus (PLWD) presenting with eye complaints to the Ophthalmology Clinic of Abia State University Teaching Hospital (ABSUTH), Aba for evaluation and treatment were consecutively recruited into the study. This study lasted from June 1, 2021 to December 31, 2022. Relevant data obtained were analyzed using Statistical Package for Social Sciences (SPSS) version 23.0 software.*
*Results: A total of 134 diabetic patients; 65 (48.5%) males and 69 (51.5%) females, were screened for DR among which 10.4% were found to have varying degrees of DR including diabetic macular oedema which was quite common. The mean random blood glucose of the study population was 213.31 SD 81.8mg/dl. Systemic hypertension was the commonest co-morbid condition seen in 65.7% of the participants.*
*Conclusion: DR is common among PLWD in the city of Aba. It is recommended that PLWD should have their blood glucose levels and the other co-morbidities such as systemic hypertension and lipid abnormalities under control to slow down the progression of DR.*

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## INTRODUCTION

There is an increasing prevalence of diabetes mellitus (DM) (Sogwi, 2011) especially among sub Saharan Africans (Chinenye et al, 2013) due to ageing of the population, improving survival of people living with diabetes, obesity, increased urbanization and westernization, dietary changes and physical inactivity. Diabetes mellitus (IDF, 2009) is projected by the WHO to rise to 552 million people world-wide by 2030. Not achieving optimal glycaemic control in persons living with diabetes plays a significant role in the development and progression of microvascular complications (affecting the eyes, kidneys and the nerves) of diabetes mellitus (Rohlfing et al, 2002). Globally, diabetic retinopathy (DR) is responsible for 5% of all blindness, affecting 2 million people (WHO, 2006), and it is the main cause of blindness in adults in industrialized countries. It is, also, the commonest ocular complication of diabetes mellitus associated with blindness (WHO, 2006).

The factors that determined the development of DR included systolic blood pressure, course of diabetes, glycated haemoglobin, total cholesterol, high-density lipoprotein cholesterol, fasting blood glucose and hypertension (Xuan et al, 2022). In another systematic review and meta-analysis (Azagew et al, 2023), co-morbid hypertension, poor glycaemic control and longer duration of diabetes illness were found to be the determinant factors of DR. Prevalence rates of diabetic retinopathy (Erasmus et al, 1989; Kalk et al, 1997; Ndiaye et al, 1999; Nwosu, 2000; Seyoum et al, 2000; Rotimi et al, 2003) among persons living with diabetes (PLWD) in Sub Saharan Africa was reported to be between 15% and 38%. The pooled prevalence of diabetic retinopathy in Nigeria was 21.3% (95% CI 21.1–21.5) and the most common risk factors for diabetic retinopathy in the same Nigerian study were duration of diabetes, poor glycaemic control and systemic hypertension (Azeez et al, 2023).

In previous reports, diabetic retinopathy was described as being rare in Nigerians (Abiose, 1978; Osuntokun, 1969) but in more recent studies, diabetic retinopathy in Nigeria (Nwosu, 2000; Muhammad, 2020; Nwosu, 2000) has been on the increase and ranged from 14% -33%. In a preliminary UCH report where 76 diabetic patients were screened for DR, prevalence of diabetic retinopathy (Ashaye et al, 2008) was even found to be 42.1%. However, in an Ilorin (Olokoba, 2019) hospital-based study where 364 diabetic patients were enrolled, diabetic retinopathy prevalence was as low as 12.1% in one or both eyes. Out of those with diabetic retinopathy, 24 (6.6%) had diabetic macular oedema with and without other features of diabetic retinopathy

Diabetic retinopathy (Kyari et al, 2014) is defined as the presence of microaneurysms, dot-blot haemorrhages, intra-retinal microvascular anomalies (IRMA), new vessels on the disc or elsewhere, cotton-wool spots, exudates and clinically significant macular edema. Diabetic retinopathy was classified as non proliferative diabetic retinopathy (NPDR), proliferative diabetic retinopathy (PDR) and diabetic macula oedema (DME) based on a modified Early Treatment Diabetic Retinopathy Study (ETDRS) classification(Early Treatment Diabetic Retinopathy Study Research Group, 1991) .[23] NPDR is divided into mild, moderate and severe forms and constitute the earliest retinal vascular changes in DR. If the glycaemic control is not optimal, NPDR progresses to PDR. Proliferative diabetic retinopathy (PDR) and diabetic macular edema (DME) are both

sight-threatening and can result in visual impairment and/or blindness (Kyari et al, 2014). Early treatment of PDR and DME with intra-vitreal anti vascular endothelial growth factor (VEGF) inhibitor can preserve visual acuity (Viswanath et al, 2003). Laser photocoagulation is useful in selected cases of PDR while vitrectomy is indicated in cases of persistent vitreous hemorrhage and/or tractional retinal detachment (Kyari et al, 2014). Visual loss from DR is, therefore, potentially avoidable.

Diabetic retinopathy typically progresses through 2 stages namely: nonproliferative diabetic retinopathy (NPDR) and proliferative diabetic retinopathy (PDR). NPDR features the earliest retinal changes detectable on dilated fundoscopy such as microaneurysms, dot and blot intraretinal hemorrhages, hard exudates as well as intraretinal microvascular anomaly.[6] NPDR is further subdivided into mild, moderate, and severe stages.[15] In the absence of optimal glycemic control, NPDR invariably progresses to PDR characterized by retina neovascularization. Neovascularization may occur on or within one disc diameter of the optic disc (NVD), elsewhere in the posterior pole of the fundus (NVE) or both. Retinal detachment is a sight threatening complication of proliferative retinopathy. The most common cause of loss of vision in patients with diabetic retinopathy is diabetic macula edema.[15,16

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detachment is a sight threatening complication of proliferative retinopathy.

The most common cause of loss of vision in patients with diabetic retinopathy is diabetic macula edema.[Progression of mild and moderate NPDR is by dietary and lifestyle modifications and good glycaemic control while severe NPDR and PDR are treated by injections of VEGF inhibitors, focal laser coagulation and panretinal photocoagulation (ref.....) . These measures serve to slow down the progression of the disease process.

There have been studies on the prevalence of diabetic retinopathy in various Nigerian centres (Nwosu, 2000; Muhammad, 2020; Nwosu SSN, 2000) but none in ABSUTH, Aba, Southeast Nigeria. Should the managers of health care institutions and government in Abia state go ahead to invest in expensive therapies for DR in the face of competing demands from other critical areas? This study, therefore, set out to bridge this gap in knowledge necessitated by dearth of published data on the burden of diabetic retinopathy in PLWD in Aba. Again, this study would provide data needed for planning and implementation by stakeholders, managers of healthcare institutions and government policymakers since progression of DR can be delayed by laser photocoagulation and intraocular injections of anti VEGFinhibitors or steroids if screened and detected early.

## SUBJECTS AND METHODS

Study design and Setting

This was a prospective, cross sectional study conducted at the Outpatient clinic of the Department of Ophthalmology of ABSUTH, Aba. Aba is a commercial city in the southeast region of Nigeria where the people are involved in lots of trading and commercial activities. The Outpatient Ophthalmology clinic serves as a referral centre to all patients who present with eye complaints to the hospital in Aba and the neighboring communities and states. It is operated once a week by ophthalmology residents, ophthalmic nurses and optometrists in the Ophthalmology department of the hospital and who are overseen by a consultant Ophthalmologist. The clinic, also, enjoys support from the nursing unit, medical records, pharmacy section and the cleaners. Study subjects who met the inclusion criteria were consecutively recruited when they sought evaluations and treatment at the outpatient Ophthalmology clinic. All the recruited subjects had their ages and genders documented and their eyes were screened for DR by the consultant Ophthalmologist.

Inclusion criteria

All patients with a diagnosis of diabetes mellitus with eye complaints or referred for ophthalmological review were enrolled into the study. Patients with repeat visits within the study period were counted as one irrespective of number of visits.

Exclusion criteria

Persons living with diabetes who had had eye surgery and those who did not give informed consent were excluded from the study.

Subjects Recruitment, screening for diabetic retinopathy and ethical considerations

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From June 1, 2021 to December 31, 2022, using the consecutive type of non-probability sampling technique (Bamgboye, 2013), 134 subjects that met the inclusion criteria for the study constituted the sample population. Age, gender and co-morbid conditions in the subjects were noted. Participants underwent eye examination including slit lamp examination of anterior segment and dilated posterior segment examination with 90 DS lens. Identified retinal conditions were documented. The retinal findings/diagnosis was that of the final diagnosis of the ophthalmologists. Ethical approval was obtained from the Institution's Health Research Ethics Committee before commencing the study.

Statistical Analysis

Statistical Package for Social Sciences (SPSS Inc. Chicago IL. USA) version 23.0 statistical software was used for data analysis. For continuous variables such as the ages of the study subjects, mean values and standard deviations (SD) were calculated. Categorical variables such as the ocular findings were summarized using proportions expressed in percentages. The categorical variables were compared using the non-parametric test, chi square test where needed. The level of statistical significance was set at $p < 0.05$.

**RESULTS**

A total of 134 persons living with diabetes; 65 (48.5%) males and 69 (51.5%) females were screened for diabetic retinopathy and 10.4% of them had DR. The subjects were aged between 32-90 years with mean age at 58.381± 2.49 years. Mean age of the males was 60.251± 3.29 years while that of the females was 56.621± 1.50 years; the difference in the mean ages of the male and female participants was not statistically significant ($t = -1.69$, $p = 0.09$). Three of the subjects had NPDR (sub-retinal haemorhage and soft/hard exudates) and the rest had PDR and diabetic macula oedema (Table 1). Again, the mean random blood glucose of the patients was 213.31 SD ±81.8mg/dl.

Table 1: Retinal changes as documented in both eyes of the patients

| Lesion | Right Eye retinopathy | Left eye retinopathy |
|---|---|---|
| **No lesion** | 121 (90.3%) | 122 (91.0%) |
| **Diabetic macula oedema** | 4 (3.0%) | 6 (4.5%) |
| **Macular star** | 2 (1.5 %) | 1(0.7%) |
| **Soft and hard exudates** | 1 (0.7%) | 1(0.7%) |
| **Sub-retinal haemorrhage** | 2 (1.5%) | 2(1.5%) |
| **Branch retinal vein occlusion** | 1 (0.7%) | 1(0.7%) |
| **Central retinal vein occlusion** | 1 (0.7%) | 1(0.7%) |
| **Retinal detachment** | 1 (0.7%) | 1(0.7%) |

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Most participants in the study were in the age group 40-60 years as shown in Table 2.The associated co-morbid conditions among the participants are shown in Table 3.

Table 2: Age distribution of the study participants

| Age range (years) | Frequency | Percent (%) |
|---|---|---|
| **20-39** | 8 | 6 |
| **40-60** | 53 | 53 |
| **61 and above** | 55 | 55 |
| **Total** | 134 | 100 |

Table 3: Co-morbid illnesses in the study participants

| Co-morbid conditions | Frequency | Percent % |
|---|---|---|
| **Hypertension** | 88 | 65.7 |
| **Obesity** | 43 | 32.1 |
| **None** | 3 | 3.2 |
| **Total** | 134 | 100 |

## DISCUSSION

The main findings of this study were that DR occurred in 10.4% of the subjects of which diabetic macula oedema (4.5%) was present in the screened patients. Majority of the patients (5.22%) had features of PDR and the commonest co-morbid condition was systemic hypertension.

DR in 10.4% of the participants in the index study is comparable to the 12.2% in Ilorin (Olokoba, 2019), 9.9% in a community based study (May et al, 2022) and in the Nigerian survey (Kyari et al, 2014) where over 10% of people with diabetes aged more than 40 years had sight threatening DR. However, the DR prevalence in the index study is much lower than in other Nigerian hospital based studies (Nwosu, 2000; Muhammad, 2020; Nwosu SSN, 2000) where DR occurred in 14-33% of the study population. Reasons for this disparity is not clear but it can be attributed to the differences in sample sizes, improved diabetic education and improved glycaemic control. The implication of this lower prevalence reported in this study is a welcome development as it suggests that blindness from DR may be decreasing. However, from the index report and other Nigerian (Nwosu, 2000; Muhammad, 2020; Nwosu SSN, 2000) studies, DR can no longer be said to be rare in Nigerians living with diabetes.

Diabetic macula oedema was common in the index study but despite being a sight threatening complication of DR, it is amenable to treatment with injections of anti VEGF inhibitors or steroids. Diabetic macula oedema at 4.5% was lower than the 6.6% reported in the Ilorin (Olokoba, 2019), Nigerian study that screened 364 diabetic patients. This low level of diabetic macula oedema in this study could be explained by the small sample size compared to the number screened for DR in the Ilorin (Olokoba, 2019), Nigerian study.

In this study, most of the patients that had DR had features of PDR and diabetic macular oedema (75%) which is associated with sight threatening vision and blindness. This is probably because persons living with DM in this part of the world are not routinely and regularly screened for DR. As a consequence, they present when the DR has advanced to late stages of DR and their visual acuity has deteriorated. In addition, majority of the study participants (65.7%) had systemic hypertension which is strongly associated with DR in prior studies (Xuan et al, 2022; Azagew et al, 2023; Azeez et al, 2023). This obviously underscores the importance of early screening for diabetic retinopathy once a diagnosis is made and the control of all associated illnesses such as hypertension and lipid abnormalities.

Finally, the study participants had poor glycaemic control (mean fasting blood glucose 213mg/dl) and this is in keeping with the reported findings in previous other studies (Xuan et al, 2022; Azagew et al, 2023) where poor glycaemic control, long duration of DM, systemic hypertension and lipid abnormalities were risk factors for development of DR. Again, most of the diabetic patients recruited into this study were middle aged and above, probably because DM is more common in that age group. By extrapolation, these are the same age groups that will be afflicted with loss of visual acuity or blindness from DR. A limitation of this study is its failure to show the contribution of systemic hypertension and lipid abnormalities towards DR development by screening only PLWD who did not have hypertension and lipoid abnormalities

**CONCLUSION/RECOMMENDATIONS**

This study has shown that DR is common in PLWD in Aba and that patients are seen in advanced stages of DR when their visual acuity has deteriorated or blindness has occurred. It is, hereby, recommended that early and regular screening of DM patients for DR should be encouraged and treatments promptly offered. Effective diabetes education and early diagnosis are important weapons in DR management

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