Original

Pattern of ocular disorders in patients with Diabetes Mellitus at an Endocrinology clinic of A tertiary centre in Ibadan, Sub-Saharan Africa.

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Abstract

Background: Diabetes mellitus causes various systemic complications including ocular disorders. Diabetic retinopathy, diabetic macula oedema and ocular conditions such as cataract and primary open angle glaucoma may lead to blindness. This study determined the spectrum of ocular disorders associated with diabetes mellitus in patients attending a tertiary hospital in Ibadan, Nigeria.
Method: This is a cross-sectional study of 270 consecutive diabetic patients attending the Endocrinology clinic at the the University College Hospital, Ibadan, Nigeria. Data analysis was by SPSS version 22.
Result: Two hundred and seventy patients were recruited between January 2018 and December 2022. There were 77 (22.85%) males and 192 (71.7%) females. The age range was 18 to 85 years and mean of 59.5+_ 11.8 years. One hundred and nine (40.4%) had tertiary level education. Two hundred and twenty (81.5%) never had an eye examination; 41 (17.4%) had diabetic retinopathy and 25 (9.3%) had diabetic macula oedema. Uncorrected refractive error was the commonest ocular diagnosis in 79(14.6%) closely followed by visually significant cataract in 75 (13.9%). One hundred and sixty-six (61.5%) patients were unaware of the visually debilitating effect of DM while 50 (18.5%) had undergone ocular screening.
Conclusion: Diabetic retinopathy, refractive errors and diabetic macula oedema are the ocular abnormalities with the highest frequency in our clinic population. There is paucity of awareness of ocular complications of diabetes mellitus in our populace and the vast majority had never had ocular screening. Creating awareness and screening for ocular disorders is key in preventing visual impairment.

Keywords*: Diabetic retinopathy, Diabetic macula oedema, Ocular disorders, Patient awareness, Screening, Visual impairment*

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Introduction

Diabetes mellitus (DM) is a non-communicable disease of increasing public health significance. There has been an upsurge of cases worldwide and Nigeria is not an exception. Recently in 2021, it was estimated that about 537 million patients were diagnosed with Diabetes mellitus globally and it has been projected that this figure will rise to about 783 million by 2045. [1,2,3,4] With the increase in prevalence of DM, it is anticipated that there will be a concomitant increase in associated complications. Ocular complications of DM may be visually debilitating for the patient as it may lead to blindness and subsequently affect the patient's quality of life. [5,6] Diabetic retinopathy (DR) is a leading cause of blindness in diabetic patients in industrialized nations. [3] The prevalence of diabetic retinopathy across Nigeria from recent research is 21.6%. [7] Diabetic macula oedema (DME) is another cause of visual impairment in diabetic patients. Concurrent with the increasing burden of DM is an acceleration of diabetic retinopathy in emerging economies such as Nigeria. [8,9] Other ocular disorders such as cataract, primary open angle glaucoma, changing refractive errors also occur commonly. [10,11] Apart from diabetic retinopathy, cataract is the most reported ocular disorder closely followed by glaucoma. [12,13] In a recent study in Ghana the prevalence for DR was 15.5% compared to 17.9 % reported a decade earlier in a study of diabetic patients from both Ghana & Nigeria. [14,15] Diabetic retinopathy is a potentially blinding complication of DM especially the proliferative variety when accompanied with vitreous haemorrhage, fibrovascular proliferation and tractional retinal detachment. The focus of this study is to describe the various ocular manifestations and prevalence of diabetic retinopathy in our hospital.

Methods

This was a hospital-based, cross-sectional study of 270 patients attending the Endocrinology clinic of the medical outpatient department, University College Hospital, Ibadan, Nigeria. The study was done over a period of five years between January 2018 and December 2022 and included all consecutive patients who gave consent and were 18 years and older. An informed consent was obtained from all respondents, and a structured questionnaire was administered to collect sociodemographic data such as age, sex, occupation and educational level. Other data relating to onset of diabetes mellitus, co-existing history of hypertension and other systemic diseases were also obtained. All patients who met the inclusion criteria were recruited. The latest fasting blood sugar and glycosylated haemoglobin values were retrieved from the patient notes. The blood pressure values were also documented.

The best corrected visual acuity was measured by a research assistant using a Snellen's chart or illiterate E chart based on the participant's educational level. A detailed anterior segment examination was done with a pen torch and a slit lamp biomicroscope. Intraocular pressures were measured with Goldmann applanation tonometry All respondents had a dilated binocular indirect ophthalmoscopy with 20 dioptre Nikon lens and a slit lamp biomicroscope with +78 D Volks lens and all fundal findings duly documented. Data analysis was done by Statistical Package for the Social Sciences (SPSS) for Windows software version 22 (SPSS Inc., Chicago, IL, USA). Means and standard deviations (SD) were determined, and logistic regression was done. Tests of statistical significance such as Chi-square test was done. Significant associations were noted when the p value was less than 0.05.

Results

Two hundred and seventy patients were recruited and examined over a five-year period from January 2018 to December 2022. There were 192 females (71.7%) and 77 males (28.5%). The male to female ratio of 1:1.5. The patient's age ranged from 18 to 85 years with a mean of 59.5 ±11.8 years. The 61-70 years age group had the most representation at 36.7%. Two hundred and thirty - seven (83.8%) of the patients were of Yoruba ethnicity. Tertiary education was the most common educational level in 109(40.4%) patients. Majority, 77.9% of the patients were married while 174 (64.1%) were employed. *(Table 1)*

Of the 259 participants who knew the duration of DM diagnosis, 148 (57.1%) had been diagnosed for 15 years or more and 42.9% for less than 15 years. The median duration was 8 years (IQR = 4.0 to 15.0). A positive history of hypertension was elicited in 58.4% of the participants. The glycaemic control in 183 (67.8%) was within normal limits (fasting blood sugar values of ≤130mg/dl) 79 (29.3%) had poor glycaemic control. For the participants with glycosylated haemoglobin (HbA1c) results, 55(40.4%) had values less than 7.0% while 59.6% had values ≥7.0%. Diabetic retinopathy was present in 41 (17.4%) participants and non-proliferative DR was seen in 34(12.6%) participants. (Figure 1) Proliferative DR was present in 13(4.9%) of which 4(1.5%) had advanced diabetic eye disease. Diabetic macula oedema was diagnosed in 25(9.3%) participants. The prevalence of diabetic retinopathy in either eye was 17.4% (47 persons).

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A total of 151 (55.9%) participants had at least one eye with a non-diabetic ocular condition. In total, 43.7% of eyes were affected by non-diabetic pathologies. The most common conditions were uncorrected refractive error (14.6%), visually significant cataract (13.9%), and glaucoma (9.6%). Other conditions such as glaucoma suspects, hypertensive retinopathy, pterygium, allergy, chorioretinal scar, age-related macular degeneration (AMD), and other less frequent pathologies accounted for the remaining ocular disorders. Pseudophakia was present in 22 (4.1%) patients.

Patients with systemic complications of DM had a significantly higher prevalence of diabetic retinopathy or diabetic macular oedema (DR/DME) compared to those without complications (25.4% vs. 14.9%, $p < 0.05$). Patients with diabetes duration of ≥15 years showed a trend towards a higher prevalence of diabetic retinopathy or diabetic macular oedema (DR/DME) compared to those with diabetes duration of <15 years this was however not statistically significant (p=0.159). Peripheral neuropathy was the commonest non-ocular complication present in 57 (13.7%) of study participants. Other variables such as gender, level of education, employment status, hypertension, duration of hypertension, most recent blood glucose, awareness of DM's effect on visual health and prior eye screening did not show significant associations with diabetic retinopathy nor diabetic macula oedema.

Among the study population, 62 (27.4%) had presenting VA worse than 6/12 in the better eye. The chi-squared test revealed a statistically significant association between the presence of DR/DME and visual impairment ($\chi^2 = 7.5$, $p = 0.006$). Specifically, a higher proportion of patients with DR/DME (n=18, 45.0%) also had visual impairment compared to those without DR/DME (n=24, 23.7%). Similarly, patients who had DR/DME in either eye were 2.6 (CI = 1.3 to 5.4) times more likely to have vision impairment compared to diabetics without DR/DME.
In this study, it was observed that most patients (n=166; 61.5%) were unaware of the potential effect of DM on visual health. Only 50 (18.5%) patients had undergone an eye screening for diabetic eye disease.

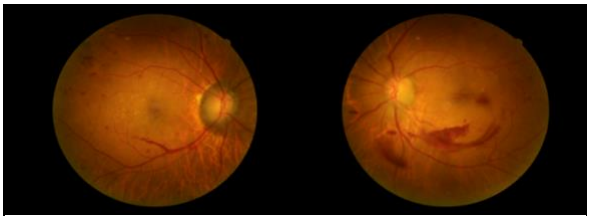

Figure 1. Fundus photograph

Figure 1 shows the fundus photographs of a 59-year-old woman with features of early proliferative diabetic retinopathy. New vessels elsewhere are present in the right fundus and a few haemorrhages and exudates and haemorrhages while the left fundus shows subhyaloid haemorrhage and a few exudates.

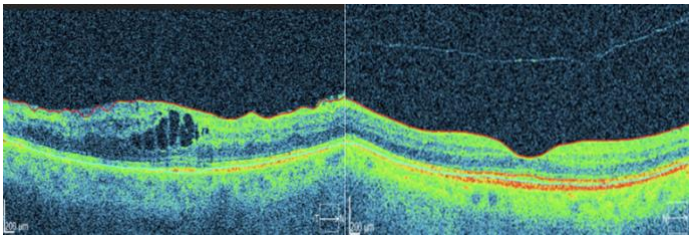

Figure 2 shows the optical coherence tomography scan of a 62-year-old woman with altered foveal contour and cystoid macula oedema on the right eye and normal foveal contour with posterior vitreous detachment.

Table 1: Sociodemographic characteristics of participants

Characteristic	Frequency	Percentage
Gender		
Male	77	28.5
Female	192	71.1
Age in category (years)		
<60	120	44.4
≥60	150	55.6
Ethnicity		
Yoruba	237	87.8
Others	28	10.4
Level of completed education		
No formal education	35	13.0
Primary	47	17.4
Secondary	77	28.5
Tertiary	109	40.4
Marital status		
Married	208	77.0
Single/widowed/separated	61	22.6
Employment status		
Employed	173	64.1
Unemployed	93	34.4

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Table 2: Clinical characteristics of participants

Characteristic	Frequency	Percentage
Years since DM diagnosis (n=259)		
<15 years	148	57.1
≥15 years	111	42.9
Hypertension (n=244)		
Present	149	58.4
Absent	106	41.6
Duration of hypertension (n=89)		
<15 years	53	59.6
≥15 years	36	40.4
Presence of non-ocular complications of DM		
None	202	74.8
Peripheral neuropathy	57	13.7
Cardiac diseases	22	8.1
Autonomic (constipation, retention etc)	9	3.4
Nephropathy	4	1.5
Most recent blood glucose (n=262)		
≤130mg/dl	183	67.8
Has complaint	79	29.3
Most recent glycosylated haemoglobin (n=136)		
<7.0%	55	40.4
≥7.0%	81	59.6
Prior spectacle use		
Prior use	137	50.7
No prior use	133	49.3

Table 3: Distribution of Non-Diabetic Ocular Conditions (n=540)

Ocular conditions	Eye= n (%)
No other ocular condition	304 (56.3)
Uncorrected refractive error	79 (14.6)
Visually significant Cataract	75 (13.9)
Glaucoma suspects	35 (6.5)
Glaucoma	33 (6.1)
Hypertensive retinopathy	14 (2.6)
Pterygium	14 (2.6)
Allergy	14 (2.6)
Chorioretinal scar	14 (2.6)
ARMD	10 (1.9)
Others	25 (4.6)

Others = Retinal vein occlusion (8 eyes), optic atrophy (5 eyes), proliferative sickle cell retinopathy (4 eyes), chorioretinal degeneration (2 eyes), dry eyes (2 eyes), pthisis bulbi (1 eye), episcleritis (1 eye), congenital ptosis (1 eye), and corneal scar (1 eye).

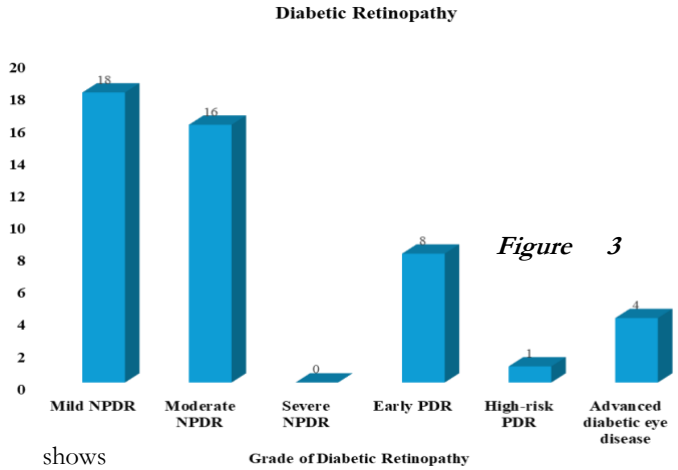

Figure 3 shows the prevalence of the different grades of Diabetic retinopathy (%).

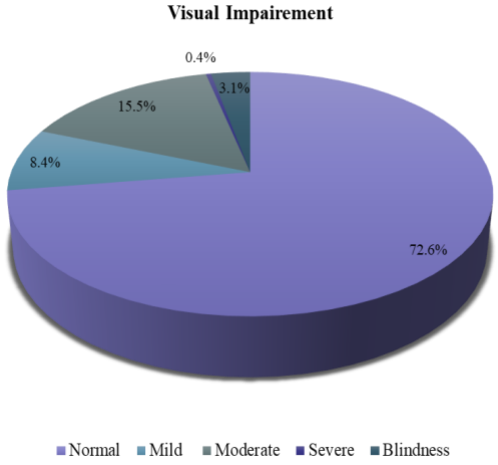

Figure 4. Distribution of visual impairment among the respondents.

Discussion

The focus of the visually debilitating manifestations of diabetes mellitus is usually DR as it is the commonest cause of irreversible blindness in diabetic patients with sub-optimal glycaemic control. Both diabetic retinopathy and other ocular disorders related to DM were studied in our patients. The mean age of the patients in this present study was comparative to the findings of a similar study in an identical population of patients about 16 years ago in Ibadan.[8] In comparison to findings in Benin and Ekiti, our study had a higher

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proportion of patients with no ocular disorders whatsoever.[10,16] The prevalence of diabetic retinopathy in this study was 17.4 % which is much lower than the 41. 2 % prevalence reported from a similar study in Ibadan and 28.5% in the USA. [8, 17] The prevalence of sight-threatening diabetic retinopathy was 1.5 %; this is lower than that reported in a study in the US. [17] The pooled prevalence of diabetic retinopathy in Nigeria is 21.3% and the associated risk factors were reported as duration of diabetes, poor glycaemic control and coexisting diagnosis of hypertension. [6] A longer duration of diabetes mellitus was a significant risk factor for development of diabetic retinopathy in our patients. A study on barriers to uptake of diabetic retinopathy screening services found lack of awareness about diabetic retinopathy and the need for regular eye examinations as some of the risk factors. [18] This is similar to findings in this study in which only 18.5% admitted to previous ocular examinations and history of screening for DM. In Ile-Ife, Nigeria, 28.9 % of patients had prior ocular examinations which is higher than in our study population. [19] Glycosylated haemoglobin levels were within normal limits in about half of those with complete laboratory results and was comparable to that in a large population study in India.[20]

For non-proliferative diabetic retinopathy, our prevalence of 40% is lower than the 55% reported in Yemen in which cataract was the most common ocular disorder unlike this study that had uncorrected refractive errors as the commonest ocular disorder.[20] The prevalence of diabetic retinopathy in Uyo, South-south Nigeria was higher than the findings in our study. [22] The prevalence of diabetic retinopathy was lower in Calabar, Nnewi and Enugu compared to our cohort of patients.[23,24,25] Non-proliferative DR was the commonest presentation in Uyo and Ekiti which is similar to our findings.[23,26,27] Mild NPDR was the commonest form in a similar study at Ilorin though the overall prevalence was much lower than our findings. A large fraction of these studies was retrospective. In comparison to a prospective study in Cameroon the prevalence of 23.3% was lower than results in our study population. Like there finding in Cameroon, cataract was the most common DM- associated ocular disorder.[28] A study assessing the prevalence of DR in a similar population of diabetic patients about 16 years ago found a prevalence of 42.1% with non-proliferative DR being the most common form of retinopathy. The rationale for this variance in the findings may be a result of the larger sample size in our study in comparison to the earlier study in Ibadan.[8] In Ekiti, 14.8% of patients had diabetic macula oedema which was higher than seen in our study.[10]

Considering the various DM-associated ocular disorders, visually significant cataract was the most prevalent followed by glaucoma suspects and definite glaucoma in this study and was similar to other studies locally in Nigeria and internationally in countries such as Ghana, India and Yemen.[10,11,12,13,21,28,29] Not surprising, hypertensive retinopathy was present in 2.65% of eyes. Half of the study patients were hypertensive reiterating the symbiotic relationship between DM and hypertension. The number of patients with hypertension was slightly higher than seen in a study in India with a prevalence of 49.2%.[28] The prevalence of hypertensive retinopathy was higher in our population in comparison to findings in Delta state about seven years ago.[9] The occurrence of vascular occlusions was less compared to 2.5% reported in an Indian population and 0.3% in a local study.[9,20] Complications of diabetes such as peripheral neuropathy was much higher in a similar study with a prevalence of 0.8%. [20] The percentage of diabetic patients with normal vison was 72.6% and was comparable with a similar study in India in which 76.9% of respondents had normal vision. On the other hand, their study had a higher prevalence of 4.5% blind patients in comparison to our findings. [20] This difference may be attributed to the larger sample size in the Indian study,

Advanced diabetic eye disease is cost-intensive, difficult to treat with poor visual outcomes. Hence simple techniques of prevention such as screening for ocular involvement at diagnosis of DM, creating awareness among physicians and general practitioners and availability of screening tools such as fundus cameras will go along way in reduction of the burden of the disease. As the prevalence of diabetes mellitus increases worldwide, expectedly the prevalence of diabetic retinopathy and other associated ocular disorders is expected to rise.[1] Good glycaemic control in diabetic patients is an important factor in prevention of diabetic retinopathy and its' potential blinding complications. [6.18] Utilizing the fasting blood sugar levels, 67.8% of patients had optimal glycaemic control and glycosylated haemoglobin values of 59.6% patients sub-optimal. Accessibility to ophthalmic care and subsequent ocular screening for manifestations of diabetes was also a barrier and may contribute visual impairments from diabetes mellitus and the other related ocular disorders as also seen in our patients.[19]

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Strengths and limitations of the study

The prospective nature of the study is one major strength. Utilization of the laboratory investigations such as the blood sugar and glycosylated haemoglobin levels is another strength of the study.

A limitation of the study is that the laboratory investigations were not done at recruitment but retrieved from patient's files.

Conclusion

Diabetic retinopathy and other related ocular disorders occur commonly in our diabetic population in Nigeria. The importance of regular ocular screening for diabetic retinopathy cannot be overemphasized. It is essential to create awareness on the need for good glycaemic control amongst diabetic patients. Regular, scheduled ocular screenings to lessen the burden of visual impairment from Diabetes mellitus should be the norm. Accessibility to screening centres and ophthalmic care must be enhanced. Endocrinologists and primary care physicians have a role to play in creating awareness in these patients. Public health campaigns in the community may be beneficial.

Declarations

Authors' Contribution: BYO conceptualized the research idea. BYO and EA participated in the data collection. ASO analysed the data. BYO, ASO, EA, ATO, AJO, OBA all participated in the article writing and review.

Conflict of interest: There are no conflict of interests for all the authors

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