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INCIDENTAL DIAGNOSES OF DIABETES MELLITUS IN PATIENTS PRESENTING WITH REFRACTIVE ERRORS: IS MYOPIA OR HYPEROPIA MORE COMMON?

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Abstract: **Background: Diabetes causes high blood sugar due to insufficient or ineffective insulin, impacting various organs, including the eyes.**

Objectives: To assess refractive changes in diabetic patients at the COOUTH eye clinic from February 2022 to January 2025.

Methodology: This descriptive study involved patients with visual problems who were incidentally found to have diabetes mellitus at COOUTH Awka Eye clinic. Visual acuity, blood sugar levels, refraction tests, and fundoscopy were conducted. Data were analyzed using simple descriptive statistics.

Results: Of 49 patients, 31 (63.3%) were male and 18 (36.7%) female, with a female-to-male ratio of 1.7:1. Among these, 35 (71.4%) had myopia and 14 (28.6%) had hyperopia. Ages ranged from 11 to 75 years.

Conclusion: Diabetes mellitus significantly causes sudden bilateral visual blurring, predominantly resulting in myopia due to changes in blood sugar levels. The lens is primarily affected by refractive changes. Restoring normal blood sugar levels is crucial. More males than females were impacted.

Keywords: **Diabetes mellitus, refraction, blurred vision, Incidental finding.**

1. INTRODUCTION

Diabetes mellitus is characterised by sustained hyperglycemia resulting from a lack or diminished efficacy of endogenous insulin. The types include insulin-dependent diabetes (IDD) or type I, and non-insulin-dependent diabetes (NIDD), also known as type II. This persistent hyperglycemia can alter the refractive dynamics of the eye and lead to diabetic cataracts, including senile diabetic cataract and true diabetic cataract (snowflake cataract).

Emmetropia, an optically normal state of the eye, occurs when parallel rays of light from infinity are focused on the retina with accommodation at rest. Ametropia refers to a state of refractive error, which includes myopia, hypermetropia, and astigmatism.

The refractive changes associated with diabetes are notable and sudden, typically presenting bilaterally, with myopia being more common than hypermetropia in hyperglycaemia cases. Sudden onset of myopia may indicate diabetes.

2. MATERIALS AND METHODS

This prospective hospital-based study was conducted at Chukwuemeka Odumegwu Ojukwu University Teaching Hospital, Awka, Nigeria, following ethical approval from the relevant committees. Patients presenting with sudden bilateral visual blurring and clear ocular media at the eye unit were recruited for the study. Information on biodata (age, sex) and clinical data such as visual acuity and refractive state of the eye were recorded. Subsequently, dilated fundoscopy was performed. Patients were then referred for fasting/random blood sugar tests as required. The data were analyzed using a scientific calculator and presented in frequency tables. Participants were advised on glycaemic control. A total of 58 patients were seen, with 49 responding, yielding a coverage rate of 84.5%.

3. RESULTS

Out of 58 patients, 49 (84.5%) responded, with the highest age representation being 31-40 years.(Table 1). There were 31 males (63.3%) and 18 females (36.7%), a male-to-female ratio of 1.7:1. The mean age was 43.2 years, with a modal age of 38 years. Myopic changes were more common (71.4%) than hyperopic changes (28.6%). The 31-40 age range had the highest myopia incidence (34.3%), while the 21-30 age range had the highest hyperopia (35.7%). Visual acuity results varied, with 40.8% presenting with visual acuity of $\frac{6}{12} \leq \frac{6}{18}$ and 4.1% had visual acuity of $\frac{6}{6} \leq \frac{6}{9}$. Blood sugar levels also varied, with 8.2% having the highest levels and 16.3% the lowest. Table 6

Table 1: Age range distribution of the patients

Age range	No. of patients	Percentage
1 – 10	-	-
11- 20	3	6.1
21 – 30	8	16.3
31 – 40	16	32.7
41 – 50	10	20.4
51 – 60	9	18.4
61 – 70	2	4.1
71 ≤ 80	1	2.0

Table 2: Sex and Age distribution of patients

Age	Total	Male	Female
1- 10		-	-
11 – 20	3	2(66.7%)	1(33.3%)
21 – 30	8	5(62.5%)	3(37.5%)
31 – 40	16	11(68.7%)	5(31.3%)
41 – 50	10	6(60%)	4(40%)
51 – 60	9	5(55.6%)	4(44.4%)
61 – 70	2	2(100)	-
71≤ 80	1	-	1(100%)
Total	**49**	**31**	**18**

Table 3: Refractive state and sex distribution

Refractive state	**Male**	**Female**	**Total**
Myopia	20(57.1%)	15(42.9%)	35(100%)
Hyperope	11(78.6%)	3(21.4%)	14(100%)
Total	**31**	**18**	**49**

Table 4: Refractive Errors and Age Distribution

Age range	Myopia	Hyperope	Total
1 – 10	-	-	
11 – 20	1(2.9%)	2(14.3%)	
21 – 30	3(8.6%)	5(35.7%)	
31 – 40	12(34.3%)	4(11.4%)	
41 – 50	8(22.9%)	2(14.3%)	
51 – 60	7(20%)	1(7.1%)	
61 – 70	2(5.7%)	-	
71 ≤80	1(2.9)	-	
Total	35	14	

Table 5: Visual Acuity and Patients distribution

Visual acuity (VA)	No of Patients
$\frac{6}{6} \leq = \frac{6}{9}$	2(4.1%)
$\frac{6}{9} \leq = \frac{6}{12}$	8(16.3%)
$\frac{6}{12} \leq = \frac{6}{18}$	20(40.8%)
$\frac{6}{18} \leq = \frac{6}{24}$	9(18.4%)
$\frac{6}{24} \leq = \frac{6}{36}$	6(12.2%)
$\frac{6}{36} \leq = \frac{6}{60}$	4(8.2%)
	49(100%)

Table 6: Distribution of patients according to fasting/random blood sugar level

Blood sugar level	No. of patients
200 – 250mg/dl	8(16.3%)
250mg/dl – 300mg/dl	15(30.6%)
280 – 330mg/dl	*9 (18.4%)
350 – 380mg/dl	*7(14.3%)
350 – 400mg/dl	6 (12.2%)
> 400mg/dl	4(8.2%)

4. DISCUSSION

Table 1 provides a breakdown of the age ranges of patients affected by sudden bilateral visual blurring due to diabetes mellitus. The majority of patients, 32.7%, fell within the 31–40 age range, highlighting that middle-aged adults are particularly susceptible to this condition. The next most affected group was the 21–30-year-olds at 16.3%, followed closely by the 51–60-year age group, which accounted for 18.4%. Patients above 60 years contributed minimally to the statistics, perhaps indicating lower incidence rates or other factors affecting their representation.

Table 2 emphasises the gender disparity in diabetic refractive changes across age groups. Males consistently outnumbered females in most age brackets, with an overall male-to-female ratio of 1.7:1. Interestingly, the male dominance was most evident in the 61–70 age group, where all patients were male, whereas the 71–80 age group comprised only females. Such gender differences could be attributable to lifestyle factors, genetic predispositions, or healthcare-seeking behaviour.

In table 3 the specific refractive errors were observed in male and female patients. Myopia was significantly more common than hyperopia, with 71.4% of patients experiencing myopic changes. Among those with myopia, males contributed slightly more (57.1%) than females (42.9%). Hyperopia was less prevalent overall but showed a more pronounced male dominance,

with males accounting for 78.6% of cases. This suggests that diabetic refractive changes may manifest differently across genders.

Table 4 shows how refractive errors varied across different age ranges. Myopia peaked in the 31–40 age group, affecting 34.3% of patients, and maintained a steady presence across older age brackets. Hyperopia, on the other hand, was most common among younger patients, with the 21–30 age group accounting for 35.7% of cases. Such patterns is suggestive of refractive caused by diabetes that may evolve with age, potentially influenced by the duration and severity of hyperglycemia.

Table 5 shows that visual acuity varied significantly among patients. This points to the diverse impact of diabetic refractive changes. The majority of patients (40.8%) presented with moderate visual impairment, defined as $\frac{6}{12} \leq = \frac{6}{18}$. Severe cases of visual impairment were less common, with 8.2% demonstrating . $\frac{6}{36} \leq = \frac{6}{60}$

Table 6 showed that the highest group of patients (30.6%) had blood sugar levels between 250–300 mg/dl, suggesting a strong correlation between hyperglycemia and visual blurring. Levels exceeding 400 mg/dl were observed in only 8.2% of patients, indicating that extremely high glucose levels may not be as common but still contribute significantly to severe refractive changes.

highlight the importance of personalized medical care, early intervention, and consistent glycemic control to address the complex interplay between diabetes and ocular health.

This study observed diabetic refractive changes predominantly in the form of myopia 35(71.4%) and hyperopia14 (28.6%). Previous research has provided varied perspectives on these changes. Some authors have reported that acute fluctuations in plasma glucose levels result primarily in hyperopia[5,6,7,8], while others suggest that both myopia and hyperopia can manifest depending on whether plasma glucose levels increase or decrease[10,11,12]

Another study has identified a clear pattern: myopia tends to occur during hyperglycemia, whereas hyperopia is associated with hypoglycemia.[13]

The osmotic gradient created by changes in blood sugar levels impacts the thickness and refractive index of the lens, leading to significant variations in refraction.[5,15,16] One study highlights the crystalline lens as the primary site of refractive change in diabetic mellitus patients.[3] However, other researchers have noted minor contributions from the cornea and vitreous to the refractive alterations observed.[14]

5. CONCLUSION

Diabetes mellitus is a major cause of sudden bilateral visual blurring in diabetics diagnosed incidentally while seeking treatment for their blurred vision. The crystalline lens is the major seat of this refractive change. Both hyperopia and myopia can occur, but myopia is more frequent. More males than females are affected. Restoration of normoglycaemia can restore vision to pre-diabetic levels.

Conflict of interest:

There is none.

Ethical consideration

Approval was obtained from the ethical board of COOUTH.

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