

Morphological Pattern of Lenticular Opacities in Diabetic Patients Attending a Tertiary Care Centre

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Abstract

Introduction: Diabetes is a multi-systemic disease leading to cataract formation as one of its ocular complications. The present cross-sectional study aims to find out the common morphological patterns of lenticular opacities in diabetic patients.

Materials and methods: This research work was done using facilities available in the Department of Ophthalmology, Regional Institute of Medical Sciences (RIMS), Imphal, Manipur. Reports of required biochemical tests needed for the study as well as a detailed data on diabetes and ocular history were obtained. All patients were informed about the test and assured that their identity will not be made known. After getting necessary consent, the pupil of a study subject was dilated (by instillation of tropicamide/phenylephrine), cataractous lens was examined by using optical section of a Haag-Streit Slit Lamp Bio-microscope in a minimally lighted room and the morphological pattern of cataract was noted and studied. Data obtained from the examination was analysed using SPSS.

Results: The present study included 150 diabetic patients with cataract attending the Eye OPD, RIMS, Imphal regardless of the duration of diabetes and the treatment (insulin or OHA). Majority of the patients were female accounting for 55.3% and male patients made up for only 44.7% and most of them were in the age group of 51-60 years accounting for 39.3%. In this study, most of the cataract morphology was found to be of mixed type (69.3%).

Conclusions: The present study found an association of increased blood sugar level and early development of cataract in diabetics and mixed type of cataract as the most common morphological pattern.

Keywords: Lenticular opacity, diabetes mellitus, nuclear cataract, cortical cataract.

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I. Introduction

Cataract is the leading cause of blindness worldwide and covers around 42% of overall visual impairment. It is responsible for almost 80% blindness in India¹. Cataract is considered a major cause of visual impairment in diabetic patients as the incidence and progression of cataract is increased in such patients.^{2,3} The risk is doubled with longer duration of diabetes and in those with poor metabolic control. Diabetes Mellitus is a state with an increased rate of ageing, in which both carbonyl stress and oxidative stress are increased and may lead to a cumulative damage of cell components.⁴

The polyol pathway has been described as the primary mediator of diabetes-induced oxidative stress in the lens.⁵ In a normo-glycaemic state the activity of the pathway is rather low; as the affinity of the first enzyme of the pathway, aldose reductase is low towards glucose. But in hyperglycaemia, the expression of the enzymes of the polyol pathway increases, thus fructose and sorbitol become formed resulting in increase in osmotic pressure inside the cells. The intracellular accumulation of sorbitol leads to osmotic changes resulting in hydropic lens fibre degeneration and formation of sugar cataracts.^{6,7} Sorbitol interferes with the Na⁺-K⁺ ATPase, by increasing intracellular Na⁺ concentration, with swelling of cells and high Na⁺ concentration leading to the accumulation of Ca²⁺ which will in turn cause increased level of mitochondrial free radical production i.e. oxidative stress, accelerating and aggravating the process of cataract formation.^{8,9}

A special type of cataract, known as snowflake cataract is seen predominantly in young type 1 diabetic patients and tends to progress rapidly. However, cataracts may be reversible in young diabetics with improvement in metabolic control.¹⁰ The prevalence of type 2 diabetes mellitus (DM) is on the rise, and more so in India.¹¹ Also, in a clinical setting, a mixed cataract—a combination of nuclear, cortical, and sub-capsular cataract—is more common than just a single entity.¹² This study aims to find out the association between

diabetes and cataract formation and also to assess the morphological patterns of lenticular opacities commonly found in diabetics.

II. Materials and Methods

This study was a cross-sectional study conducted in Department of Ophthalmology, Regional Institute of Medical Sciences, Imphal, Manipur, during the two calendar years from October 2015 to September 2017.

Inclusion criteria:

Patients aged 14 years and above with diabetes and presenting with signs of cataract.

Exclusion criteria:

1. Patients with congenital, traumatic, senile or complicated cataract
2. Patients who refused to participate or take part in the study
3. Patients less than 14 years of age.

Study population: 150 consecutive diabetic patients fulfilling the inclusion criteria and presenting to the Eye OPD, RIMS, Imphal were taken up for this study.

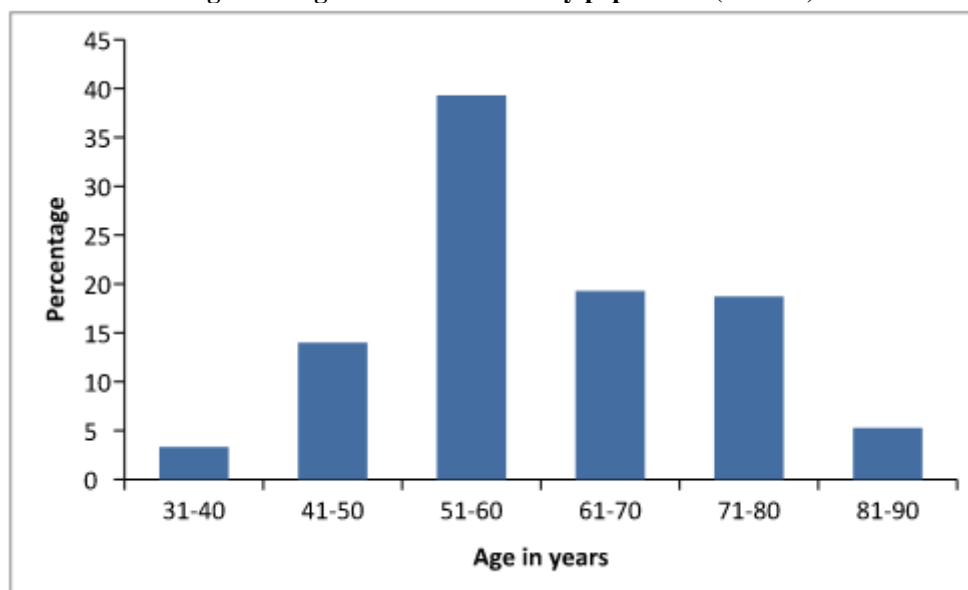
Study tools: Snellen's Visual chart, Schiottz Tonometer, Keeler Non-Contact Tonometer, Haag-Streit Slit Lamp, Heine Beta -200 Direct Ophthalmoscope (Heine Germany) and Blood sugar (fasting and post prandial).

Procedure: Informed consent was taken from each and every patient. The pupil was dilated using tropicamide (2%) and phenylephrine (5%) instillation. After 15-20 minutes, subject's eye was examined in a minimal lighted room using direct ophthalmoscope and the optical section of a Haag-Streit bio-microscope. The lenticular opacity observed during study was graded using Lens Opacity Classification System (LOCS) III consisting of nuclear colour (NC) and nuclear opalescence (NO), retro-illumination images for grading cortical cataract (C), and retro-illumination images for grading posterior sub-capsular cataract (P) and a severity grade was assigned to the observed lenticular opacity.

Statistical analysis: Data analysis was done using SPSS version 21. Descriptive statistical analysis was carried out using appropriate statistical method. Chi-square test and t-test were used for analysis of association between variables. P value < 0.05 was taken as significant.

III. Results

Figure 1: Age distribution of study population (n = 150)



As shown in figure 1, majority of the patients studied were between the age group of 51-60 years which accounted for 39.3% comprising of 59 patients. The least number of patients (3 patients) were between the age group of 31-40 years making up for only 3.3%.

Table 1: Gender distribution among study population

Gender	No. of patients (n=150)	%
Female	83	55.3
Male	67	44.7
Total	150	100.0

Female patients were more than male patients accounting for 55.3% with 83 patients. Male patients made up for only 44.7% with 67 patients (Table 1)

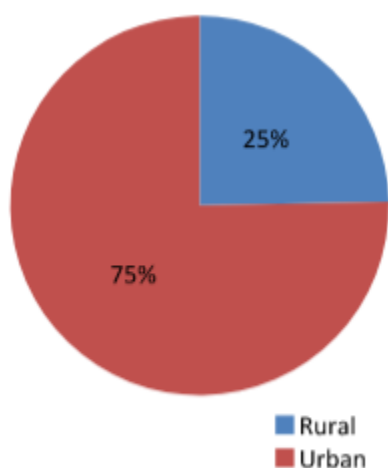


Figure 2: Geographical distribution of study population (n=150)

Majority of the patients belonged to a urban area (75.3%) with 113 patients out of 150 (Figure 2)

Table 2: Incidence of cataract in relation to the duration of diabetes

Duration of diabetics	No. of patients (n=150)	%
1-5	78	52.0
6-10	38	25.3
11-15	17	11.3
16-20	15	10.0
>20	2	1.3
Total	150	100.0

As shown in Table 2, duration of diabetes is calculated from the apparent time of detection of diabetes. Most of the diabetic patients with cataract in the study group were diagnosed with the disease for 1-5 years with 78 patients. Only 3 patients (1.3%) were diagnosed for more than 20 years.

Table 3: Blood sugar distribution of study population

	No. of patients (n=150)	%
Blood Sugar(F)		
• <120	67	44.7

• 120-170	52	34.7
• >170	31	20.7
Blood Sugar PP		
• <120	3	2.0
• 120-170	41	27.3
• >170	106	70.7

Table 3 shows the fasting and post-prandial blood sugar distribution of the study population. Majority had fasting blood sugar below 120 mg/dl comprising 44.7% while 70.7% population had post-prandial blood sugar above 170 mg/dl.

Table 4: Cataract morphology in study subjects

Cataract	No. of patients (n=150)	%
Mixed type	104	69.3
Cortical Cataract (cx)	22	14.7
Nuclear sclerosis (ns)	14	9.3
posterior sub capsular cataract (psc)	10	6.7
Total	150	100.0

Table 4 shows that majority of the patients (69.3%) in study group had mixed type of cataract morphology, followed by cortical cataract (14.7%), then nuclear sclerosis (9.3%), and posterior sub-capsular cataract (6.7%).

IV. Discussion

Diabetes Mellitus is a major health concern globally affecting both developed and developing countries. It is a progressive disease also affecting the eyes, and if appropriate measures are not taken on time, it can result in blindness. Therefore routine eye examinations are required in diabetic patients along with the maintenance of blood sugar level. Diabetic patients with uncontrolled blood sugar for a prolonged period are at higher risk of developing complications.

In the present study, majority of the patients were female accounting for 55.3% with 83 patients and male patients made up for only 44.7% with 67 patients out of 150 patients. This finding is similar to the cross-sectional study conducted by Raman R et al¹³ where prevalence of cataract was higher among women (51.4%). Such female preponderance may be due to the fact that T2DM is common in obese individuals which may be related to their low metabolic rate and hence increased risk. Almost 75.3% of the patients belonged to urban area with 113 patients and 24.7% with 37 patients belonged to rural area. This may be due to easy accessibility of RIMS Hospital to the urban people and moreover patients belonging to rural area are least bothered about their health to seek medical help on time.

The majority of the diabetic patients with cataract were in the age group of 51-60 years accounting for 39.3% and comprising of 59 patients out of 150 patients. The least number of patients were between the age group of 31-40 years (3 patients) making up for only 3.3%, which is similar to the study conducted by Padma et al. and Mohanty et al. In their study, cataract observed was found to be higher in age groups of 51- 60 years which accounted for almost 43.07%. Their study found that the mean age of senile cataract in patients without diabetes was 70.83±0.97 years, whereas in patients with diabetes senile cataract developed in 64.58±1.13 years (t value=32.508, p<0.001), which shows that cataract develops early in patients with diabetes as compared to non-diabetic patients. Thus highly significant differences were observed among the diabetic and non-diabetic groups relating to age and the development of cataract. This is also supported by the data from the Framingham

study which concludes that three to fourfold increased prevalence of cataract in diabetes under the age of 65 and upto twofold excess prevalence in patients above 65.

In this study, most of the cataract morphology was found to be of mixed type with 69.3% (104 patients) followed by cortical type with 14.7% (22 patients), then nuclear sclerosis with 9.3% (14 patients) and the least type of cataract found was posterior sub-capsular cataract 6.7% with 10 patients. This result is similar to the study conducted by Raman R et al¹³ where they concluded that mixed cataract is more common than mono type cataract (42% vs. 19%, respectively).

The Tanjong Pagar¹⁴ study found an increase in the incidence and progression of cortical and posterior sub-capsular cataract associated with diabetes. Further, HbA1c was associated with an increased risk for development of nuclear and cortical cataract which is similar to the findings in the present study, where most of the cataract morphology was of the mixed type.

However, a cross-sectional hospital-based survey by Seema Dutt Bandhu et al^{15, 16} found that most of the diabetic patients (71.1%) belonged to nuclear sclerosis (NS) type which is not similar to the findings of the present study.

Eydis et al¹⁷ in their study found that cortical cataract was commonly associated with diabetes mellitus. In a study by Saxena et al a 2-fold higher incidence of cortical cataract was found among patients with diabetes mellitus over a period of 5 years. They concluded that, posterior sub-capsular cataract was more frequent in diabetic patients, but this association was statistically significant only for subjects newly diagnosed with diabetes. The result of their study is not similar to the findings in the present study.

However, the Beaver Dam Study,^{18, 19} the Blue Mountain Study²⁰ and Visual Impairment Project^{21, 22} have all reported, association between diabetes with the prevalence and incidence of posterior sub-capsular cataract and less consistently with prevalence and incidence of cortical cataract which is again not similar to the results of the present study.

V. Conclusion

The following conclusions were made from our study,

- Lenticular opacity was a consistent finding in diabetics with a higher blood sugar level showing that increased blood sugar level leads to early development of cataract in diabetics as compared to non-diabetics of the same age group.
- Mixed type of cataract morphology was the most consistent finding accounting for 69.3% of the total diabetic patients studied. Among the monotype cataracts, cortical cataract was the commonest and the least common lenticular opacity found in the present study was posterior sub-capsular cataract.

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