Original Research

Analysis of Cataract in Diabetic and Non-Diabetic Patients

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ABSTRACT

Introduction: Cataract is one of the most common causes of avoidable blindness accounting for 51% of the world's total blindness. Diabetes mellitus is a metabolic disorder that causes several complications such as a cataract. Cataract tends to develop at an earlier age in diabetics, and progression of cataract is much more rapid in diabetics.

Objective: To assess cases of cataract between diabetic and non-diabetic patients based on factors such as age, sex, type of cataract, HbA1C, duration and treatment for diabetes, and other associated comorbidities.

Methods: 35 patients of two groups, diabetic and non-diabetic admitted for cataract surgery in Saveetha Medical College and Hospital were analyzed. Detailed ophthalmic evaluation on visual acuity, slit-lamp examination and fundus examination was done and associated comorbidities were noted in each group.

Results: The prevalence of cataract was higher in age-group 40-60 years among diabetic patients, largely in diabetic females; and higher in the age-group 60-80 years among non-diabetics. In Diabetic cases, the Posterior subcapsular cataract(50%) was the common type of cataract, while among Non-diabetics, the nuclear cataract(56.66%) was the most common. 58.82% of all diabetics were hypertensives.

Conclusion: The research proves that prevalence of cataract occurs commonly at a younger age in diabetics compared to the non-diabetics with female diabetics more prone to cataract formation. Good glycemic control and early detection of cataract help to retard the progression of cataract and thus prevent blindness due to cataract.

Key Words: Cataract, Cortical cataract, Diabetes Mellitus, Nuclear cataract, Posterior subcapsular cataract

INTRODUCTION

A cataract is defined as the loss of transparency and opacification of the clear lens.[1] It is the most common cause of blindness accounting for 51% of the world's total blindness and 33% of the world's visual impairment.[2] It is one of the most common causes of avoidable blindness and if left untreated, many patients will face the tragic outcome of partial or total blindness. It becomes increasingly common with advancing age.

Diabetes mellitus is a metabolic disorder which is characterized by hyperglycaemia.[3] There are currently 351.7 million people of working age (20–64 years) with diabetes in 2019. This number is expected to increase to 417.3 million by 2030 and to 486.1 million by 2045.[4] Diabetes mellitus is a multisystem disorder that causes several complications in various organs of our body. In the eyes, it most commonly causes cataract and diabetic retinopathy. Cataract tends to develop at an earlier age in diabetics, and progression of cataract is much more rapid in diabetics.[5-8] This increases the burden both visually and financially on the community as a more young population are being affected. In a study by Leske, evaluating the relationship between diabetes and lens opacities among the black population it was found that a history of diabetes mellitus (18% prevalence) was related to all lens changes at a younger age.[9]

The purpose of this study is to assess the differences in the parameters such as age, sex, type of cataract, systemic comorbidities that contribute to the formation of cataract among diabetics and non-diabetics.

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MATERIALS AND METHODS

This is a cross-sectional study conducted between January to March of 2020 among patients admitted to the ophthalmology department of Saveetha Medical College and Hospital, Chennai for cataract surgery. A total of 35 patients were taken in this study, out of which 17 were diabetic and 18 were non-diabetic. 4 diabetic eyes and 6 non-diabetic eyes were pseudophakic and was excluded from the study. A complete examination of the remaining 60 eyes was done which included visual acuity, slit-lamp examination, and fundus examination. The type of cataract was noted by slit-lamp examination.

The inclusion criteria for the patient with diabetes was fasting blood glucose level ≥126 mg/dL, postprandial blood glucose ≥200 mg/dL and HbA1c ≥6.5%. The duration of diabetes was taken as the period from the diagnosis of DM to the day of examination for cataract surgery as informed by the patient. Their medication status was also recorded. Other comorbidities such as hypertension and dyslipidemia were also taken into account.

The study was conducted as per the guidelines and approval of the Institutional Ethics Committee, the ethical clearance number of which is: SMC/IEC/2020/03/373. Informed consent was obtained from the patient. Excel sheets were prepared and statistical analysis was done using SPSS software. The significant difference between types of cataract, gender and age was analysed by chi-square test and p-value were calculated.

RESULTS

Among the total number of patients (n=35) 14 were male and 21 were female.

The sex distribution is shown in table 1.

Table 1: Sex Distribution

Sex	Diabetic	Non-Diabetic
Male	3 (17.64%)	10 (55.55%)
Female	14 (82.35%)	8 (44.44%)
Total	17	18

The chi-square statistic is 5.3814. The *p*-value is .020352. The result is significant at *p* < 0.05. Here, among the diabetics, there is a predilection of females to develop cataract than the males (female: 82.35%, male: 17.64%). And among the non-diabetics males developed cataract slightly more than the females (female: 44.44%, male: 55.55%). The result is significant at *p* < .05.

The age distribution is shown in table 2.

Table 2: Age Distribution

AGE	DIABETIC	NON-DIABETIC
40-60 YEARS	13 (76.47%)	6 (33.33%)
61-80 YEARS	4 (23.52%)	12 (66.66%)
TOTAL	17	18

The chi-square statistic is 6.5557. The p-value is .010455. The result is significant at p < 0.05. Here, there is a marked difference between the distribution of cataract among the two age groups. Diabetics developed cataract earlier than non-diabetics. 76.47% of patients with diabetes developed cataract within the 40-60 year age group, whereas 66.66% of non-diabetics developed a cataract in the 61-80 year age group. The result is significant at p < .05.

The treatment for diabetic patients is shown in table 3.

Table 3: Treatment for Diabetes

Treatment for Diabetes	
On Oral Hypoglycaemic Agents	7(41.1%)
On Insulin	8(47%)
No Treatment	2(11.7%)
Total	17

41.1% of patients were on oral hypoglycaemic drugs, 47% were on insulin therapy and 11.7% were not taking any diabetes treatment. The distribution of type of cataract among diabetics and non-diabetics is shown in table 4.

Table 4: Type of Cataract

Type of Cataract	Diabetic	Non-Diabetic
CC	3 (10%)	6 (20%)
PSCC	15 (50%)	4 (13.33%)
NC	5 (16.66%)	17 (56.66%)
MC	6 (20%)	2 (6.66%)
HMC	1 (3.33%)	1 (3.33%)
TOTAL	30 (100%)	30 (100%)

HMC: hypermature cataract; MC: mature cataract; NC: nuclear cataract; PSCC: posterior subcapsular cataract; CC: cortical cataract. The chi-square statistic is 15.9139. The *p*-value is .003137. The result is significant at *p* < 0.01. Here, among the diabetics, the most prevalent type was posterior subcapsular cataract (PSCC: 50%) which was followed by mature cataract (MC: 20%). Among the non-diabetics, the most prevalent type was nuclear cataract (NC: 56.66%) followed by cortical cataract (CC: 20%). The result is significant at *p* < .01.

Associated comorbidities are given in table 5.

Table 5: Associated Comorbidities

	Hypertension	Dyslipidemia	None
Diabetics	10 (58.82%)	4 (23.52%)	3 (17.64)
Non Diabetics	1 (5.55%)	1 (5.55%)	16 (88.88%)

The chi-square statistic is 18.0445. The *p*-value is .000121. The result is significant at *p* < 0.01.

Prevalence of hypertension and dyslipidaemia is markedly higher among the diabetics compared to the non-diabetics. Among the diabetics, 58.82% were hypertensives, 23.32% had dyslipidemia. While, among the non-diabetics, 88.88% had no associated comorbidities.

The association between treatment for diabetes and the type of cataract is shown in figure 1. 1.
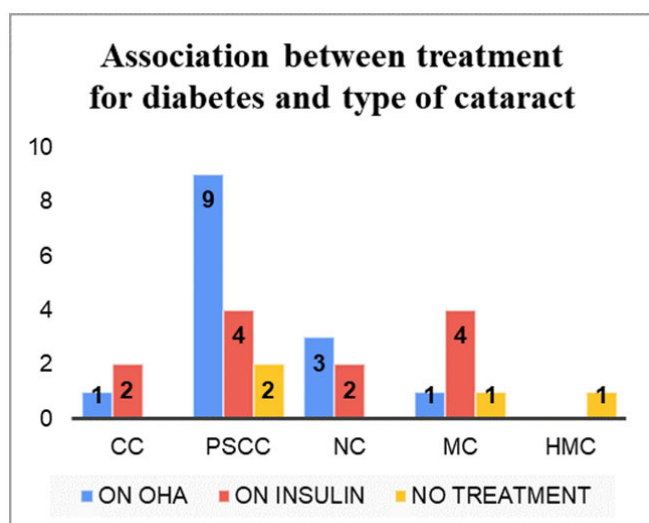

Figure 1: Association between treatment for diabetes and the type of cataract.

OHA: oral hypoglycemic agent; HMC: hyper mature cataract; MC: mature cataract; NC: nuclear cataract; PSCC: posterior subcapsular cataract; CC: cortical cataract.

Posterior subcapsular cataract (9) was found to be more prevalent in patients taking oral hypoglycaemic agents. Posterior subcapsular cataract (4) and Mature cataract (4) occurred equally among patients on insulin therapy. And Posterior subcapsular cataract (2), Mature cataract (1), Hypermature cataract (1) occurred almost equally in patients who did not take any diabetes treatment.

The Association between duration of diabetes and type of cataract is shown in figure 2.
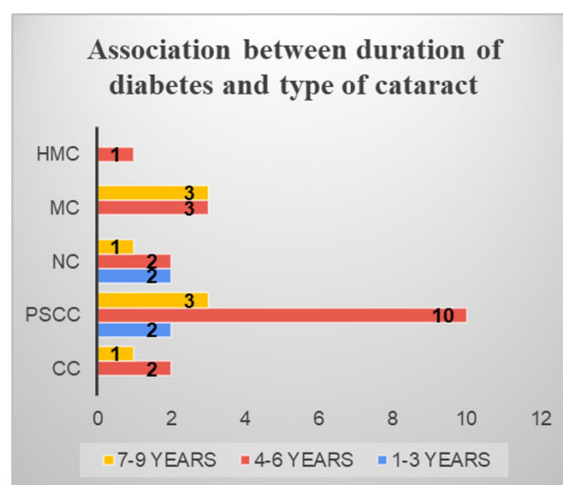

Figure 2: Association between duration of diabetes and type of cataract.

HMC: hyper mature cataract; MC: mature cataract; NC: nuclear cataract; PSCC: posterior subcapsular cataract; CC: cortical cataract.

4 eyes (13.3%) developed cataract within 1-3 years of onset of diabetes, 18 eyes (60%) developed cataract within 4-6 years and 8 eyes (26.6%) developed cataract within 7-9 years of onset of diabetes.

The association between HbA1C levels and type of cataract is shown in the figure: 3.
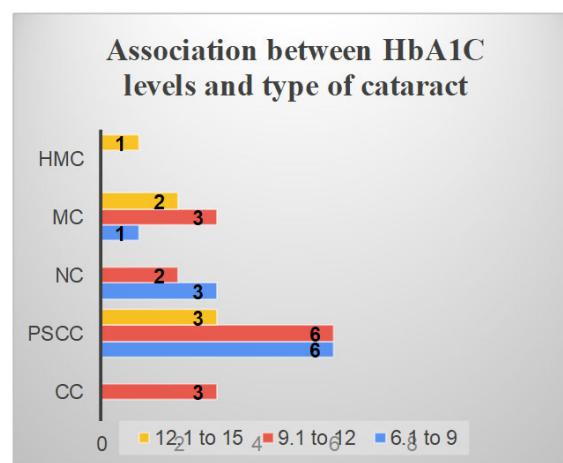

Figure 3: Association between HbA1C levels and type of cataract.

HMC: hyper mature cataract; MC: mature cataract; NC: nuclear cataract; PSCC: posterior subcapsular cataract; CC: cortical cataract.

Here, at HbA1C levels of 6.1 to 9, 6 developed PSCC, 3 developed NC and 1 developed MC. At HbA1C levels of 9.1 to 12, 6 developed PSCC, 3 developed MC, 3 developed CC and 2 developed NC. At HbA1C levels of 12.1 to 15, 3 developed PSCC, 2 developed MC and 1 developed HMC.

DISCUSSION

Results of the present study found that the formation of cataract occurs at a younger age among diabetic patients as compared to non-diabetics. 76.47% of patients with diabetes developed cataract within the 40-60 year age group, whereas 66.66% of non-diabetics developed a cataract in the 61-80 year age group. The result is significant at p < .05. This is supported by a study by Klein, where cataracts were seen among the younger population.[5] Similarly, in a study by Aslam, (71.1%) cataracts developed frequently in the 35-50 years age group among the diabetics.[10]

The prevalence of cataract in our study was higher in diabetic females (82.35%) compared to non-diabetic females (44.4%), this corresponds to a study done by Delcourt where there was an increased risk of cataract among the females.[11] Also in a study done by Raman the prevalence of cataract was higher in females (51.4%).[12] In our study, 13.3% developed cataract within 1-3 years of onset of diabetes, 60% developed cataract within 4-6 years and 26.6% developed cataract within 7-9 years this can be compared to the study by Raman where known diabetics (50.3%) and long-standing diabetes (64.5%) developed cataract [12] Similarly, in a study by Kim showed that long duration of diabetes mellitus is the most significant risk factor for the development of cataract in diabetics as accumulated hyperglycemia is related to lens opacity.[13]

In our study, among the diabetics, the most prevalent type of cataract was posterior subcapsular cataract (PSCC: 50%) which was followed by mature cataract (MC: 20%). Among the non-diabetics, the most prevalent type was nuclear cataract (NC: 56.66%) followed by cortical cataract (CC: 20%). The result is significant at *p* < .01. In a study done by Chen, the prevalence of nuclear cataract, cortical cataract, and posterior subcapsular cataract among type II diabetics were 22.5, 20.2, and 19.9% respectively.[14] Similarly, in a study done by Olafsdottir, the prevalence of nuclear cataract, cortical cataract, and posterior subcapsular cataract among type II diabetics were 48%, 65.5% and 42.5%, respectively.[15] A study done by Lathika associating grade of cataract with the duration of type II diabetes mellitus showed that immature senile cataract was the most common type of cataract detected in patients who had diabetes for 15 years or more.[16] In an epidemiological study done by Hiller, diabetics have a higher risk of developing PSCC than NC or CC.[17] Similarly, a study done by Miglior found that PSCC was the most prevalent type of cataract in diabetics.[18] Diabetic patients have an increased risk of developing posterior subcapsular, cortical, and mixed cataracts.[19] But, in contrast to the Beaver Dam Eye Study, it was found that older onset diabetes was associated with age-related lens changes and cortical opacity.[20]

In our study, there was a markedly increased number of patients with associated hypertension and dyslipidaemia among the diabetics which could suggest the increased prevalence of cataract among patients with metabolic syndrome. In a study done by Nirmalan in a rural population in Southern India, it was found that hypertension and diabetes were associated with the development of cataract.[21] In a study done by Chen among type II diabetics in Kinmen, Taiwan it was found that increased triglyceride levels may increase the risk of development of PSCC and NC.[15] Similarly, in the Framingham studies, hypertriglyceridemia is associated with the development of posterior subcapsular cataract in men.[22] In a study done by Shabana, there was an increased prevalence of lipid abnormalities among female diabetics.[23]

The present study was able to find a statistically significant correlation between age, sex and the type of cataract which develops in the two groups. Appropriate glycemic control was established among the uncontrolled diabetic patients and all were operated on with intraocular lens implantation. The main limitations of this study are the sample size as the study was completed within the given time constraints. Other parameters like BMI, Socioeconomic status was not included in the study.

CONCLUSION

Incidence of cataract occurs at a younger age among diabetics and there is a predilection towards females. Posterior subcapsular cataract was the most common type of cataract among diabetics followed by mature cataract. Longer duration of diabetes and poor glycaemic control were the risk factors for the development of cataract in diabetics. Proper control of blood sugar at the early stage of disease will hamper the development of cataracts among diabetic, thereby reducing the burden on society.

ACKNOWLEDGEMENT

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