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Research Article

Association of grade of cataract with duration of diabetes, age and gender in patients with type II diabetes mellitus

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ABSTRACT

Background: Despite the advancement in the diagnosis and surgical techniques, cataract remains one of the major leading causes for avoidable blindness in the world. This study was performed to evaluate the association of duration of diabetes mellitus, age and gender in predicting the morphological grade of cataract in patient with type II diabetes.
Methods: Sixty nine patients (35 males and 34 females) of age 50-70 years with diabetes type II who underwent cataract surgery were studied retrospectively. Patients were classified into those with immature cataract (IMSC), mature (MSC) and hypermature senile cataract (HMSC). Risk factors such as duration of diabetes, age and gender were analyzed by multiple regression analysis. Further, correlation between duration of diabetes and grade of cataract in males and females were also analyzed.
Results: IMSC was the most common type with no statistically significant difference in prevalence among the gender. The cataracts detected in diabetic patients of 15 or more years of duration turned out to be IMSC. Incidence of cataract in patients with diabetic duration of 0-5 years was 37%, 6-9 years was 28.5%, 10-14 years was 12% and >15 years was 22.5%. Multiple regression analysis revealed that the duration of diabetes and age was not significantly correlated with the grade of cataracts in either males or females.
Conclusions: The duration of diabetes, age or gender did not emerge as a significant risk factor for predicting grade of cataract in male or female diabetic patients. In fact, IMSC was found to be the most common among patients with >15 years of diabetic duration.

Keywords: Cataract, Diabetes mellitus, Nuclear sclerosis, Cortical cataract, Posterior subcapsular cataract

INTRODUCTION

Despite the advancement in the diagnosis and surgical techniques, cataract remains one of the major leading causes for avoidable blindness in the world. According to the latest survey, cataract is responsible for 51% of world blindness. In subjects with diabetes mellitus (DM), it becomes the most common cause of visual impairment.[1] Population-based study has greatly increased the knowledge concerning the association between diabetes and cataract formation. The development of cataract may occur at an earlier age and is about 2–5 times more frequently in patients with diabetes. Furthermore, studies have demonstrated that cataracts are the most common cause of visual impairment in older-onset diabetic patients.[2,3] The rate of cataract surgery is correspondingly high in diabetic patients with relatively a higher risk of complications after phacoemulsification cataract surgery compared to the non-diabetic patients.[4] According to the Framingham and other eye studies, three to four fold increased prevalence of cataract in patients with diabetes

under the age of 65, and up to a twofold excess in patients above 65.[3,5-7]

DM is expected to reach 4.4% by 2030 and the total number of people with DM across the world is projected to rise from 171 million (in 2000) to 366 million in 2030.[8] The analysis of the data proved that longer duration of diabetes was associated with an increased frequency of cortical cataract and cataract surgery, but results are highly inconsistent with the population studied in terms of whether nuclear sclerosis (NS), cortical cataract (CC) or posterior subcapsular (PSC) are specifically associated with DM. The incidence and progression of CC and PSC was associated with diabetes. A population-based cross-sectional study showed that PSC has statistically significant association with diabetes.[9] In addition, increased levels of glycated hemoglobin were shown to be associated with an increased risk of NS and CC.[10]

No attempts were done to find out the association of grade of cataract with that of the diabetes duration. If such a correlation could be established, it might help the Ophthalmologist to predict when a diabetic patient would develop a particular grade of cataract as well. Further, it may also help to plan surgical intervention more early and effectively. Thus, there may be great advantages in quality of life and safety issues related to the successful treatment of cataracts. Therefore, this study was aimed to evaluate the association of grade of cataract with the duration of diabetes, age and gender in a cohort of diabetic patients who had undergone surgery and the findings are reported in this paper.

METHODS

Sixty nine cataract patients (35 male and 34 female) in the age range 50 – 80 years were included in the retrospective study. All cases of cataract such as immature senile cataracts-Partially opaque lens and the disc view hazy (IMSC), mature senile cataracts-completely opaque lens with no disc view (MSC) and hyper mature senile cataracts-liquefied cortical matter (HMSC) patients with type 2 DM who underwent surgery for cataract from January 2004 to December 2004 were evaluated retrospectively. The study was conducted as per the guidelines and approval of the Institutional Ethics Committee and also had obtained consent from the patient.

A diabetic patient was defined as one who had a fasting serum glucose concentration of equal to or more than 126 mg/dl or who had greater than 200 mg/dl when measured two hours after a meal. 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. All patients underwent ophthalmologic evaluation including assessment of best corrected visual acuity, anterior segment evaluation using slit lamp biomicroscopy and dilated fundus examination using 90 D lens and indirect ophthalmoscopy. Risk factors such as gender, age and duration of diabetes were statistically analyzed with grade of cataract in these patients.

Statistical analysis

Statistical analysis was performed using the SPSS software package version 16. Multiple regression analysis was used to predict the degree of association of the grade of cataract with the gender, age and duration of diabetes. Significant difference between grades of cataract with duration of diabetes, gender or age was analyzed by chi-square test. P value less than 0.05 was considered as significant.

RESULTS

Occurrence of cataract among male and female diabetic patients is given in Figure 1. Among the total number of cases (n=69), the prevalence was found to be similar among both genders.

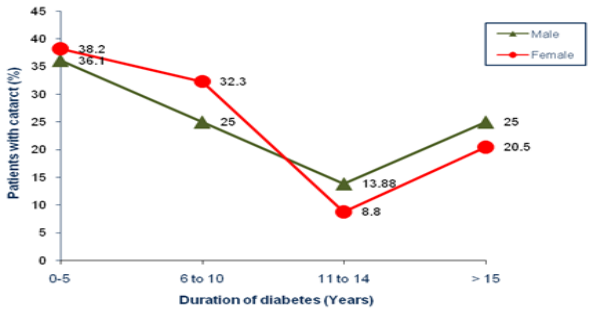

Figure 1: Distribution of males and females diabetic cataract patients with duration of diabetes.

The mean fasting level of glucose in patients with age 50-59 years was 108 mg/dl, 60-69 years was 115 mg/dl, whereas in the 70-79 years age group was 118 mg/dl.

Regarding diabetic age, the maximum number of cataract patients belonged to the group with duration of diabetes less than 5 years (26/69). However, it is statistically not significant ($p>0.05$) with respect to percentage incidence of cataract in other groups with duration of diabetes 6-10 and 11-14 years. In both genders, the prevalence of cataract was found to be decreased initially from group with age less than 5 years to 11-14 years and then increased in ≥15 years group.

Distribution of various grades of cataract in relation to diabetic age

Association of duration of diabetes (diabetic age) with grade of cataract is depicted in Table 1.

In the group with diabetic age less than 5 years, there was 88.4% incidence of IMSC with a slightly increased

prevalence among males (Figure 2). The prevalence of IMSC in male diabetic patients with duration of diabetes, 6-10 and 15 years or more was found to be almost similar. In female patients, distribution of IMSC consistently increases with increase in duration of diabetes (Figure 3). MSC was slightly more in the male patients with duration of diabetes less than 5 years. The percent was represented as more due to the less number of patients in the 11-14 years of duration (8/69). Only 2 female patients (7.6%) with HMSC were found and they belonged to the group with less than 5 years of diabetes.

Table 1: Association of duration of diabetes with grading of cataract.

Duration (years)	Number of patients		
	IMSC	MSC	HMSC
0-5 (n = 26)	23 (88.4)	1 (3.8)	2 (7.6)
6-10 (n =19)	18 (94.7)	1 (5.2)	0 (0)
11-14 (n = 8)	7 (87.5)	1 (12.5)	0 (0)
>15 (n = 16)	16 (100)	0 (0)	0 (0)

Value in the parenthesis indicates percent of occurnace; IMSC: immature senile cataracts; MSC: mature senile cataracts; and HMSC: hyper mature senile cataracts.

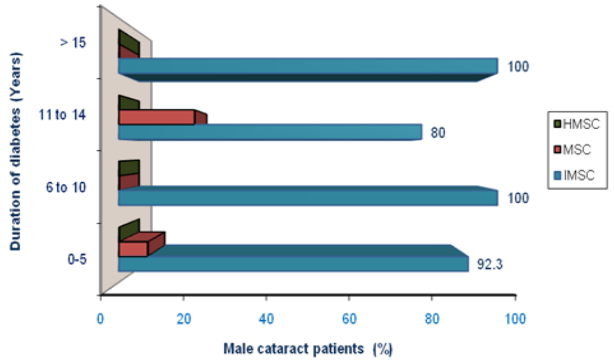

Figure 2: Distribution of grade of cataract in male diabetic patients with duration of diabetes. IMSC: immature senile cataracts; MSC: mature senile cataracts; and HMSC: hyper mature senile cataracts.

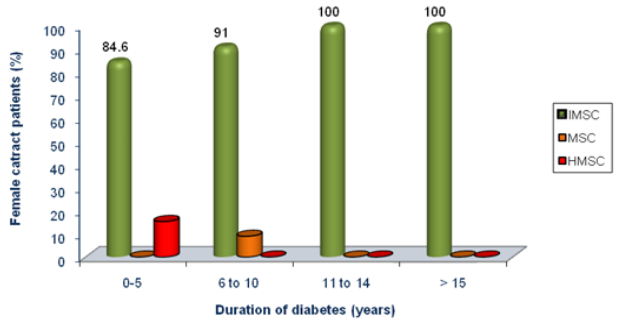

Figure 3: Distribution of grade of cataract in female diabetic patients with duration of diabetes. IMSC: immature senile cataracts; MSC: mature senile cataracts; and HMSC: hyper mature senile cataracts.

Multiple correlation coefficient (R = 0.331) indicates poor level of prediction. The coefficient of determination (R^2, 0.109) showed that the independent variables such as age, gender and duration of diabetes explain only 10.9% of the variability of the dependent variable, grade of cataract. Similarly, the independent variables did not statistically significantly predict the dependent variable. Therefore, a multiple regression analysis to predict grade of cataract from variables such as gender, age and duration of diabetes not statistically significantly, F (3, 66) = 2.7, p = 0.053, R^2 = 0.109. All three variables not added statistically significantly to the prediction. Further no correlation found between cataract grading with duration of diabetes (r =4.6, p = 0.58).

DISCUSSION

Results of the present study revealed no association between the grade of cataract and risk factors such as age, duration of diabetes or gender as evident from the correlation coefficient of multiple regression analysis. In fact, IMSC emerged as the most commonly found cataract in the patients with duration of diabetes >15 years and more.

Several studies have concluded that the duration of diabetes is a risk factor for the incidence of cataract. In multiple regression analysis, Kim and Kim found that the duration of diabetes was the most important risk factor for diabetic cataracts.[11] Diabetes has been associated with early onset of cataracts formation in various populations.[12] Kim et al recently reported the presence of diabetes was independently associated with cataracts in young and middle aged adults in Korean population.[13] Further, duration of diabetes was found to be a significant independent predictor of cataract for patient with insulin dependent diabetes mellitus.[14] In European countries, factors such as a long duration of diabetic disease, advanced age at the time of clinical diagnosis, advanced retinopathy, treatment with diuretics and poor control of blood sugar level were reported as risk factors for cataract in diabetics.[15-18] However, no reports published so far for correlating duration of diabetes, age and gender for predicting the grading of cataract.

The association of diabetes with cataract can be ascribed to the excess of sorbitol formed from the accumulated high blood glucose level in the diabetic patients. Therefore, patients with DM are 2–5 times more likely to develop cataracts when compared with the non-diabetic counterparts.[17] Furthermore, the risk may reach 15–25 times in diabetics less than 40 years of age.[19] All the cataract patients with diabetes enrolled in the present study were above 50 years. This indicates that though the type II diabetes incidence has been reported after the age of 40 years, most of the people underwent ophthalmic examination for the complaint of quality vision after the diagnosis of DM which may probably be around 45 years of age. In our population, despite a statistically non-significant correlation obtained a trend of slight decrease

initially and increase observed with increase in the duration of diabetes. In the female patient when compared to the males, a consistent increase could observe in the prevalence of IMSC. This could be a reflection of the fact that prevalence of diabetes and hence the occurrence of diabetic cataract in females is higher than that of males.[3,11] Schwab et al reported that diabetes was a strong risk factor for first cataract surgery in all age and sex groups except in men aged 75 to 84 years.[15]

In this survey, no cases of HMSC were found in patients with >15 years of diabetic duration. This may be ascribed to increased awareness of the cataract as well as due to a relatively better socioeconomic status of among the diabetic patients in the society. In our population, diabetic screening is very active and sought after. Hence, an early diagnosis of cataract and intervention may be more in diabetic patients when compared to the general population. This could possibly explain the non-significant correlation observed between grades of cataract with diabetic age in our study cohort. The data collected in this study was for 1 year period which was less to predict the association of the grade of cataract with diabetic duration among both genders.

Studies showed that cataract formation in hyperglycemia is associated with loss of lens transparency.[20] It is well established that chronic complications of DM such as diabetic cataract, diabetic retinopathy, and diabetic keratopathy lead to loss of vision. Hence, it is generally believed that hyperglycemia can stimulate risk factors to accelerate the progression of the diabetic complications. The polyol such as sorbitol- produced by the aldol reductase- may collect in the lens of the eye and promote cataract development. The most important change in the crystalline lens that leads to cataract formation was the thickening of basement membrane of the lens capsule. Typical diabetic cataracts contain cortical and/or posterior subcapsular opacities.[21] The age mainly and level of glucose in diabetic patients to a lesser extent are the independent risk factors that will determine the onset of cataract incidence. In this study, all the patients had fasting glucose level more than 110 mg/dl. Furthermore, a non significant increase in the fasting level could be evidenced with increase in age in both genders. Therefore, the increased incidence of cataract in patients with age less than 5 years might be caused due to the existed mild hyperglycemia.

Success rate of cataracts surgery, without serious complications and improved vision is possible with the advanced surgical procedure and with the aid of equipments. Phacoemulsification is associated with better visual results, less inflammation and less need for capsulotomy as compared to extracapsular cataract surgery.[22] However, cataract surgery is more complicated in diabetic patients overall. Though the success rate is reported as high, one of the two most common side effects reported during the post-surgical treatment was inflammatory reaction in the eye and cystoid macular oedema. In this study, we could not find any such post-surgical morbidity among the patients studied (data not included).

It was reported that most patients having lenticular opacity had DM for more than five years and various types of opacities of the lens were developed in 64% of diabetic patients under treatment.[23] Caird et al reported that 10.7% of patients of senile cataract extraction had DM and the extraction rate was four to six times higher than the cases without DM.[24] Less number and short duration (1 year) of sampling are the major limitations of this study. Hence, a multi-centric study with large group of diabetic cataract patients is warranted to further look into the association of grade of cataract and duration of diabetes.

CONCLUSION

Results of this study concludes that though the incidence of IMSC was more with increased duration of diabetes (>15 years), diabetic age per se did not emerge as a significant risk factor for grading cataracts. There were more patients with cataract in the group with duration of diabetes less than 5 years. Further, multiple regression analysis showed no statistically significant association between the grade of cataract with age and gender.

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