

Influence of Diabetes on Cataract: A Study in A Tertiary Care Centre

Rasna Sharma

Abstract

Introduction: A cataract is opacity of the lens that interferes with vision, and is the most frequent cause of visual impairment. It is always important to identify the risk factors that affect the development and progression of cataract. We have attempted in our study to identify the risk factors and grade of cataract associated with diabetes. *Materials and Methods:* Demographic details, physical and clinical evaluation was done for 245 patients. Blood pressure was taken and HbA1c levels were measured for all patients with elevated blood sugar levels. The nature of the cataract was categorized 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). *Results:* 72.7% of these patients had diabetes while 66.9% of them had hypertension. The prevalence of cataract was more in patients with diabetes and hypertension rather than those with these risk factors alone. In the patients who had diabetes for less than 5 years, 86.4% of the patients had Immature senile cataracts with partially opaque lens and hazy disc view (IMSC) and 8.8% patients had hyper mature senile cataract with liquefied cortical matter (HMSC). In patients who had diabetes for more than 15 years, 98.1% had IMSC and there were no patients with HMSC. *Conclusion:* Although diabetes has no influence on the age and the grade of the cataract, there was a considerable association between diabetes and cataract.

Keywords: Cataract; Diabetes; Visual Impairment.

How to cite this article:

Rasna Sharma. Influence of Diabetes on Cataract: A Study in A Tertiary Care Centre. *Ophthalmol Allied Sci.* 2019;5(1):65-68.

Introduction

A cataract is opacity of the lens that interferes with vision, and is the most frequent cause of visual impairment worldwide, especially for the elderly because the incidence of cataracts increases with increasing age. It is the leading cause of blindness affecting around 42% of overall visual impairment. In India, it is estimated to cause almost 80% blindness [1].

This multifactorial disease process is induced

by various toxic factors, environmental, stressors and gene mutations. Cataract is classified into four types, nuclear, cortical, posterior subcapsular and mixed. Cataract is known to be associated with damage or death of lens epithelial cells [2].

It is always important to identify the risk factors that affect the development and progression of cataract. A number of risk factors are known to be associated with cataract like diabetes, hypertension, obesity, age, race, smoking alcohol use and low socioeconomic status [3,4]. Identification of the factors that could delay or prevent cataract development would be important both for increasing the well being of an older patient as well as reduction of the health care costs [5].

Diabetes is one of the most common health hazard of today globally. It has been estimated by the International Diabetic federation that in 2015, 415 million people were living with diabetes and it is estimated to rise to 642 million people by the year 2040 [6].

Author Affiliation: Assistant Professor, Department of Ophthalmology, Mallareddy Medical College for Women, Suraram, Hyderabad, Telangana 500055, India.

Corresponding Author: Rasna Sharma, Assistant Professor Department of Ophthalmology, Mallareddy Medical College for Women, Suraram, Hyderabad, Telangana 500055, India.

E-mail: rasna2005@rediffmail.com

Received on 14.11.2018, **Accepted on** 26.11.2018

Diabetes is a well-recognized cause of premature death and disability, increasing the risk of cardiovascular disease, kidney failure, blindness and lower-limb amputation [7]. Hyperglycemia, blood pressure and elevated blood lipid levels seem to be one of the major cause of diabetic complications and disease progression [8,9]. Ocular complications are one of the frequent complication to both Type 1 and Type 2 diabetes and is considered to be the fifth most common cause of blindness. In 95% of type 1 diabetic and 60% of type 2 diabetics with disease duration longer than 20 years, signs of diabetic retinopathy occur [10-12].

Visual impairment is another global problem which is estimated to be prevalent in 45 million people being blind and 135 million having severe visual impairment. It is found to be more prevalent among the developing countries such as Africa, Asia and Latin America rather than the developed with the incidence being 10-40 times higher [13].

We have attempted in our study to identify the risk factors and grade of cataract associated with diabetes. This would help the ophthalmologist to predict the development of cataract in a diabetic patient and plan an effective surgical intervention.

Materials and Methods

This study was conducted by the Department of Ophthalmology at Mallareddy Medical college for Women during a period of of 2 years 4 months ie from June 2015 to Sep 2017. 245 patients with cataract, above the age of 40 years were included into the study. Patients who had other ocular disorders like corneal disorder, glaucoma, vitreous disorders and other lens abnormalities were excluded from the study.

Demographic details were taken from all the patients after the informed consent was acquired. All of them underwent complete physical and clinical examination. Blood tests were done for all the regular biochemical and hematological

parameters including random blood sugar to identify the sugar levels. Those who were found to have elevated blood sugar levels underwent HbA1c level detection. The duration of diabetes, medication for diabetes was also noted.

Ophthalmological evaluation was done and the best corrected visual acuity assessment, anterior segment evaluation using slit lamp biomicroscopy and dilated fundus examination using 90 D lens and indirect ophthalmoscopy.

The nature of the cataract was categorized 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).

Results

The average age of the patients was 61.6 years with males being the predominant gender affected with cataract. Most of these patients (72.7%) had diabetes while 66.9% of them had hypertension (Table 1).

Table 1: Baseline characteristics of patients

Parameter	N (%) or mean (SD)	95% CI
Age (in years)	61.6±6.9	59.3–62.7
Sex (male)	142 (58%)	55.5-60.0
Smoker	43 (17.6%)	15.5-19.6
Hypertension	164 (66.9%)	62.9-68.2
Diabetes	178 (72.7%)	71.0-73.5
BMI	25.8±3.9	25.1-26.3

The average age was higher in the cataract patients with no cataract or hypertension (66.3 years), while those having both were faster to achieve cataract (58.7 years). The same was the case with sugar levels and the systolic and diastolic blood pressure, which were all higher in patients with both the risk factors (Table 2).

Table 2: Age, pressure and blood sugar levels in normal, diabetic, and hypertensive patients

	Normal	Hypertensive	Diabetics	Hypertensive with diabetes
Age (in years)	66.3±3.2	61.4±4.1	60.9±2.9	58.7±3.6
Systolic (mmHg)	127.8±1.1	158.5±1.4	126.9±0.98	161.8±3.1
Diastolic (mmHg)	84.3±0.7	116.5±3.4	81.3±0.9	119.3±2.4
Fasting Blood Sugar	88.3±4.1	89.1±2.8	141.5±2.4	144.3±4.1

In the patients who had diabetes for less than 5 years, 86.4% of the patients had Immature senile cataracts with partially opaque lens and hazy disc view (IMSC) and 8.8% patients had hyper mature senile cataract with liquefied cortical matter (HMSC). In patients who had diabetes for more than 15 years, 98.1% had IMSC and there were no patients with HMSC (Fig: 1).

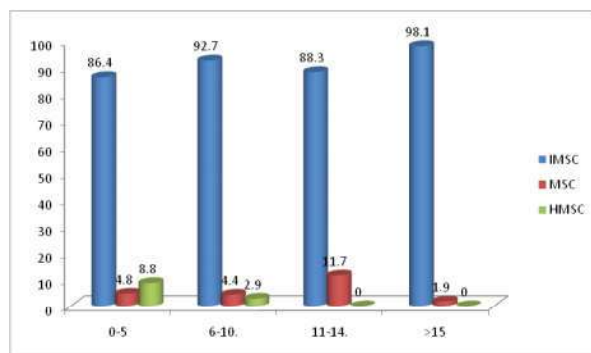


Fig. 1: Association of type of cataract with duration of diabetes

Discussion

Cataract is a major cause of vision impairment in people with diabetes. Numerous studies have documented an association between diabetes and cataracts [14-16]. Klein et al. demonstrated that patients with diabetes mellitus are 2-5 times more likely to develop cataracts than their nondiabetic counterparts [15]. Data from the Framingham and other eye studies indicate a three to fourfold increased prevalence of cataract in patients with diabetes under the age of 65, and up to a twofold excess prevalence in patients above 65 [17,18].

The pathogenesis of cataract in the diabetic patients has been attributed to the large amounts of glucose present in the blood wherein hexokinase becomes saturated and the excess glucose enters the polyol pathway when aldose reductase (AR) reduces it to sorbitol. Intracellular accumulation of sorbitol leads to osmotic changes resulting in hydropic lens fibers that degenerate, ultimately results in the formation of lens opacities (form sugar cataracts). The speed of conversion sorbitol is faster than it is converting to fructose by the enzyme sorbitol dehydrogenase. The intracellular increase of fluid in response to AR-mediated accumulation of polyols results in lens swelling associated with complex biochemical changes ultimately leading to cataract formation [19-21].

Duration of diabetes is also considered to be a risk factor for the incidence of cataract [22]. In our

study, though, we found no relation between age and the grade of cataract. Similar results were found in a study by Lathika et al, where in there was no association of grade of cataract to age [23].

However, we have found a considerable association to occur between cataract and diabetes. The advancing age in combination with diabetes and hypertension were largely associated with cataract. In fact age related cataract has been estimated to be the cause of blindness in 17 million individuals [24].

In our study we also found less occurrence of cataract in individuals with normal blood pressure along with normal blood sugar levels, showing that hypertension also has a significant influence on cataract. Similar results were observed in a similar study by Shakil et al. Few other studies also have associated high blood pressure to be the cause of higher incidence of cataract [4,25-28].

In a Barbados Eye study, the 4 - year lens opacities were evaluated and the factors which increased the risk for cortical opacity were old age, female gender, low economic status and diabetes mellitus. The risk factors for posterior subcapsular opacity were age, and diabetes and for nuclear opacity, it was age, leaner body mass and diabetes [29,30].

Conclusion

Although diabetes has no influence on the age and the grade of the cataract, there was a considerable association between diabetes and cataract. Moreover, diabetes along with hypertension was a likely to lead to cataract and eventually blindness.

References

1. Gupta SK, Kalaiselvan V, Saxena R, Agarwal SS. Advances in ophthalmological strategies for the prevention of cataract development. *Ind J Ophthalmol.* 2009;57:175-183.
2. Li WC, Kuszak JR, Dunn K. Lens epithelial cell apoptosis appears to be a common cellular basis for non-congenital cataract development in humans and animals. *J Cell Bio.* 1995;130:169-181.
3. Leske MC, Wu SY, Hennis A, Connell AM, Hyman L, Schachat A. Diabetes, hypertension, and central obesity as cataract risk factors in a black population. The Barbados eye study. *Ophthalmol.* 1999;106:35-41.
4. Caulfield LE, West SK, Barron Y, Cid-Ruzafa J. Anthropometric status and cataract: the Salisbury eye evaluation project. *AM J Clin Nutr.* 1999;69:237-42.
5. Lisa Brown, Eric B Rimm, Johanna M Seddon,

- Edward L Giovannucci, Lisa Chasan-Taber, Donna Spiegelman, et al. A prospective study of carotenoid intake and risk of cataract extraction in US men. *Am J Clin Nutr.* 1999;70:517-24.
6. International Diabetic federation. <http://www.idf.org/about-diabetes/facts-figures>
 7. B. Levitan, Y. Song, E. Ford et al. Is nondiabetic hyperglycaemia a risk factor for cardiovascular disease? A meta-analysis of prospective studies. *Arch. Intern. Med.* 2004;164:2147-55.
 8. J. Harding, M. Egerton, R. van et al. Diabetes, glaucoma, sex, and cataract: analysis of combined data from two case control studies. *British. J. Ophthalmol.* 1993;77:2-6.
 9. H. Kahn, H. Lebowitz, J. Ganley et al. The Framingham eye study. II. Association of ophthalmic pathology with single variables previously measured in the Framingham heart study. *Am. J. Epidemiol.* 1977;106:33-41.
 10. P. Guillausseau, P. Massin, M. Charles, et al. Glycaemic control and development of retinopathy in type 2 diabetes mellitus: a longitudinal study. *Diabetic Medicine.* 1998;15:151-55.
 11. R. Turner. Intensive blood-glucose control with sulphonylureas or insulin compared with conventional treatment and risk of complications in patients with type 2 diabetes (UKPDS 33). *The Lancet.* 1998;352(9131):837-53.
 12. I. Stratton, E. Kohner, S. Aldington et al. UKPDS 50: risk factors for incidence and progression of retinopathy in type II diabetes over 6 years from diagnosis. *Diabetologia.* 2001;44(2):156-63.
 13. Hashemi H, Fotouh A, and Mohammad K. The Tehran eye study: research design and eye examination protocol. *BMC Ophthalmol.* 2003;3:8.
 14. Delcourt C, et al: Risk factors for cortical, nuclear, and posterior subcapsular cataracts: the POLA study: Pathologies Oculaires Liees a l'Age. *Am J Epidemiol.* 2000;151:497-504.
 15. Klein BE et al. Older-onset diabetes and lens opacities: the Beaver Dam Eye Study. *Ophthalmic Epidemiol.* 2005;2:49-55.
 16. Saxena S, Mitchell P, Rochtchina E. Five-year incidence of cataract in older persons with diabetes and pre-diabetes. *Ophthalmic Epidemiol.* 2004;11:271-277.
 17. B.E.K. Klein, R. Klein, and S.E. Moss. Prevalence of cataracts in a population-based study of persons with diabetes mellitus. *Ophthalmology;* 1985;92(9): 1191-96.
 18. F. Ederer, R. Hiller, and H. R. Taylor. Senile lens changes and diabetes in two population studies. *American Journal of Ophthalmology;* 1981;91(3):381-95.
 19. J. Kinoshita. Mechanisms initiating cataract formation. *Proctor lecture Inv. Ophthalmol.* 1974; 13(10):713-24.
 20. J. Kinoshita, S. Fukushi, P. Kador et al. Aldose reductase in diabetic complications of the eye. *Metabolism.* 1979;28(4):462-9.
 21. P. Kador, J. Kinoshita. Diabetic and galactosaemic cataracts. *Ciba. Foundation. Symposium.* 1984;106: 110-31.
 22. Kim SI, Kim SJ. Prevalence and Risk Factors for Cataracts in Persons with Type 2 Diabetes Mellitus. *Korean J Ophthalmol.* 2006;20:201-4.
 23. Vasu Kamaladevi Lathika1, TA Ajith., Association of grade of cataract with duration of diabetes, age and gender in patients with type II diabetes mellitus. *Int J Adv Med.* 2016 May;3(2):304-308
 24. Congdon NG. Prevention strategies for age related cataract: present limitations and future possibilities. *BrJ Ophthalmol.* 2001;85:516-20.
 25. Muhammad Shakil, Syed Touseef Ahmed, Syed Samiullah, Khalida Perveen, Surriya Sheikh, Aiysha Humaira, Akbar Khoja. Influence of hypertension and diabetes mellitus of senile cataract. *Pak J Physiol* 2008;4(2):30-32.
 26. Hiller R, Robert D. Sperduto, Ederer F. Epidemiologic associations with cataract in the 1971-1972 National Health and Nutrition Examination Survey. *Am J Epidemiol* 1989;118(2):239-49.
 27. Clayton RM, Cuthbert J, Philips CI, et al. Analysis of individual cataract patients and their lenses: a progress report. *Exp Eye Res.* 1980;31:553-66.
 28. Mohan M, Sperduto RD, Angra SK. India-US case-control study of age related cataracts. *India-US Case Control Study Group. Arch Ophthal* 1989;107:670-76.
 29. Leske MC, Wu SY, Nemesure B & Hennis A (2002): Risk factors for incident nuclear opacities. *Ophthalmology* 109:1303-1308.
 30. Hennis A, Wu SY, Nemesure B & Leske MC. Risk factors for incident cortical and posterior subcapsular lens opacities in the Barbados Eye Studies. *Arch Ophthalmol.* 2004;122:525-30.
-