

## Original research article

**Outcome of cataract surgery in diabetic and non-diabetic patients: a comparative study****Dr. Poonam<sup>1</sup>, Dr. Bibhuti Prassan Sinha<sup>2</sup>, Dr. Gyan Bhaskar<sup>3</sup>****<sup>1</sup>Senior Resident, Regional Institute of ophthalmology, IGIMS, Patna, Bihar, India.****<sup>2</sup>Professor & Head, Regional Institute of IGIMS, Patna, Bihar, India.****<sup>3</sup>Additional Professor, Regional Institute of ophthalmology, IGIMS, Patna, Bihar, India.****Corresponding Author: Dr. Bibhuti Prassan Sinha****Abstract**

**Background:** A leading cause of vision loss in the young adult population worldwide is sequelae and complications of diabetes. Cataract surgery performed on diabetic patients accounts for approximately 20% of total cataract surgeries. Cataract in patients with diabetes leads to decreased visual acuity and poses difficulty in examination of the retina adequately. Hence, it is advantageous to perform cataract surgery for diagnostic and therapeutic benefits, even if there is possible associated risk of aggravating the retinopathy. Hence the present study aimed at comparison of outcomes after cataract surgery in diabetic and non-diabetic patients

**Materials and Methods:** A prospective study was done to compare outcome of cataract surgery in 200 diabetics as compared to 200 non-diabetics. Within 10 days of Cataract surgery, all the patients underwent fasting blood glucose analysis. Recording of the complete intra-surgical and post-surgical complications along with visual acuity was done at 10 days, three month and six months' time in all the subjects.

**Results** A total of 200 diabetic patients were included in the study group while another 200 non-diabetic patients comprised of control group. Mean age of subjects in the study group and control group was 51.6 and 55.5 years respectively. In diabetic and non diabetic group 96 and 104 were males respectively and 104 and 96 were female diabetic and non diabetic respectively. At 10 days time, the occurrence of Post-surgical visual acuity in diabetic group and non-diabetic group was found to be 0.16 and 0.23 respectively.

**Conclusion:** Diabetic patients should not be refused for cataract surgeries. However, there is a need for taking of extra-precautions in such patients.

**Introduction**

Cataract is one of the leading causes of blindness across the world and is largely sequelae of diabetes. It is one of the most common complications of diabetes in the eye and up to 20% of all cataract procedures are performed for diabetic patients.<sup>1</sup> Diabetic retinopathy is defined as progressive dysfunction of the retinal vasculature caused by chronic hyperglycaemia resulting in structural damage to the neural retina. Microaneurysms are the first ophthalmoscopically demonstrable alteration in diabetic retinopathy and are measured as the hallmark of NPDR.<sup>2</sup> Cataract in patients with diabetes leads to decreased visual acuity and poses difficulty in examination of the retina adequately. Hence, it is advantageous to perform cataract surgery for diagnostic and therapeutic benefits, even if there is possible associated risk of aggravating the retinopathy

In earlier days, cataract surgery among diabetics was threatened by the accelerated progression of diabetic retinopathy and deterioration of vision due to higher incidence of post-operative complications.<sup>3</sup> According to Kim SJ et al., diabetic eyes have a high incidence of central foveal thickness after cataract surgery.<sup>4</sup> According to some studies,

clinicians should continue to sustain vigilance in diabetic patients after cataract extraction even when central macular oedema is not present immediately prior to cataract surgery, particularly in eyes with prior Diabetic Macular Edema (DME) treatment or non-central involved DME that may be at a predominantly high risk for development of central-involved Macular Oedema (ME) after cataract surgery.<sup>5,6</sup>

However, this is usually mild and can be adequately treated by photocoagulation. Current surgical techniques Small Incision cataract surgery (SICS) and phacoemulsification have an advantage over previously followed cataract surgeries that they allow quicker recovery of vision and lesser post-operative inflammation. The modern techniques of cataract surgery have improved results.<sup>7,8</sup>

Recent studies have reported favourable visual acuity after cataract surgery in diabetic patients.<sup>9-11</sup> Cataract surgery in diabetes has good results, with high reliability and a slightly higher rate of complications than non-diabetic patients. Causes for poor visual acuity after surgery are poor preoperative visual acuity, advanced stages of diabetic retinopathy and old age.<sup>12</sup>

On measurement of central foveal thickness by OCT after cataract surgery eyes of diabetic patients showed higher macular thickness which led to poorer post-operative visual recovery. However, few studies are of the opinion that macular oedema following cataract surgery in diabetic eyes may take a benign path.<sup>4,13,14</sup> We planned the present study to compare the outcome of cataract surgeries in diabetic and non-diabetic patients.

### **Material and methods**

This study was conducted in department of Ophthalmology, Indira Gandhi Institute of Medical Science, Patna Bihar India from January 2019 to January 2020 and included assessment of prognosis of cataract surgery in diabetic and non- diabetic patients over a period of one year. Ethical approval was taken from the institutional ethical committee and consent was obtained from all the patients after explaining in detail the entire research protocol. We analyzed a total of 200 diabetic and 200 age-matched non- diabetic subjects. All those diabetic cases that underwent cataract surgery were included in the present study.

**Inclusion criteria** for the present study for subjects of study groups included:

1. Patients history of diabetes
2. Patients within the age group of 35 to 65 years
3. Patients without any known drug allergy
4. Patients without any other systemic illness

Non-diabetic group subjects included subjects with comparable age and sex, who had cataract extraction during the same period. Based on the fasting sugar levels of more than 120 mg/dl, diagnosis of diabetes was made.

**Exclusion criteria** for the present study for subjects of study group included:

1. Patients with traumatic cataracts,
2. Patients with uveitic or complicated cataracts.

Within one week of surgery, all the patients underwent fasting blood glucose analysis.

Glycemic control in the subjects was divided as follows<sup>9</sup>

- Good (<70mg/dl),
- Moderate (70-100mg/dl) or
- Poor (>100mg/dl)

Under the administration of peri-bulbar anaesthesia, phaco with posterior chamber intraocular lens implantation was done in all the subjects. Recording of the complete demographic details of all the subjects along with clinical details was done separately. Recording of the complete

intra- surgical and post-surgical complications along with visual acuity was done at 10 days, three month and six months' time in all the subjects. Recording of the mean Snellen acuity was done in all the subjects.<sup>15</sup>

### Statistical analysis

The recorded data was compiled and entered in a spreadsheet computer program (Microsoft Excel 2010) and then exported to data editor page of SPSS version 20 (SPSS Inc., Chicago, Illinois, USA).

Descriptive statistics included computation of percentages, means and standard deviations were calculated. Test applied for the analysis were student t-test. Level of significance was set at  $\leq 0.05$ .

### Results

A total of 200 diabetic patients were included in the study group while another 200 non diabetic patients comprised of control group. Mean age of subjects in the study group and control group was 51.6 and 55.5 years respectively .In diabetic and non diabetic group 96 and 104 were males respectively and 104 and 96 were female diabetic and non diabetic respectively. At 10days time, the occurrence of Post- surgical visual acuity in diabetic group and non-diabetic group was found to be 0.16 and 0.23 respectively .At three month's time, the occurrence of Post- surgical visual acuity in the diabetic group and the non-diabetic group was found to be 0.32 and 0.39 respectively (table 2). Non- significant results were obtained while comparing the mean. Post- surgical visual acuity in between the two study groups at different time intervals (p value > 0.05). Striate keratopathy was most commonly encountered post- surgical complication in the diabetic group 29 (14.5) and the non-diabetic group 17 (8.5),and followed by Posterior capsular opacity 25 (12.5) and 12 (6.0) and Posterior capsular rent 11.5 and 8 in diabetic and non-diabetic, Pigment dispersion 10.5 and 7.0 percent in diabetic and non-diabetic patients respectively.

**Table1: Gender wise distribution of study population**

Diabetic patients	Diabetic N (%)	Non Diabetic N (%)
Male	96 (48)	104 (52)
Female	104 (52)	96 (48)
Total	200	200

**Table 2: Distribution of cases according to FBS**

FBS	N	%
Normal (70-100)	125	62.5
High(>100)	75	37.5
Total	200	100

**Table 3: Post- surgical visual acuity in subjects of diabetic and control group**

Post- surgical period	Diabetic patients	Non-diabetic patients	p- value
10 days	0.16	0.23	>0.05
Three month	0.32	0.39	>0.05
Six months	0.43	0.52	>0.05

Test applied: student t-test

**Table 4: Complications occurring both study groups**

Complications	Diabetic patients (N)	%	Non-diabetic patients (N)	%
<b>Intra- surgical</b>				
Hyphema	5	2.5	5	2.5
Vitreous loss	9	4.5	9	4.5
Posterior capsular rent	23	11.5	16	8
<b>Post-operative complications</b>				
Striate keratopathy	29	14.5	17	8.5
Pigment dispersion	21	10.5	14	7
Raised intra-ocular pressure	6	3	3	1.5
Posterior capsular opacity	25	12.5	12	6
Wound dehiscence	5	2.5	0	0
Intra-ocular lens displacement	4	2	0	0

### Discussion

In diabetic patients, cataract is one of the major causes of blindness in developing countries. However, the exact pathogenesis of diabetic cataract development is not known. There is associated higher risk of development of complications in diabetic patients undergoing cataract surgery. However, exact incidence of these complications is still unknown.<sup>16-18</sup> hence; under the light of above evidence, we planned the present study to evaluate and compare the prognosis of cataract surgeries in diabetic and non-diabetic patients.

In this study, in diabetic group 104 (52%) were females and 96 (48%) were males. Among the non-diabetics, 96 (48%) were males & 104 (52%) were females. Various studies have proven the prevalence of cataract itself is more common in females than males. In the Framingham eye study also senile lens changes were more common in women. Age related cataract is a bilateral condition, one eye affected earlier than the other.<sup>19</sup>

In the present study, we observed non- significant results while comparing the mean post-surgical visual acuity in between the study group and the control group (p value > 0.05). At 10 days time, the occurrence of Post- surgical visual acuity in diabetic group and non-diabetic group was found to be 0.16 and 0.23 respectively. At three month's time, the occurrence of Post- surgical visual acuity in the diabetic group and the non-diabetic group was found to be 0.32 and 0.39 respectively. Onakpoya OH et al determined the visual outcome of cataract surgery in diabetes mellitus with advanced cataract in a tertiary institution in Nigeria. Twenty three consecutive patients with diabetes and 23 age and sex matched non-diabetic control patients who had extracapsular cataract extraction for advanced cataract. Twenty three patients with diabetes mellitus and 23 non diabetic controls were studied; mean duration of diabetes was  $8.1 \pm 7.2$  years. The mean post-operative visual acuity in diabetics was  $0.11 \pm 0.38$ ,  $0.33 \pm 0.57$  and  $0.38 \pm 0.49$  at one week, two months and six months compared with  $0.23 \pm 0.19$ ,  $0.46 \pm 0.37$  and  $0.48 \pm 0.31$  in non-diabetics. (p=0.207, 0.403 and 0.465 respectively). Improvement in preoperative visual acuity was noted in 84.2% and 90% in diabetics and non-diabetics respectively. Poor visual outcome in diabetics was mainly due to diabetic retinopathy, maculopathy or diabetes related surgical complications. Visual improvement was seen following surgery for advanced cataract in diabetics in this study population. Post-operative monitoring for treatment of diabetic retinopathy may enhance visual outcome.<sup>15</sup>

Lara-Smallling A et al. described preoperative risk factors associated with visual outcomes for diabetic patients undergoing cataract surgery and appropriate nursing interventions for these

patients. Literature review of risk factors and cataract surgery outcomes in terms of complications, visual acuity, and visual functioning of diabetic patients was undertaken. Preoperative risk factors and postoperative complications, including inflammation and cystoid macular edema (CME), were also examined. To emphasize evidence of best practices, the role of the nurse as educator and advocate was further explored in terms of their impact on diabetes management of the patient to improve visual results. Diabetic patients of advanced age, with a history of diabetic retinopathy who are taking insulin and have elevated Hb A1C levels, may have an increased risk of intraoperative and postoperative complications and decreased postoperative visual acuity and visual functions that may affect their quality of life. High-risk factors should be identified in diabetic patients when developing a perioperative patient education plan to help reduce their risk of cataract complications and improve their visual outcomes.<sup>20</sup>

Glycemic control was assessed using fasting blood sugar levels at the time of admission. Of the 200 patients in the diabetic group, 75 (37.5%) had high blood glucose level (FBS: >100mg/dl). Their blood sugar was controlled and they were operated. 125 (62.5%) patients had normal blood sugar levels at the time of examination (70-100mg/dl). All 200 diabetic patients were on treatment for type 2 diabetes mellitus with either injection insulin or oral hypoglycaemic agents.

In this study the development of PCO in diabetics was 25 (12.5%) compared to 12 (6%) in non- diabetics, at the end of 4 weeks, confirming the finding of increase in incidence of PCO in diabetics as shown in previous studies. Study by Ebihara Y et al.<sup>21</sup> also showed significant increase in PCO in diabetic compared to non- diabetic patients. A study by Hyashi K et al. also showed significant increase in PCO in diabetics after cataract extraction compared to non-diabetics.

Pigments over IOL were seen in 4 (2%) of the cases in diabetics as compared to 0 %) in the Non- diabetic group. Previous studies it has been shown that, there is increased pigment dispersion in diabetic patients undergoing cataract extraction and IOL implantation. This may be comparable with: Onakpoya H Oluwatoyin et al.<sup>15</sup> showed increase amount of pigment dispersion occurring in diabetic patients i.e 6 in diabetics and 1 in non-diabetic patient.

Longer duration of surgery is associated with increased post-operative inflammation. Fibrinous exudates & posterior synechiae was not found in our study compared to previous study. None of the patients in our study had anterior segment neovascularization, as reported in previous studies. Smiddy WE et al. determined the frequency of visually significant cataracts after vitrectomy for complications of diabetic retinopathy. They studied 40 patients and 56 concurrent control patients in a retrospective, consecutive, comparative case series in an institutional setting. The rate of cataract extraction after vitrectomy in patients with diabetes is lower than in patients without diabetes undergoing vitrectomy and suggests a lower rate of cataract formation. This inference should be considered when attributing subnormal vision in a patient who has had a diabetic vitrectomy to a cataract. This is especially significant because the risk ratio in patients with diabetes in general and in patients with a previous vitrectomy is likely less favorable compared with the general population.<sup>22</sup>

Kim SJ et al. assessed the incidence or progression of macular edema (ME) after cataract surgery in diabetic patients using optical coherence tomography (OCT) and correlating this with degree of diabetic retinopathy or other risk factors. Fifty diabetic eyes undergoing cataract surgery were analyzed. From the results, they concluded that diabetic eyes have a high incidence of increased center point thickness on OCT after cataract surgery, associated with a loss of vision at 1 month, with limited visual recovery at 3 months. Treatment to prevent this might improve outcomes in similar individuals after surgery.<sup>23</sup>

### Conclusion

From the above results, the authors conclude that diabetic patients should not be refused for cataract surgeries. However, there is need for taking extra-precautions as diabetic subjects might be more prone for surgical associated complications.

### Reference

1. Li L, Wan XH, Zhao GH. Meta-analysis of the risk of cataract in type 2 diabetes. *BMC Ophthalmol.* 2014;14:94.
2. Yanoff M(ed), Duker J.S.(ed) *Ophthalmology.* Fourth edition. Elsevier Inc, 2014. Pp. 541.
3. Chang LK, Sarraf D. Current and future approaches in the prevention and treatment of diabetic retinopathy. *ClinOphthalmol.* 2008;2(2):425-33.
4. Kim SJ, Equi R, Bressler NM. Analysis of macular edema after cataract surgery in patients with diabetes using optical coherence tomography. *Ophthalmology.* 2007;114(5):881-89.
5. Diabetic Retinopathy Clinical Research Network Authors/Writing Committee, Baker CW, Almkhatar T, Bressler NM, Glassman AR, Grover S, et al. Macular edema after cataract surgery in eyes without pre-operative central-involved diabetic macular edema. *JAMA Ophthalmol.* 2013;131(7):870-79.
6. Yang J, Cai L, Sun Z, Ye H, Fan Q, Zhang K, et al. Risk factors for and diagnosis of pseudophakic cystoid macular edema after cataract surgery in diabetic patients. *J Cat and Refractive Surg.* 2017;43(2):207-14.
7. Squirrell D, Bhola R, Bush J, Winder S, Talbot JF. A prospective, casecontrolled study of the natural history of diabetic retinopathy and maculopathy after uncomplicated phacoemulsification cataract surgery in patients with type 2 diabetes. *Br J Ophthalmol.* 2002;86(5):565-71.
8. Romero-Aroca P, de la Riva-Fernandez S, Valls-Mateu A, Sagarra-Alamo R, Moreno-Ribas A, Soler N. Changes observed in diabetic retinopathy: eight-year follow-up of a Spanish population. *Br J Ophthalmol.* 2016;100(10):1366-71.
9. Zaczek A, Olivestedt G, Zetterstrom C. Visual outcome after phacoemulsification and IOL implantation in diabetic patients. *Br J Ophthalmol.* 1999;83(9):1036-41.
10. Dowler JG, Hykin PG, Lightman SL, Hamilton AM. Visual acuity following extracapsular cataract extraction in diabetes: a meta-analysis. *Eye (Lond).* 1995;9( Pt 3):313-17.
11. Krepler K, Biowski R, Schrey S, Jandrasits K, Wedrich A. Cataract surgery in patients with diabetic retinopathy: visual outcome, progression of diabetic retinopathy, and incidence of diabetic macular oedema. *Graefes Arch Clin Exp Ophthalmol.* 2002;240(9):735-38.
12. Ostri C. Intraocular surgery in a large diabetes patient population: risk factors and surgical results. *Acta Ophthalmol.* 2014;92;1:1-13.
13. Pollack A, Leiba H, Bukelman A, Oliver M. Cystoid macular oedema following cataract extraction in patients with diabetes. *Br J Ophthalmol.* 1992;76(4):221-24
14. Dowler JG, Hykin PG, Hamilton AM. Phacoemulsification versus extracapsular cataract extraction in patients with diabetes. *Ophthalmology.* 2000;107(3):457-62.
15. Onakpoya OH, Bekibele CO, Adegbehingbe SA. Cataract Surgical Outcomes In Diabetic Patients: Case Control Study. *Middle East African Journal of Ophthalmology.* 2009;16(2):88-91.
16. Rossetti L, Chaudhuri J, Dickersin K. Medical prophylaxis and treatment of cystoid macular edema after cataract surgery: the results of a meta-analysis. *Ophthalmology.* 1998;105(3):397-405.

17. Heier JS, Topping TM, Baumann W, Dirks MS, Chern S. Ketorolac versus prednisolone versus combination therapy in the treatment of acute pseudophakic cystoid macular edema. *Ophthalmology*. 2000;107(11):2034-38.
18. Flach AJ, Lavelle CJ, Olander KW, Retzlaff JA, Sorenson LW. The effect of ketorolac tromethamine solution 0.5% in reducing postoperative inflammation after cataract extraction and intraocular lens implantation. *Ophthalmology*. 1988;95(9):1279-84
19. Kahn HA, Leibowitz HM, Ganley JP, Kini MM, Colton T, Nickerson RS. The Framingham eye study: I. Outline and major prevalence findings. *Am J Epidemiol*. 1977;106(1):17-32.
20. Lara-Smalling A, Cakiner-Egilmez T. Diabetes and cataract surgery: preoperative risk factors and positive nursing interventions. *Insight*. 2014 Spring;39(2):18-20.
21. Ebihara Y, Kato S, Oshika T, Yoshizaki M, Sugita G. Posterior capsule opacification after cataract surgery in patients with diabetes mellitus. *J Cataract Refractive Surg*. 2006;32(7):1184-7.
22. Smiddy WE1, Feuer W. Incidence of cataract extraction after diabetic vitrectomy. *Retina*. 2004;24(4):574-81.
23. Kim SJ1, Equi R, Bressler NM. Analysis of macular edema after cataract surgery in patients with diabetes using optical coherence tomography. *Ophthalmology*. 2007;114(5):881-9.

Received: 12-09-2020 || Revised: 03-10-2020 || Accepted: 28-10-2020