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Original Research Article

Outcome Assessment of Cataract Surgery in Diabetic and Non-Diabetic Patients: A Prospective Case-Controlled Study

Sangeeta[1], Rajesh Tiwary[2]

[1]Senior Resident, Department of Ophthalmology, Nalanda Medical College and Hospital, Patna, Bihar, India

[2]Professor, Department of Ophthalmology, Nalanda Medical College and Hospital, Patna, Bihar, India

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Corresponding author: Dr. Sangeeta

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Abstract

Aim: The aim of the present study was to compare the visual outcome following cataract surgery in diabetics and non-diabetics.

Material & Methods: A Prospective case-control study including was conducted at department of Ophthalmology for one year. 100 eyes in the diabetic group and 100 eyes in the non-diabetic group that underwent small incision cataract surgery with posterior chamber intraocular lens implantation. Age, sex, surgical technique, follow up and pre- and postoperative best corrected visual acuity (BCVA) were evaluated.

Results: In this study highest number of patients were in the age group of 60-65 years that is 50 (50%) in diabetics & 43 (43%) in control group. In this study patients above 65 years of age were excluded. Remaining 50 (50%) of the patients in diabetics & 57 (57%) of the patients in control group were below 60 years. Of the 100 patients in the diabetic group, majority of patients 65 (65%) had good glycaemic control (FBS: 70 – 110 mg/dl). 5 (5%) patients had low blood sugar levels at the time of examination (<70 mg/dl). Their blood sugar normalized eventually and they were operated. More importantly, 30 (30%) patients had high fasting blood sugar levels (FBS> 110 mg/dl). The highest fasting blood glucose value recorded was 143 mg/dl. The two main co-existing pathologies were psuedoexfoliation and myopia. There were 10 (10%) patients in diabetic group and 12 (12%) patients in the non-diabetic group that had psuedoexfoliation. Among the myopia, there were 5 cases in diabetic group and 6 cases in non-diabetic group. The final visual outcome was recorded using Snellens visual acuity chart and the values were converted to logMAR units for statistical analysis. Majority of the patients, 70 (70%) in the diabetic group and 76 (76%) in the non-diabetic group had visual acuity of 6/12 or better at the end of 6 weeks of follow up. Only 5 patients in the diabetic group and 6 patients in the non-diabetic group had visual acuity less than 6/60.

Conclusion: Cataract surgery in diabetic patients without retinopathy led to favourable and comparable visual outcomes to that of non-diabetics. The incidence of postoperative complication was more in the diabetic group.

Keywords: Cataract; Cataract surgery outcome; Diabetic Cataract; SICS; Visual outcome of cataract surgery

Introduction

Diabetes mellitus is one of the common systemic problems affecting a variety of people worldwide. [1] Epidemiological data suggests that there is an increasing incidence of diabetes mellitus in developing countries. By 2030, it is estimated that global prevalence of diabetes would reach approximately 4.4%. [2] Blindness due to cataract presents an enormous problem in India not only in terms of human morbidity but also in terms of economic loss and social burden. The annual incidence of cataract blindness in India is about 3.8 million. About one sixth of world's total blind with visual acuity >3/60, lives in India. [3] Cataract is the second most common ocular complication of diabetes mellitus after diabetic retinopathy. Diabetes mellitus is a risk factor for development of cataract. [1] Cataracts occur at an early age and 2-5 times more frequently in patients with diabetes, thus visual loss has a significant impact on the working population.

Overall, up to 20% of all cataract procedures are estimated to be performed for diabetic patients. [4] Cataract is a well-recognised complication of diabetes and it has been estimated that up to 20% of all cataract surgery is performed on diabetic patients. [5] Persons with diabetes mellitus have been found to be at increased risk of developing cataract when compared to non-diabetic and nearly two third of the diabetic population shows evidence

of cataract. Studies have shown an increased risk of ocular complications in diabetics after cataract surgery, but modern surgical techniques have minimized them, leading to an overall good visual outcome. Cataract surgery in diabetics is indicated for visual improvement or to allow assessment and treatment of posterior segment pathology. [6]

Diabetes mellitus influences the function and morphology of the eye lens. Poor visual outcome in diabetics has been linked with the severity of retinopathy and maculopathy prior to cataract surgery. Pre-operatively it is recognized that, in diabetics, there is higher incidence of pigment dispersion and fibrinous reaction in the anterior chamber, together with the development of posterior synechiae, as well as increased risk of capsule rupture and vitreous loss. [3] Patients with diabetes mellitus have higher complication rates from cataract surgery. Furthermore some studies have reported that cataract surgery may have adverse effects, including, progression of retinopathy, vitreous hemorrhage, iris neovascularisation and decrease or loss of vision. Both diabetes and cataract pose an enormous health and economic burden, particularly in developing countries, where diabetes treatment is insufficient and cataract surgery often inaccessible . [7]

The increasing incidence of diabetes in developing countries such as India necessitates an assessment of the surgical outcome of diabetic cataract among the study population. This study is being carried out to assess and understand the visual outcome of surgery in Diabetic cataracts with the intention of making recommendations for improved care.

Material & Methods

A Prospective case-control study including was conducted at Department of Ophthalmology, Nalanda Medical College and Hospital, Patna, Bihar, India for the duration of year. A total of 200 patients who were willing to give informed consent and fulfilling the specified inclusion and exclusion criteria were included in the study.

Inclusion criteria

1. Patients who have given informed consent.
2. Patients with Type II diabetes mellitus.
3. Age group 18- 65 years

Exclusion Criteria

1. Patients with traumatic or complicated cataract.
2. Neovascularisation of iris
3. Secondary glaucoma
4. Iridocyclitis
5. Uncontrolled diabetes
6. Posterior segment causes of visual loss in diabetics.

Methodology

- **Pre-operative evaluation:** All patients were admitted to the hospital one day prior to surgery. All these patients underwent pre-operative evaluation and complete ophthalmic examination, including a thorough history with required demographic data. Systemic evaluation was also carried out.
- **Ophthalmic examination included:**

1. Visual acuity was recorded using Snellens E chart and Jaegers near vision chart.
2. Slit lamp Examination.
3. Applanation tonometry using Goldmann Applanation Tonometer.
4. Gonioscopy using Goldmann three-mirror goniolens.
5. Keratometry using Bausch and Lomb keratometer.
6. Axial length measurement using A-Scan.
7. IOL power calculation using SRK formula (A constant 118.2)
8. Posterior segment evaluation by Indirect Ophthalmoscope.
9. Ultrasound scan of the posterior segment (B-scan).

- **Pre-operative preparation:** The day before surgery and hours before surgery one drop of ciprofloxacin eye drops was instilled in the inferior fornix at hourly intervals. Pre op pupillary dilatation was obtained using Tropicamide and phenylephrine 2.5% eye drops instilled thrice an hour prior to surgery.
- **Procedure:** Anaesthesia and akinesia of the globe was achieved with peribulbar block of 4 ml mixture of 2% xylocaine with adrenaline.

Surgery: All patients underwent small incision cataract surgery with posterior chamber intraocular lens implantation under peribulbar anaesthesia. Post-operative evaluation: On the first post-operative day, all the patients were submitted to detailed slit lamp examination and fundus examination. Visual acuity was recorded. The patients were discharged on the second or third post operative day, Assessment of anterior chamber inflammation: Aqueous flare and cells measured by counting within the field visible with a slit lamp keeping the beam at maximum intensity. Describe by The SUN Working Group Grading Scheme for Anterior Chamber Cells & Flare.

Statistical Analysis: Descriptive statistics such as mean, SD and percentage was used to present the data. Comparison between control and diabetic groups was done using chi square test for qualitative data and t-tests for quantitative data. A p-value less than 0.05 was considered as significant. Data was analysed by using software SPSS v16.0.

Results

Table 1: Age distribution

Age Group (Years)	Diabetics	Non-Diabetics
18-29	0	0
30-39	5	2
40-49	15	20
50-59	30	35
60-65	50	43
TOTAL	100	100

In this study highest number of patients were in the age group of 60-65 years that is 50 (50%) in diabetics & 43 (43%) in control group. In this study patients above 65 years of age were excluded. Remaining 50 (50%) of the patients in diabetics & 57 (57%) of the patients in control group were below 60 years.

Table 2: Pre-Operative Gaycaemic Control

Fasting Blood Suger (Mg/Dl)	No. of Patients	Percentage
LOW (<70)	5	5
NORMAL (70-110)	65	65
HIGH (>110)	30	30
TOTAL	100	100%

Of the 100 patients in the diabetic group, majority of patients 65 (65%) had good glycaemic control (FBS: 70 – 110 mg/dl). 5 (5%) patients had low blood sugar levels at the time of examination (<70 mg/dl). Their blood sugar normalized eventually and they were operated. More importantly, 30 (30%) patients had high fasting blood sugar levels (FBS> 110 mg/dl). The highest fasting blood glucose value recorded was 143 mg/dl.

Table 3: Co-existing Ocular Diseases

Ocular Diseases	Diabetics	% Age	Non- Diabetics	% Age
Psuedoexfoliation	10	10	12	12
Myopla	5	5	6	6
Total	15	15	18	18

The two main co-existing pathologies were psuedoexfoliation and myopia. There were 10 (10%) patients in diabetic group and 12 (12%) patients in the non-diabetic group that had psuedoexfoliation. Among the myopia, there were 5 cases in diabetic group and 6 cases in non-diabetic group.

Table 4: Final Visual Outcome

Visual Acuity	Diabetics	% Age	Non- Diabetics	% Age
<6/60	5	5	5	5
6/60 – 6/36	10	10	7	7
6/24 – 6/18	15	15	12	12
≥ 6/12	70	70	76	76
TOTAL	100	100	100	100

The final visual outcome was recorded using Snellens visual acuity chart and the values were converted to logMAR units for statistical analysis. Majority of the patients, 70 (70%) in the diabetic group and 76 (76%) in the non-diabetic group had visual acuity of 6/12 or better at the end of 6 weeks of follow up. Only 5 patients in the diabetic group and 6 patients in the non-diabetic group had visual acuity less than 6/60. The mean post-operative best corrected visual acuity in logMAR units in the diabetic group was 0.32 + 0.4 and in the control group was 0.29 +0.5. On comparing the post op values in both the groups the p value was (<0.2) which was not statistically significant. On comparing the pre-operative and post-operative visual acuity in both the groups the p value (0.01) was statistically significant.

Table 4: Post-op complications

Post-op complications	Diabetics	% Age	Non- Diabetics	% Age
Striate keratopathy	15	15	10	10
Pigment dispersion	7	7	6	6
Anterior chamber reaction	34	34	20	20
Cystoid macular edema	15	15	5	5
Posterior capsule opacification	5	5	2	2
Corneal edema	30	30	16	16

Corneal edema was found in 30 (30%) and 16 (16%) of the cases in diabetic and non-diabetic groups respectively which was considerably higher in diabetics compared to non-diabetics. Striate keratopathy was found in 15 (15%) of the diabetics compared to 10 (10%) in non-diabetics. Pigments over IOL were seen in 7 (7%) of the cases in diabetics as compared to 6 (6%) in the control group. In this study, total 32 (32%) eyes in the diabetic group and 20 (20%) eyes in the non diabetic group had anterior chamber reaction. Cystoid macular edema was noted in 15 (15%) of diabetic and 5 (5%) of non-diabetic eyes post operatively. In this study the development of PCO in diabetics was 5 eyes (5%) compared to 2 eyes (2%) in non-diabetics, at the end of 6 weeks.

Discussion

Diabetes mellitus is one of the common systemic problems affecting a variety of people worldwide. Epidemiological data suggests that there is an increasing incidence of diabetes mellitus in developing countries. By 2030, it is estimated that global prevalence of diabetes would reach approximately 4.4%. [8] Cataract is the second most common ocular complication of diabetes mellitus after diabetic retinopathy. Diabetes mellitus is a risk factor for development of cataract. Approximately, two third of the diabetic population shows evidence of cataract. Diabetes mellitus influences the function and morphology of the lens. Cataracts occur at an early age in diabetics compared to non- diabetics [9] and 2-5 times more common in diabetic patients. So cataract surgery in diabetics is often done earlier. Apart from visual improvement, diabetic patients need cataract surgery for the assessment and treatment of posterior segment pathology. In India approximately 20% of all cataract surgery is done in diabetics. [10] Population growth, ageing, urbanization, sedentary lifestyles and an increasing prevalence of obesity are increasing the number of people with diabetes mellitus. Worldwide more than 285 million people are affected by diabetes mellitus. This number is expected to increase to 439 million by 2030 according to the International Diabetes Federation. Globally, cataracts remain the leading cause of blindness, affecting approximately 18 million people. Cataracts occur at an early age and 2-5 times more frequently in patients with diabetes, thus visual loss has a significant impact on the working population. Overall, upto 20% of all cataract procedures are estimated to be performed for diabetic patients. [11]

In this study highest number of patients were in the age group of 60-65 years that is 50 (50%) in diabetics & 43 (43%) in control group. In this study patients above 65 years of age were excluded. Remaining 50 (50%) of the patients in diabetics & 57 (57%) of the patients in control group were below 60 years. 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. [12] Of the 100 patients in the diabetic group, majority of patients 65 (65%) had good glycaemic control (FBS: 70 – 110 mg/dl). 5 (5%) patients had low blood sugar levels at the time of examination (<70 mg/dl). Their blood sugar normalized eventually and they were operated. More importantly, 30 (30%) patients had high fasting blood sugar levels (FBS> 110 mg/dl). The highest fasting blood glucose value recorded was 143 mg/dl. The two main co-existing pathologies were psuedoexfoliation and myopia. Larsson et al. 7 have shown that diabetes has been associated with structural changes in corneal endothelial cells such as polymegathism and pleomorphism. The cornea has been reported to be thicker in eyes of diabetic patients than in eyes of non-diabetic subjects. [13]

There were 10 (10%) patients in diabetic group and 12 (12%) patients in the non-diabetic group that had psuedoexfoliation. Among the myopia, there were 5 cases in diabetic group and 6 cases in non-diabetic group. The final visual outcome was recorded using Snellens visual acuity chart and the values were converted to logMAR units for statistical analysis. Majority of the patients, 70 (70%) in the diabetic group and 76 (76%) in the non-diabetic group had visual acuity of 6/12 or better at the end of 6 weeks of follow up. Only 5 patients in the diabetic group and 6 patients in the non-diabetic group had visual acuity less than 6/60. The mean post-operative best corrected visual acuity in logMAR units in the diabetic group was 0.32 + 0.4 and in the control group was 0.29 +0.5. On comparing the post op values in both the groups the p value was (<0.2) which was not statistically significant. On comparing the pre-operative and post-operative visual acuity in both the groups the p value (0.01) was statistically significant. Corneal edema was found in 30 (30%) and 16 (16%) of the cases in diabetic and non-diabetic groups respectively which was considerably higher in diabetics compared to non-diabetics. The study by Morikuba S et al [14] has shown increase in the corneal thickness was greater on post-op day one among diabetic patients. Striate keratopathy was found in 15 (15%) of the diabetics compared to 10 (10%) in non-diabetics. Pigments over IOL were seen in 7 (7%) of the cases in diabetics as compared to 6 (6%) in the control group. Onakpoya H Oluwatoyin et al [15] showed increase amount of pigment dispersion occurring in diabetic patients compared to control, 6 in diabetics and 1 in control. In this study, total 32 (32%) eyes in the diabetic group and 20 (20%) eyes in the non-diabetic group had anterior chamber reaction. Cystoid macular edema was noted in 15 (15%) of diabetic and 5 (5%) of non-diabetic eyes post operatively. In this

study the development of PCO in diabetics was 5 eyes (5%) compared to 2 eyes (2%) in non-diabetics, at the end of 6 weeks. The study by Ebihara Y et al [16] also showed significant increase in PCO in diabetic compared to non-diabetic patients.

Conclusion

In this comparative study, the pre-operative best corrected visual acuity was compared to the post-operative best corrected visual acuity in both the groups and the P value was statistically significant (p=0.01). The post-operative complications that were observed during the period of this study were posterior capsular opacification, corneal edema, striate keratopathy, anterior chamber reaction, pigment dispersion over IOL, cystoid macular edema and vitreous loss. These were significantly more in the diabetic group when compared to the non- diabetics. Therefore, we concluded that small incision cataract surgery in diabetics without diabetic retinopathy yields similar visual outcomes as non-diabetics. There is a higher incidence of post- operative complications among diabetics, so extra care should be taken intra-operatively and during post-op follow up.

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