ORIGINAL ARTICLE

INTRAOPERATIVE AND POSTOPERATIVE COMPLICATION OF CATARACT SURGERY IN DIABETES

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Background: The incidence of diabetes worldwide is rising; cataract is a common ocular pathology and phacoemulsification with IOL implantation the preferred treatment. Objective of this study was to assess the visual acuity and rate of intraoperative and postoperative complications in eyes of diabetic and non-diabetic patients undergoing cataract surgery by phacoemulsification. **Methods:** In this quasi experimental study 200 eyes of 200 patients (100 diabetic, 100 non-diabetic) underwent phacoemulsification surgery. Best corrected visual acuity (BCVA), intraoperative, postoperative complications were measured and compared in both groups before and after surgery up to 4 months. **Results:** In 200 samples the ages were 56.6±6.3 years, 54% were male, 50% were diabetic. Among non-diabetics 76% had BCVA 6/6–6/12 postop, 24% had BCVA of 6/18 or >6/18 postop, 4% had uveitis, 42% had mild keratopathy, 8% had severe keratopathy and 10% had had (posterior capsular opacity) PCO. In diabetics 52% had BCVA 6/6–6/12 postop, 50% had BCVA of 6/18 or >6/18 postop, 28% had uveitis, 26% had mild keratopathy, 24% had severe keratopathy, 18% had worsening of retinopathy, and 30% PCO (p<0.05). Two percent non-diabetics had iris trauma; 4% diabetics had posterior capsular rupture (PCR), 2% had dropped nucleus and 6% had iris trauma. Intraoperative parameters were statistically insignificant (p>0.05). **Conclusion:** In cataract surgeries with phacoemulsification postoperative complication rate were found significantly higher in diabetics with non-diabetics achieving a better postoperative visual acuity. No significant differences in intraoperative complication rate were found among the cases.

Keywords: Diabetes, Phacoemulsification, Cataract, Complications

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INTRODUCTION

The diabetic population of the world is estimated to reach 439 million by the year 2030 according to the international diabetes federation and around 289 million are affected already.[1] In 2021, 33 million adults in Pakistan are living with diabetes.[2] Diabetes-induced microangiopathy causes diabetic retinopathy, neuropathy[3] and nephropathy. In recent times, retinal vasculopathy has been suggested to be not only aggravated but also preceded by retinal neurodegenration.[4-5] Retinal neurodegeneration secondary to diabetes demonstrates clinically as reduction in the retinal nerve fibre layer, Muller cells, along with ganglion cell layer.[6,7] Electrophysiology might show spatial frequency changes and colour vision loss.[8,9] Diabetes not only involves the retina but also roots structural and morphological amendments in other structures of the eye including cornea, tear film, and crystalline lens, changing the optical quality of diabetic eye.

Throughout the world, one of the foremost causes of vision loss is cataract affecting roughly eighteen million people.[1] The incidence of cataract is increasing in diabetics and causing visual impairment.[10] Many clinical studies show cataract tend to occur with more frequency and manifest at a younger age in diabetics.[11] A large proportion of all cataract surgeries are of diabetics.[12]

Cataract surgeries are the mainstay treatment modality for cataract among diabetics and non-diabetics. The aim of this study was to compare the visual outcomes and rate of intraoperative and postoperative complications among these groups over a follow up of 4 months.

MATERIAL AND METHODS

This quasi experimental study was conducted at the Layton Rahmatullah Benevolent Trust (LRBT) tertiary teaching eye hospital Korangi, Karachi from Feb to May 2023. After obtaining approval from the hospital ethical review committee, non-probability consecutive sampling technique was used and included a total of 200 eyes of 100 non-diabetic patients (Group I) and 100 diabetics for at least 5 years (Group II). Written informed consent was obtained from all patients in the study.

The inclusion criteria were: patients with cataract, patients aged 40 or above, patients who could undergo phacoemulsification surgery, informed consent of the patient and compliance of the related risk and ability for regular follow-ups. The study excluded patients less than 40 years old, patients with any active ocular surface disease, only eyed patients and patients having history of any previous surgery, uveitis,

glaucoma, retinal breaks/detachment, retinal vein occlusion, corneal disease, and other severe pathologies.

Before the phacoemulsification cataract surgery patients age, sex, diabetic status, best corrected visual acuity (BCVA) on a Snellen's chart and intraocular pressure (IOP) with a Goldman applanation tonometer were recorded. Detailed slit-lamp examination and dilated fundoscopy was performed and the presence along with grade of cataract was observed.

Biometry was performed. The pupil was dilated using tropicamide 1% and proparacaine drops were used as topical anaesthesia, 2–3 mL of local anaesthetic (Lidocaine 2% and Bupivacaine 0.7%) was injected peri-bulbar. Phacoemulsification on the same machine (Oertli CataRhex 3) was performed under strict aseptic measures by the same surgeon and the same intraocular foldable lens was implanted. Intraoperative complications such as posterior capsular rupture (PCR), dropped nuclear fragments and iatrogenic iris trauma were noted. All patients were prescribed topical combination of moxifloxacin 0.5% and dexamethasone 0.1% after the surgery. All patients were called for follow-ups at 1st day and subsequently at week 1, 4, 8 and 16. Postoperatively patients' BCVA using Snellen's chart, and IOP with Goldman applanation tonometer were measured at every visit and dilated fundoscopy was performed. Postoperative complications such as uveitis, keratopathy, worsening of retinopathy and early posterior capsular opacity (PCO) were noted and compared in both groups.

Data were analysed using SPSS-23. Mean±SD was reported for age (years), counts with percentages were reported for postoperative and intraoperative parameters of diabetic and non-diabetic samples. Fisher's Exact test was used to check the association between groups, and $p \leq 0.05$ was considered statistically significant.

RESULTS

There were a total of 200 patients, 50% were diabetic and 54% were male. Patients' mean age was 56.6±6.3 years. (Table-1).

Table-2 shows the postoperative parameters. Among non-diabetic patients 76% had visual acuity 6/6–6/12, 24% patients had visual acuity of 6/18 or >6/18, 4% had uveitis, 42% had mild keratopathy, 8% had severe keratopathy, none had worsening of retinopathy, and 10% had early PCO. Among diabetic cases 52% had visual acuity 6/6–6/12, 50% cases had visual acuity of 6/18 or >6/18, 28% had uveitis, 26% had mild keratopathy, 24% had severe keratopathy, 18% had worsening of retinopathy, and 30% had early PCO. All the parameters except for keratopathy were significant ($p<0.05$).

Table-3 reports association of the intraoperative studied parameters. Among non-diabetic samples only 2% were found with iris trauma, whereas among diabetic samples 4% had PCR, 2% had dropped nucleus and 6% had iris trauma. Association of intraoperative parameters with studied group was statistically insignificant ($p>0.05$).

Table-1: Baseline characteristics of patients (n=200)

Variables		Number	Percentage
Group	Non-Diabetic	100	50
	Diabetic	100	50
Gender	Male	108	54
	Female	92	46
Age (Years)		56.6±6.3	

Table-2: Postoperative parameters in study groups

Parameters		Non-diabetic (%)	Diabetic (%)	*p*
Visual aquity 6/6–6/12	Yes	76	52	0.021*
	No	24	48	
Visual aquity of 6/18 or >6/18	Yes	24	50	0.012*
	No	76	50	
Uveitis	Yes	4	28	0.002*
	No	96	72	
Keratopathy	No	50	50	0.056
	Mild	42	26	
	Severe	8	24	
Worsening of retinopathy	Yes	0	18	0.001*
	No	100	82	
Early PCO	Yes	10	30	0.023*
	No	90	70	

*Significant, (Fisher's Exact test)

Table-3: Intraoperative parameters in study groups (Fisher's Exact test)

Parameters		Non-diabetic (%)	Diabetic (%)	*p*
PCR	Yes	0	4	0.49
	No	100	96	
Dropped nucleus	Yes	0	2	0.99
	No	100	98	
Iris trauma	Yes	2	6	0.61
	No	98	94	

DISCUSSION

Cataract surgery is the treatment of choice for cataracts. Many considerations are to be made during surgery in a diabetic patient, improved visual outcomes in diabetes have also come as a consequence of a lean in tendency towards earlier cataract extracions.[13] Phacoemulsification with intraocular lens placement supersedes extracapsular cataract surgery as it has less inflammation and better visual results.[14] Diabetic eyes suffer from a greater frequency of anterior capsular phimosis.[15] The capsulorhexis size, therefore should be larger than normal but smaller than intraocular lens optic diameter to prevent anterior IOL dislodgment and posterior capsular opacification (PCO).[16] Postoperative treatment of peripheral retinal pathologies is assisted by a larger optic size.[17] Augmented risk of progression of retinopathy and successive visual compromise come as a consequence of lengthier duration and cataract surgery being complicated.[18] In diabetic patients, there is high likelihood of damage to pupillary parasympathetic supply with a resulting poor pupillary dilatation.[19] Cetinkaya *et al*[20] showed that for the duration of cataract surgery photic maculopathy was more common in diabetic patients than non-diabetics. Wound healing is impaired in diabetes as a result of poor epithelial and stem cell proliferation.[21] Diabetics also have a greater incidence and rate of corneal endothelial cell loss.[21,22] A routine specular microscopy is therefore suggested for all

people with diabetes, and while operating on diabetic patients a greater care to prevent endothelial cell damage should be taken.

In our study there was significant association of increased post-operative complications in patients with diabetes, although none of the group I had posterior capsular rupture whereas two PCR alone with two cases of dropped nucleus with PCR was noted in group II; the sample size is not significant to give a definite remark on the intraoperative complications.

As demonstrated by Dorotea Ivanic *et al*[23] after cataract surgery in patients with diabetes mellitus type 1 and type 2, the postoperative complications were more often than in patients with cataract who did not suffer from a systematic or local disease. Validated by Chancellor J *et al*[24], higher rates of posterior capsular rupture and dropped nuclear fragments was observed in diabetics. On the contrary, Kelkar A *et al*[12] found that the mere presence of diabetes does not increase the risk of intraoperative complications such as posterior capsular rupture, zonular dehiscence, and vitreous loss.

CONCLUSION

Post-operative visual outcomes were affected and patients with diabetes had a final best corrected visual acuity less favourable than those without diabetes. The postoperative complication rates were higher in those who suffered from diabetes. Further studies and data are required to investigate this.

REFERENCES

1. Wild S, Roglic G, Green A, Sicree R, King H. Global prevalence of diabetes: estimates for the year 2000 and projections for 2030. Diabetes Care 2004;27(5):1047–53.
2. International Diabetes Federation (IDF). Diabetes Atlas, 9th ed. Brussels, Belgium: International Diabetes Federation; 2019.
3. Wong TY, Cheung CM, Larsen M, Sharma S, Simó R. Diabetic retinopathy. Nat Rev Dis Primers 2016;2:16012.
4. Wang W, Lo ACY. Diabetic Retinopathy: Pathophysiology and treatments. Int J Mol Sci 2018;19(6):1816.
5. Simó R, Hernández C; European Consortium for the Early Treatment of Diabetic Retinopathy (EUROCONDOR). Neurodegeneration in the diabetic eye: new insights and therapeutic perspectives. Trends Endocrinol Metab 2014;25(1):23–33.
6. Carpi-Santos R, de Melo Reis RA, Gomes FCA, Calaza KC. Contribution of Müller cells in the diabetic retinopathy development: Focus on oxidative stress and inflammation. Antioxidants (Basel) 2022;11(4):617.
7. Lai D, Wu Y, Shao C, Qiu Q. The role of Müller cells in diabetic macular edema. Invest Ophthalmol Vis Sci 2023;64(10):8.
8. Ba-Ali S, Larsen M, Andersen HU, Lund-Andersen H. Full-field and multifocal electroretinogram in non-diabetic controls and diabetics with and without retinopathy. Acta Ophthalmol 2022;100(8):e1719–28.
9. Di Leo MA, Caputo S, Falsini B, Porciatti V, Greco AV, Ghirlanda G. Presence and further development of retinal dysfunction after 3-year follow up in IDDM patients without angiographically documented vasculopathy. Diabetologia 1994;37(9):911–6.
10. Harding JJ, Egerton M, van Heyningen R, Harding RS. Diabetes, glaucoma, sex, and cataract: analysis of combined data from two case control studies. Br J Ophthalmol 1993;77(1):2–6.
11. Mrugacz M, Pony-Uram M, Bryl A, Zorena K. Current approach to the pathogenesis of diabetic cataracts. Int J Mol Sci 2023;24(7):6317.
12. Kelkar A, Kelkar J, Mehta H, Amoaku W. Cataract surgery in diabetes mellitus: A systematic review. Indian J Ophthalmol 2018;66(10):1401–10.
13. Chew EY, Benson WE, Remaley NA, Lindley AA, Burton TC, Csaky K, *et al*. Results after lens extraction in patients with diabetic retinopathy: early treatment diabetic retinopathy study report number 25. Arch Ophthalmol 1999;117(12):1600–6.
14. Saad Filho R, Moreto R, Nakaghi RO, Haddad W, Coelho RP, Messias A. Costs and outcomes of phacoemulsification for cataracts performed by residents. Arq Bras Oftalmol 2020;83(3):209–14.
15. Kato S, Oshika T, Numaga J, Hayashi Y, Oshiro M, Yuguchi T, Kaiya T. Anterior capsular contraction after cataract surgery in eyes of diabetic patients. Br J Ophthalmol 2001;85(1):21–3.
16. Takamura Y, Tomomatsu T, Yokota S, Matsumura T, Takihara Y, Inatani M. Large capsulorhexis with implantation of a 7.0 mm optic intraocular lens during cataract surgery in patients with diabetes mellitus. J Cataract Refract Surg 2014;40(11):1850–6.
17. Saxena S, Mitchell P, Rochtchina E. Five-year incidence of cataract in older persons with diabetes and pre-diabetes. Ophthalmic Epidemiol 2004;11(4):271–7.
18. Go JA, Mamalis CA, Khandelwal SS. Cataract surgery considerations for diabetic patients. Curr Diab Rep 2021;21(12):67.
19. Cahill M, Eustace P, de Jesus V. Pupillary autonomic denervation with increasing duration of diabetes mellitus. Br J Ophthalmol 2001;85(10):1225–30.
20. Cetinkaya A, Yilmaz G, Akova YA. Photic retinopathy after cataract surgery in diabetic patients. Retina 2006;26(9):1021–8.
21. Shih KC, Lam KS, Tong L. A systematic review on the impact of diabetes mellitus on the ocular surface. Nutr Diabetes 2017;7(3):e251.
22. Yang R, Sha X, Zeng M, Tan Y, Zheng Y, Fan F. The influence of phacoemulsification on corneal endothelial cells at varying blood glucose levels. Eye Sci 2011;26(2):91–5.
23. Ivancić D, Mandić Z, Barać J, Kopić M. Cataract surgery and postoperative complications in diabetic patients. Coll Antropol 2005;29(Suppl 1):55–8.
24. Chancellor J, Soliman MK, Shoults CC, Faramawi MF, Al-Hindi H, Kirkland K, *et al*. Intraoperative complications and visual outcomes of cataract surgery in diabetes mellitus: a multicenter database study. Am J Ophthalmol 2021;225:47–56.

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