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Original Research Article

To evaluate the visual outcome after phacoemulsification in diabetic patient and non-diabetic patient

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Abstract

Background: This study investigates visual outcomes after phacoemulsification in non-diabetic and diabetic patients, highlighting cataract as a complication of diabetes mellitus, which affects 285 million people globally. Cataract is the leading cause of blindness, impacting 18 million people worldwide, particularly in developing countries. In India, diabetes-induced cataracts account for 20% of cases. Despite advancements in phacoemulsification making cataract surgery safer and more predictable with rapid visual recovery, diabetic patients still experience poorer visual prognoses. This is attributed to elevated osmotic stress, oxidative stress, and non-enzymatic glycation of lens proteins.

Materials and Methods: The study involved 398 participants, evenly split into diabetic and non-diabetic groups aged 50 to 80 years. The selection criteria included visual acuity (VA) less than 6/18, well-controlled diabetes, and the absence of retinopathy and macular oedema. Post-operative uncorrected visual acuity (UCVA) and best-corrected visual acuity (BCVA) were recorded at 15-day intervals up to 45 days for all patients. Data were compiled using Microsoft Office 2010 and exported to SPSS version 29.0.01 (IBM SPSS) for analysis.

Results: Indicated that younger patients had significantly better visual outcomes compared to older patients. Although both groups showed substantial improvement after cataract surgery, diabetic patients had poorer postoperative visual outcomes.

Conclusion: Phacoemulsification significantly improves visual outcomes in both diabetic and non-diabetic patients; however, diabetic patients, despite having well-controlled diabetes and no retinopathy or macular oedema, demonstrate comparatively poorer postoperative visual recovery. Younger patients tend to achieve better results, highlighting the influence of age and underlying metabolic factors on surgical prognosis.

Keywords: Diabetes, Cataract, Phacoemulsification

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1. Introduction

Cataract is the most common curable disorder in the eye. Diabetes mellitus affects around 285 million people worldwide. Globally, cataracts remain the major cause of blindness, affecting around 18 million people.[1] It continues to be one of the leading causes of vision impairment globally and a major issue for ophthalmic public health across developing countries.[2] After diabetic retinopathy, cataracts are the second most prevalent visual problem associated with diabetes mellitus.[3,15] It is predicted that 4.4% of people worldwide will have diabetes by 2030.[4] Cataracts arise at an earlier age in diabetics compared to non-diabetics and are 2-5 times more common in diabetic patients. In diabetics, cataract surgery is recommended to enable the assessment and treatment of retinopathy in addition to improving visual acuity.[5,6] The visual prognosis for patients with diabetes is not as good as it is for people without the disease, even though improved methods have made cataract surgery safe and predictable.[7] After cataract surgery, retinopathy advances more quickly in diabetic patients, and a ruptured capsule may contribute to rubeosis. Timely laser

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therapy and close monitoring are required.[8] In addition, phacoemulsification offers a quick visual recovery compared to earlier cataract surgery techniques.[9,10] The Wisconsin study identified that the ten-year cumulative incidence of cataract surgery was 27% in patients with early onset diabetes and 44% in cases with older onset disease.[11] Diabetic cataract aetiology has been investigated via multiple routes, including elevated osmotic stress, oxidative stress, and non-enzymatic glycation of lens protein.[12] Diabetes patients are more at risk of intra- and post-operative complications, resulting in comparatively poor outcomes.[13] This shows that the present visual prognosis after cataract surgery is generally excellent in diabetics. According to earlier research, 62%–89% of diabetics have satisfactory visual outcomes (VA of 6/12 or higher on the Snellen, or a similar VA notation).[14] A significant health and financial burden is associated with both diabetes and cataracts, especially in underdeveloped nations where availability to cataract surgery is frequently restricted and diabetes management is insufficient.[15] This study was designed to evaluate the visual outcome after phacoemulsification with non-diabetic and diabetic patients.

2. Materials and Methods

This cross-sectional study was conducted at the Department of Ophthalmology, Hind Hospital Barabanki, Uttar Pradesh. A total of 398 patients were included using non-probability purposive sampling, comprising 199 diabetic and 199 non-diabetic individuals. The study aimed to assess the prognosis of cataract surgery in both diabetic and non-diabetic groups over two months.

2.1. Inclusion criteria

In this study participants included were in age between 50 to 80 years, best corrected visual acuity (BCVA) less than 6/18, well-controlled diabetes without retinopathy or macular oedema, and voluntary participation with informed consent.

2.2. Exclusion criteria

In this study excluded patients were other systemic co-morbidities, mature or hyper-mature cataracts, and ocular disorders affecting vision.

2.3. Study procedure

A comprehensive eye examination, including visual acuity testing using Snellen's chart at 6 meters for distance and 40cm for near vision, was conducted. Patients were categorized into two groups based on visual acuity: good vision (6/12 to 6/6) and poor vision (≥6/18). Postoperative visual acuity assessments, including uncorrected visual acuity (UCVA) and BCVA, were performed at 15-day, 30-day, and 45-day intervals for all patients. Data were compiled and entered into Microsoft Office 2010 before being exported to the data editor page of SPSS version 29.0.01 (IBM SPSS). Descriptive statistics, including percentages, means, and standard deviations, were calculated, with a significance level set at ≤0.05.

3. Result

The study comprised 199 patients, with 116 males (58.3%) and 83 females (41.7%). As illustrated in **Figure 1**, the age distribution of the participants is divided into three groups: Group A consists of 127 individuals (63.8%) aged 51-60 years, Group B includes 43 individuals (21.6%) aged 61-70 years, and Group C has 29 individuals (14.6%) aged 71-80 years, as detailed in **Table 1**.

Among the patients, 100 (50.3%) were diabetic, 70 (36.2%) were non-diabetic, and 27 (13.6%) had other systemic illnesses (**Figure 2**). In our study, 100 patients (50%) had diabetes, with 29 (29%) also having an associated eye disorder, while 71 (71%) did not. There were 72 healthy patients with no associated disorders. Among the 27 patients with other systemic disorders, 2 were diabetic and 25 were non-diabetic (**Table 2**).

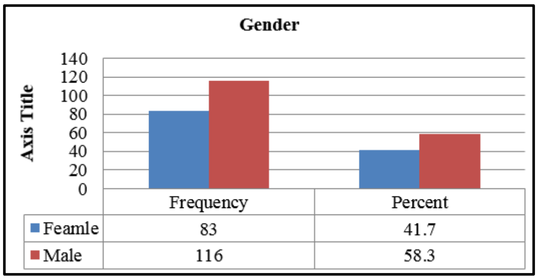

Figure 1: Gender distribution

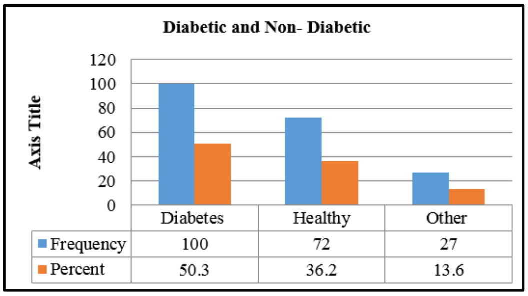

Figure 2: Diabetic and Non-Diabetic

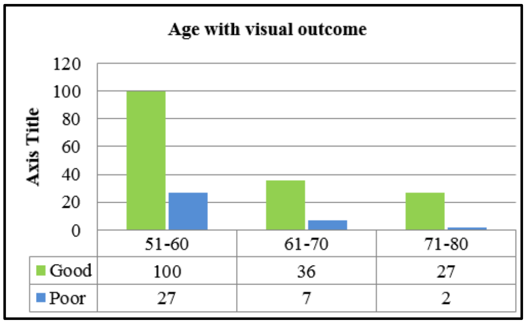

Figure 3: Age with visual outcome distribution

Table 1: Age group distribution

Age Group	Frequency	Percent
51-60	127	63.8
61-70	43	21.6
71-80	29	14.6
Total	199	100.0

Table 2: Systemic with associated Cross tabulation

Systemic with associated Cross tabulation				
		Associated eye disorder		Total
		Diabetic retinopathy	Normal	
Systemic	Diabetic	29	71	100
	Healthy	0	72	72
	Other	2	25	27
Total		31	168	199

Table 3: Systemic with gender cross-tabulation

Systemic with Gender Cross tabulation				
		Gender		Total
		Male	Female	
Systemic	Diabetic	67	33	100
	Healthy	27	45	72
Total		94	78	172

Table 4: Systemic disorder with 15-day visual acuity

Systemic disorder with 15-day visual acuity						P value
			Poor	Good	Total	<0.001
Systemic	Diabetic	Count	70	30	100	
		% within Systemic	70.0%	30.0%	100.0%	
	Healthy	Count	34	38	72	
		% within Systemic	47.2%	52.8%	100.0%	
	Other	Count	24	3	27	
		% within Systemic	88.9%	11.1%	100.0%	
Total		Count	128	71	199	
		% within Systemic	64.3%	35.7%	100.0%	

Table 5: Systemic disorder with 30-day visual acuity

Systemic disorder with 30-day visual acuity						p-value
			Visual outcome		Total	0.031
			Poor	Good		
Systemic	Diabetic	Count	37	63	100	
		% within Systemic	37.0%	63.0%	100.0%	
	Healthy	Count	14	58	72	
		% within Systemic	19.4%	80.6%	100.0%	
Total		Count	51	121	172	
		% within Systemic	29.6%	70.4%	100.0%	

Table 6: Systemic disorder with 45-day visual acuity

Systemic disorder with 45-day visual acuity						P value
			Visual outcome		Total	<0.001
			Poor	Good		
Systemic	Diabetic	Count	29	71	100	
		%	29.0%	71.0%	100.0%	
	Healthy	Count	2	70	72	
		% within Systemic	2.8%	97.2%	100.0%	
Total		Count	31	141	172	
		% within Systemic	18.1%	81.9%	100.0%	

In our study, out of 172 patients, 100 (50%) were diabetic and 72 (36.2%) were non-diabetic. Among the diabetic patients, 33% were female and 67% were male, as shown in **Table 3**.

Among the 172 patients in our study, 100 (58.1%) were diabetic, and 72 (41.86%) were non-diabetic. By the 15th postoperative day, 70 (70%) of the diabetic patients had poor visual acuity, while 30 (30%) had good visual acuity. In contrast, 34 (47.2%) of the non-diabetic patients had poor visual acuity, and 38 (52.8%) had good visual acuity. Additionally, 24 non-diabetic patients had good vision, and 3 had poor vision. By the end of the research (45 days post-operative), both diabetic and non-diabetic patients had normal vision, as shown in **Table 4**.

Thirty days post-operation, 37 diabetic patients (37%) had poor visual acuity, while 63 (63%) had good visual acuity. Among non-diabetic patients, 14 (19.4%) had poor visual acuity, and 58 (80%) had good visual acuity, as shown in **Table 5**.

Forty-five days post-operation, 29 diabetic patients (29%) had poor visual acuity, while 71 (71%) had good visual acuity. In contrast, among non-diabetic patients, 2 (2.8%) had poor visual acuity, and 70 (97.2%) had good visual acuity, as shown in **Table 6**. The p-value was significant at <0.001.

Visual outcomes by age group show that patients aged 51-60 had a high rate of good visual acuity, with 100 (50%) having good outcomes and 27 (13.5%) having poor outcomes. In the 61-70 age group, 36 (18%) had good visual acuity, while 7 (3.5%) had poor outcomes. Among patients aged 71-80, 27 (13.5%) had good visual acuity, and 3 (1.5%) had poor outcomes, as illustrated in **Figure 3**.

At the end of the study, visual outcomes were significantly better in the younger age group, while the older age group had fewer good visual outcomes.

4. Discussion

This study analyzed the visual outcomes of 199 patients, comprising 116 males (58.3%) and 83 females (41.7%). The participants were divided into three age groups: Group A (51-60 years) with 127 individuals (63.8%), Group B (61-70 years) with 43 individuals (21.6%), and Group C (71-80 years) with 29 individuals (14.6%).

In the present study, the Phacoemulsification procedure was utilized for cataract surgery. Earlier studies on ECCE suggest that a relatively less favourable outcome of ECCE-posterior chamber IOL surgery in diabetics, with or without nonproliferative retinopathy, is due to greater frequency of retinopathy or other ophthalmic disease responsible for decreased vision. Based on this study and all available information, guidelines regarding diabetes mellitus and intraocular lens implantation are presented.[14]

Earlier studies on Small incision cataract surgery suggest that there is a higher incidence of postoperative complications among diabetics, which can be managed conservatively. So extra care should be taken intra-operatively and during post-op follow-up.[3]

A significant portion of the study population had diabetes, with 100 patients (50.3%) diagnosed as diabetic, 70 patients (36.2%) as non-diabetic, and 27 patients (13.6%) with other systemic illnesses (**Figure 2**). Among the diabetic patients, 29 (29%) had associated eye disorders, while 71 (71%) did not. The non-diabetic group included 72 healthy patients with no associated disorders. Among the 27 patients with other systemic disorders, 2 were diabetic and 25 were non-diabetic.

Post-operative visual outcomes were closely monitored, revealing notable differences between diabetic and non-diabetic patients. By the 15th day, post-operation, 70 (70%) of diabetic patients had poor visual acuity, compared to 34 (47.2%) of non-diabetic patients. Conversely, 30 (30%) of diabetic patients and 38 (52.8%) of non-diabetic patients exhibited good visual acuity. By the end of the study (45 days post-operative), all patients had normal vision.

Further analysis at 30 days post-operation showed that 37 (37%) of diabetic patients had poor visual acuity, while 63 (63%) had good visual acuity. Among non-diabetic patients, 14 (19.4%) had poor visual acuity, and 58 (80%) had good visual acuity (**Table 5**).

Visual outcomes in diabetic patients after phacoemulsification with intra-ocular lens implants are comparable to the results in non-diabetic patients if the diabetics have no retinopathy and have good glycemic control.[13]

In our study, visual outcomes varied by age group. Patients aged 51-60 had the highest rate of good visual acuity, with 100 (50%) achieving good outcomes and 27 (13.5%) experiencing poor outcomes. In the 61-70 age group, 36 (18%) had good visual acuity, while 7 (3.5%) had poor outcomes. In our study, younger patients showed significantly better visual outcomes compared to older patients.

5. Conclusion

In conclusion, our study highlights that diabetic patients generally had poorer visual outcomes post-operatively compared to non-diabetic patients, although both groups showed significant improvement by the end of the study period. Additionally, younger patients tended to have better visual outcomes compared to older patients. These findings underscore the importance of managing systemic conditions like diabetes to improve post-operative visual prognosis and tailoring treatment approaches based on patient age.

6. Conflict of Interest

None.

7. Source of Funding

None.

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