

Comparison of visual acuity before and after senile cataract surgery (in patients with diabetes mellitus less than 5 years and more than 5 years) in Yogyakarta

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ABSTRACT

Cataract is a condition in which the lens fiber on the lens capsule crumbles. One of the complications of diabetes mellitus is diabetic retinopathy. The study aimed to compare the visual acuity before and after phacoemulsification surgery in senile cataract patients with diabetes mellitus less than and more than 5 years in Yogyakarta. It was analytical observational research with cross-sectional design. The study was conducted at the Eye Clinic of a private hospital in Yogyakarta by using samples of 53 patients. The dependent t test method was used as the research test. The results of the study were significant with a value of 0.000 ($P < 0,05$), indicating there was a significant correlation between the visual acuity before and after phacoemulsification.

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INTRODUCTION

Cataracts are a common ocular condition characterized by the clouding of the lens, leading to diminished visual acuity, particularly in the elderly population (Nizami et al., 2024). The World Health Organization estimates that cataracts account for approximately 51% of world blindness, highlighting the need for effective surgical interventions (WHO, 2021). As the population ages, the prevalence of cataracts continues to rise, necessitating effective surgical interventions to restore vision (Alabdulwahhab, 2022; Hashemi et al., 2020). Among the various risk factors associated with cataract formation, diabetes mellitus (DM) is particularly significant. Studies indicate that individuals with diabetes are at a heightened risk of developing cataracts, with research suggesting a 3-5 times increased likelihood compared to non-diabetic individuals (Ivanescu et al., 2024; Kiziltoprak et al., 2019; Ye et al., 2024; Zarei-Ghanavati et al., 2024).

Diabetes mellitus is characterized by chronic hyperglycemia, which can lead to various complications, including diabetic retinopathy—a progressive disease affecting the retinal blood vessels (Liu et al., 2019). This vascular damage can impair blood flow and nutrient delivery to the

eye, potentially exacerbating cataract development (Mrugacz et al., 2023). The duration of diabetes plays a crucial role in the risk of cataract formation; studies suggest that patients with a longer history of diabetes tend to have more severe ocular complications (Kiziltoprak et al., 2019). Research indicates that patients with diabetes may experience different visual outcomes post-surgery based on the duration and control of their diabetes (Saraswati et al., 2024). Specifically, the duration of diabetes has been correlated with the severity of cataract formation and postoperative complications, which can ultimately affect visual recovery (Faramawi et al., 2020).

Furthermore, the impact of glycemic control on postoperative outcomes cannot be ignored. Poorly controlled diabetes has been associated with increased rates of postoperative complications, such as infection and delayed healing, which can hinder visual recovery (Lee et al., 2025). Therefore, it is critical for healthcare providers to prioritize the management of blood glucose levels in diabetic patients prior to and following cataract surgery (Verma et al., 2022). Phacoemulsification has emerged as the standard surgical technique for cataract removal, providing significant improvements in visual acuity and quality of life for patients (Akpolat et al., 2022; Atima et al., 2024; Chen et al., 2021). However, the outcomes of phacoemulsification in diabetic patients, particularly those with varying durations of diabetes, remain underexplored. Recent studies have suggested that patients with less than five years of diabetes may experience different surgical outcomes compared to those with more than five years of diabetes (Grzybowski et al., 2019).

This article aims to compare visual acuity before and after phacoemulsification surgery in senile cataract patients with diabetes mellitus for less than five years versus more than five years. By analyzing these two distinct groups, we seek to provide insights into the surgical outcomes and implications for clinical practice in managing cataracts among diabetic patients.

RESEARCH METHOD

This study employs a descriptive analytical observational method with a cross-sectional design. The research was conducted over a period of 7 months, from October 2023 to May 2024, at the Eye Clinic of a private hospital in Yogyakarta. The target population for this study comprises patients diagnosed with senile cataracts and diabetes mellitus who undergo phacoemulsification surgery. The sampling method utilized was consecutive sampling, meaning that the sample for this study includes all individuals who meet the inclusion and exclusion criteria. The inclusion criteria include patients aged over 40 years, diagnosed with senile cataracts and diabetes mellitus, who have undergone phacoemulsification surgery, and are registered at the eye clinic of the private hospital in Yogyakarta. The exclusion criteria consist of patients with a history of eye trauma and those who have undergone surgeries on the eyeball other than cataract surgery. The data obtained are primary data, which will be analyzed using SPSS software.

RESULTS AND DISCUSSIONS

The results of this study indicate that the highest number of cataract patients with diabetes mellitus (DM) for less than 5 years is in the younger age group of 51 - 60 years, with a total of 12 (46%) patients. In contrast, for cataract patients with DM for more than 5 years, the largest numbers are found in the age groups of 61 - 70 years and over 70 years, each with 9 (33%) patients. The table also indicates that among patients with DM for less than 5 years, there are more males, totaling 14 patients, which accounts for 54%. Conversely, in the group with DM for more than 5 years, there are more females, totaling 16 patients, representing 59% (Table 1).

Table 1. Characteristics of the sample

	Cataract with diabetes mellitus < 5 years		Cataract with diabetes mellitus > 5 years	
	N	%	N	%
Age				

41 - 50	0	0%	2	7%
51 - 60	12	46%	7	26%
61 - 70	9	35%	9	33%
> 70	5	19%	9	33%
Gender				
Male	14	54%	11	41%
Female	12	46%	16	59%

Characteristics of Visual Acuity in Cataract Patients with DM <5 Years and >5 Years

The visual acuity before surgery shows that 13 eyes (50%) were in moderate condition and 13 eyes (50%) were in poor condition. No eyes were recorded with good visual acuity prior to surgery. By the fourth week post-surgery, visual acuity was predominantly in the good condition category, with 18 eyes (69%), followed by moderate condition with 8 eyes (31%), and no eyes were found in poor condition. In the first week post-surgery, visual acuity began to be dominated by the moderate condition category, with 14 eyes (52%), followed by good condition with 9 eyes (33%), and poor condition with 4 eyes (11%). By the fourth week post-surgery, visual acuity was dominated by the good condition category, with 19 eyes (70%), followed by moderate condition with 5 eyes (19%), and 3 eyes (11%) in poor condition.

These findings are consistent with the research by Hanis et al., (2023) conducted at RSUD H. Abdul Manap in Jambi City. In this study, it was found that prior to surgery, poor visual acuity was dominant at 86.96%, followed by moderate visual acuity at 13.04%, and 0% with good visual acuity. In contrast, by the fifth week post-surgery, good visual acuity was dominant at 91.3%, followed by moderate visual acuity at 4.35%, and poor visual acuity also at 4.35%. In the first week post-surgery, good visual acuity was not predominant, which may be due to complications that can occur in the early weeks after cataract surgery. According to research by Putri & Sujuti, (2022), several complications can occur from the first day up to one month after cataract surgery, such as wound leakage, residual lens material, endophthalmitis, and glaucoma.

Average Visual Acuity Before and After Surgery

It is noted that in patients with DM for less than 5 years, the average visual acuity before surgery is 0.09, the visual acuity one week after surgery is 0.41, and the visual acuity four weeks after surgery is 0.59. For patients with DM for more than 5 years, the average visual acuity before surgery is 0.07, the visual acuity one week after surgery is 0.31, and the visual acuity four weeks after surgery is 0.58 (Table 2).

Table 2. Characteristics of visual acuity before and after surgery

Duration of diabetes mellitus	Before surgery	One week after surgery	Four weeks after surgery
< 5	0.09	0.41	0.59
> 5	0.07	0.31	0.58

Based on the data, there is an improvement in visual acuity at each follow-up compared to the pre-operative measurements. The results indicate that the average visual acuity at the four-week follow-up is higher in cataract patients with DM for less than 5 years, with a visual acuity difference of 0.01. This may be attributed to several factors, one of which is the duration of diabetes mellitus.

Differences in Visual Acuity Before and After Surgery

The difference in average visual acuity before and one week after cataract surgery in patients with DM <5 years and >5 years yielded a P value of 0.00 (<0.05), indicating that the difference is significant. The difference in average visual acuity before and four weeks after cataract surgery in patients with DM <5 years and >5 years also resulted in a P value of 0.00 (<0.05), demonstrating that this difference is significant as well. Furthermore, the difference in average visual acuity between one week and four weeks after cataract surgery in patients with DM

<5 years and >5 years showed a P value of 0.00 (<0.05), indicating that this difference is also significant.

Table 3. Differences in visual acuity before and after surgery

	Before surgery	One week after surgery	A	p
	Mean ± SE	Mean ± SE	Mean ± SE	
< 5 years	0,09 ± 0,03	0,41 ± 0,13	-0,32 ± 0,12	0,00
> 5 years	0,07 ± 0,05	0,31 ± 0,11	-0,24 ± 0,09	0,00
	Before surgery	Four weeks after surgery	A	p
	Mean ± SE	Mean ± SE	Mean ± SE	
< 5 years	0,09 ± 0,03	0,59 ± 0,13	-0,5 ± 0,13	0,00
> 5 years	0,07 ± 0,05	0,58 ± 0,11	0,50 ± 0,13	0,00
	One week after surgery	Four weeks after surgery	A	p
	Mean ± SE	Mean ± SE	Mean ± SE	
< 5 years	0,41 ± 0,13	0,59 ± 0,13	-0,19 ± 0,09	0,00
> 5 years	0,31 ± 0,11	0,58 ± 0,11	-0,26 ± 0,12	0,00

The analysis results, which show a significance value of 0.00 using the dependent t-test method, confirm that there is a significant improvement in the visual acuity of patients with senile cataracts and diabetes mellitus after undergoing cataract surgery using the phacoemulsification technique. This finding is highly relevant, considering that cataracts are one of the leading causes of blindness worldwide, and diabetes mellitus can exacerbate this condition.

Research by Zhai et al., (2019) indicates that the phacoemulsification technique is effective in improving visual acuity. This technique allows for the removal of cataracts with minimal trauma to the ocular tissue, contributing to faster recovery and better visual outcomes. Additionally, phacoemulsification reduces the risk of postoperative complications, which are often higher in patients with diabetes mellitus. This aligns with findings that show diabetic patients undergoing phacoemulsification experience a significant improvement in their visual quality, which can enhance their overall quality of life.

Sartiwi & Yusuf, (2019) highlight a significant relationship between high blood sugar levels and postoperative visual acuity, with a p-value of 0.00. This indicates that effective management of blood sugar levels is crucial for achieving optimal visual outcomes after cataract surgery. Patients with diabetes mellitus often experience fluctuations in blood sugar levels that can affect the healing process and the final results of the surgical procedure. Therefore, it is essential for the medical team to conduct proper evaluation and management of patients' blood sugar levels before and after surgery.

CONCLUSION

Cataract is a condition in which the lens fiber on the lens capsule crumbles. One of the complications of diabetes mellitus is diabetic retinopathy. The study was conducted at the Eye Clinic of a private hospital in Yogyakarta by using samples of 53 patients. The dependent t test method was used as the research test. The results of the study were significant with a value of 0.000 ($P < 0,05$), indicating there was a significant correlation between the visual acuity before and after phacoemulsification.

The results of this study showed a significant difference in visual acuity recovery between patients with diabetes mellitus less than 5 years and more than 5 years after cataract surgery using the phacoemulsification technique. This study emphasizes the need for earlier cataract screening for diabetic patients, especially those who have had diabetes for more than 5 years, due to the risk of faster cataract progression and slower visual recovery. The findings can be used in clinical guidelines to emphasize the importance of evaluating the duration of diabetes before cataract surgery, in anticipation of different responses to visual recovery.

Further studies could compare the effectiveness of other surgical techniques, such as femtosecond laser-assisted cataract surgery, in patients with diabetes to determine the most optimal method for improving visual outcomes.

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