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The influence of duration and control of diabetes mellitus with the results of phacoemulsification surgery on senile cataract sufferers with diabetes mellitus in Yogyakarta

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ABSTRACT

Diabetes Mellitus (DM) is a metabolic disorder that can be established if the GDP level is ≥ 126 mg/dl or the GDS or TTGO level is ≥ 200 mg/dl. Currently phacoemulsification technique has been widely used to treat cataracts because of its faster increase of visual acuity, lower changes in astigmatism, and low complication rates during surgery and post-operatively. The study aimed to determine the influence of duration and control of DM with the results of phacoemulsification surgery on senile cataract sufferers with DM in Yogyakarta. The study, which used an analytical observational method with a cross-sectional design, was conducted at the Eye Polyclinic of a Private Hospital in Yogyakarta by taking a sample of 77 patients. Consecutive sampling was carried out to collect the sample. Logistic regression method was applied for the study test. We used a logistic regression test and obtained significance values of 0.643 and 0.432 (P>0.05) which suggested no influence of duration and control of DM and the results of phacoemulsification surgery. It was stated that there was no influence between the duration and control of DM on the results of phacoemulsification surgery.

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INTRODUCTION

Diabetes Mellitus (DM) is a metabolic disease diagnosed by glucose levels of ≥ 126 mg/dl for fasting plasma glucose or ≥ 200 mg/dl for oral glucose tolerance test (American Diabetes Association, 2020; Kemenkes RI, 2020). The International Diabetes Federation (IDF) reported that in 2021, 19.46 million individuals in Indonesia were diagnosed with diabetes mellitus (DM). In the initial phases of diabetes mellitus, patients exhibit notable symptoms. Nonetheless, the predominant symptoms of diabetes mellitus are polyphagia, polyuria, and polydipsia (Devi et al., 2023; Magliano DJ & Boyko EJ, 2021).

A prevalent effect of diabetes mellitus is the impairment or occlusion of ocular blood vessels resulting from restricted blood supply to the eye (Altomare et al., 2018). The concepts of nutritional management for individuals with diabetes mellitus must emphasize the regularity of meal timing, the kind of food, and the caloric intake. Pharmacological therapy, with food management and physical exercise, may be administered for 30 to 45 minutes (PERKENI, 2019). The mechanisms involved encompass the disruption of all phases of lens development, lens fibrous epithelial metaplasia, cortical hydration of lens fibers, and the deposition of certain pigments (Cicinelli et al., 2023).

Cataract therapy may involve pharmacological interventions and surgical procedures. If visual acuity is 6/24 or superior, pupil dilation using 2.5% phenylephrine, cyclopentolate, atropine, or corrective lenses is enough for daily activities (Kaur et al., 2023; Nizami AA et al., 2024). Phacoemulsification surgery is the predominant surgical option. It entails the extraction and permanent substitution with an artificial intraocular lens (IOL) (Awad et al., 2024). This surgical procedure facilitates lens extraction through a smaller incision, necessitating minimal sutures or none, enabling patients to enhance their eyesight rapidly (Alshamrani, 2018). Despite the theoretical potential for excellent vision following phacoemulsification surgery, many circumstances may result in moderate to poor visual outcomes, including retinal detachment, macular edema, proliferative diabetic retinopathy, posterior capsule rupture, and glaucoma (Grzybowski et al., 2019; Kiziltoprak et al., 2019).

RESEARCH METHOD

This research employed an analytical, descriptive, observational approach with a cross-sectional design, was conducted for seven months, from October 2023 to April 2024, at the Eye Polyclinic of a private hospital in Yogyakarta.

The study population comprised individuals with senile cataracts and a history of diabetes mellitus who had undergone phacoemulsification surgery and were registered at the Eye Polyclinic of a private hospital in Yogyakarta. The sampling procedure employed was sequential, ensuring that all samples in this study adhered to the inclusion and exclusion criteria. Inclusion criteria were individuals over 40 years of age, diagnosed with senile cataracts and diabetes mellitus, who underwent phacoemulsification surgery. Exclusion criteria included patients with inadequate data, a history of trauma, cardiovascular illness, hypertension, corticosteroid use, and chronic infections. The original data collected were analyzed using the SPSS 22 software and the logistic regression test.

RESULTS AND DISCUSSIONS

This study acquired 77 patients who met both inclusion and exclusion criteria. The table shows that the largest patient demographic at the Eye Polyclinic of Private Hospitals in Yogyakarta was 60-74 age group, comprising 43 individuals (55.84%), with females accounting for 41 individuals (53.25%). The youngest patient with cataracts in this study was 45 years old, while the oldest was 76.

Table 1. Characteristics of the sample

Characteristics	N=77	Percentage (%)
Patient Age		
Middle age (45-59 years)	26	33,77%
Advanced age (60-74 years)	43	55,84%
Old age (75-90 years)	8	10,39%
Gender		
Male	36	46,75%
Female	41	53,25%
Duration of diabetes mellitus		

Characteristics	N=77	Percentage (%)
Less than 5 years	32	41,56%
More than 5 years	45	58,44%
Control status		
Controlled	38	49,35%
Not controlled	39	50,65%
Operated eye		
Right eye (OD)	39	50,65%
Left eye (OS)	38	49,35%
Post-phacoemulsification vision		
Good	58	75,32%
Average	12	15,58%
Poor	7	9,09%
Fundus abnormalities		
PDR	1	1,29%
CME	3	3,89%
Retinopathy of diabetes mellitus	6	7,79%
Corneal edema	4	5,19%
None	63	81,81%

Analysis of the ocular samples revealed that patients at the Eye Polyclinic of the Private Hospital in Yogyakarta with senile cataracts had minimal differences between the left and right eyes affected by cataracts. The data indicates that most patients at the Eye Polyclinic of Private Hospitals in Yogyakarta have had diabetes mellitus for over five years, totaling 54 individuals (58.44%), with 39 individuals (50.65%) exhibiting uncontrolled diabetes mellitus. Fifty-eight individuals (75.32%) achieved satisfactory postoperative eyesight (6/6-6/18). The status of the fundus was predominantly normal, leading to favorable postoperative phacoemulsification visual outcomes.

This study indicates that 58 patients with diabetes mellitus under and over five years of age, regardless of control status, exhibit satisfactory vision following phacoemulsification surgery. Twelve patients with diabetes mellitus exhibited moderate vision, whereas seven patients demonstrated poor vision. Post-phacoemulsification eyesight is compromised due to fundus abnormalities.

Impact of diabetes mellitus duration on phacoemulsification surgery outcomes

Table 2. Duration of diabetes mellitus and its impact on phacoemulsification surgery outcomes

Duration of Diabetes Mellitus	Fourth-week post-phacoemulsification vision			Total	P-values
	Good	Average	Poor		
< 5 years	25 (32,47%)	5 (6,49%)	2 (2,59%)	32 (41,55%)	0,643
> 5 years	33 (42,85%)	7 (9,09%)	5 (6,50%)	45 (58,44%)	
Total	58 (75,32%)	12 (15,58%)	7 (9,09%)	77 (100%)	

The logistic regression hypothesis test yielded a p-value of 0.643 (P>0.05). The length of diabetes mellitus does not influence the outcomes of phacoemulsification surgery. Consequently, it might be inferred that the hypothesis is rejected or lacks statistical significance. The findings correspond with a 2018 study at Cicendo Eye Hospital, which indicated that 73% of patients with senile cataracts had satisfactory eyesight following phacoemulsification surgery (Budiman, 2018). The enhancement in vision noted in this study occurred during the fourth week following phacoemulsification. It pertains to the re-epithelialization process of the cornea (Satwika et al., 2022). Individuals with diabetes mellitus, whether diagnosed for less than five years or more than five years and exhibiting fundus abnormalities such as diabetic retinopathy, macular edema, and

cystoid macular edema, typically experience moderate to poor visual outcomes following phacoemulsification surgery. The extended condition of hyperglycemia induces the onset of cataract problems via retinal nerve tissue and blood vessels (Lazuardi & Ashan, 2021). Cataract surgery is believed to elevate the chance of acquiring diabetic retinopathy postoperatively (Zhu et al., 2017). In this study, two patients exhibited the most prolonged duration of diabetes mellitus, precisely 25 years. Patients with diabetes mellitus for 25 years and fundus abnormalities associated with cystoid edema generally exhibited mediocre vision post-phacoemulsification surgery, whereas patients devoid of fundus abnormalities demonstrated acceptable vision following the procedure. Nonetheless, the suboptimal post-phacoemulsification vision was observed in a patient with a four-year history of diabetes mellitus, attributed to pre-existing macular edema and cystoid macular edema before the surgery.

The impact of regulated diabetes mellitus on the results of phacoemulsification surgery

The logistic regression hypothesis test yielded a p-value of 0.432 (P>0.05). The DM control status does not influence the results of phacoemulsification surgery. The results indicate that the hypothesis is rejected or lacks statistical significance. This outcome contradicts evidence indicating that the incidence of cataract problems following phacoemulsification surgery is much higher in populations with inadequate blood sugar regulation before the procedure (Kumar et al., 2016). Mahadewi's study (2022) indicates that excessive blood glucose levels might lead to retinal ischemia and adversely affect postoperative visual acuity (Mahadewi et al., 2022).

The researcher posits that patients who experienced moderate to poor eyesight following phacoemulsification surgery were affected by advanced age beyond 60 years and exhibited fundus abnormalities both preoperatively and postoperatively. Advancing age can diminish the flexibility of the ocular lens, resulting in difficulty with both near and distant vision. Subsequent assessment also influences the stability of eyesight following phacoemulsification surgery. Satwika's research (2022) indicates that the wound healing process following phacoemulsification surgery peaked at week six (Satwika et al., 2022). Still, this study exclusively examined post-phacoemulsification viral effects at week four. Intraoperative problems, including corneal edema, separation of the Descemet membrane, vitreous prolapse, and posterior capsule rupture, can adversely impact postoperative visual outcomes following phacoemulsification surgery.

CONCLUSION

Neither the duration of DM (p -value: 0.643) nor the control of DM (p-value: 0.432) significantly affected the outcomes of phacoemulsification surgery.

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