

Preoperative Clinical Profile and Coexisting Ocular Disease Among Phacoemulsification Candidates at Utama Eye Clinic Gresik

Nabila Putri Rahmadandi*, Uyik Unari Dwi Kaptuti

Utama Eye Clinic, Gresik, East Java, Indonesia

E-mail: nabilaputrirahmadandi@gmail.com; unariuyik53@gmail.com

*Corresponding author: Nabila Putri Rahmadandi; nabilaputrirahmadandi@gmail.com

ABSTRACT

Phacoemulsification is the most commonly performed cataract surgery worldwide, and preoperative evaluation plays a critical role in optimizing surgical outcomes. Regional data describing preoperative characteristics and coexisting ocular diseases remain essential for improving clinical decision-making and planning individualized management strategies. This study aims to describe the preoperative clinical profile, biometric characteristics, and coexisting ocular diseases among cataract patients undergoing phacoemulsification at Utama Eye Clinic, Gresik. This descriptive cross-sectional study utilized secondary data from medical records of patients who underwent preoperative assessment between October and November 2025. Variables included demographic characteristics, blood pressure, random blood glucose (RBG), visual acuity, intraocular pressure (IOP), biometric parameters, operative duration, and ocular comorbidities. Data were analyzed using univariate descriptive statistics. A total of 246 patients were included. Most patients were aged 60-69 years (45.5%) and female (52.8%). Visual acuity <math><6/60</math>-light perception (LP) was the most common preoperative category (69.1%). Hypertension (57.7%) was more frequent than normotension. The majority of patients had normal RBG values (91.5%) and normal IOP (96.7%). Median biometric measurements were: anterior chamber depth 3.18 mm, lens thickness 4.50 mm, and IOL power 20.00 D. Median operative duration was 11 minutes (range 5–69 minutes). The most common coexisting ocular diseases were posterior capsular fibrosis (PCO) ($n=11$), high myopia ($n=5$), glaucoma ($n=3$), and pseudoexfoliation syndrome ($n=3$). The study reveals that most patients presented at an advanced age with significant visual impairment and a high prevalence of systemic and ocular comorbidities. Accurate biometric assessment and comprehensive preoperative evaluation, including identification of ocular comorbidities, are essential for optimizing cataract surgical planning and outcomes. These findings provide updated regional data that may support improvements in preoperative screening protocols.

Keywords: cataract; phacoemulsification; preoperative evaluation; ocular comorbidity; biometric parameters

INTRODUCTION

Cataracts are a condition in which the lens of the eye becomes cloudy or opaque, blocking light from reaching the retina and causing a progressive decline in vision that can occur in people of all ages [1]. Globally, cataracts remain the leading cause of blindness, accounting for approximately 45% of blindness cases worldwide and affecting more than 15 million people [2]. In Indonesia, the prevalence of blindness is the highest in Southeast Asia, with an estimated annual increase in cataract incidence of 0.1% [3]. Currently, the most commonly used modern cataract surgery technique is phacoemulsification. This procedure breaks up the lens using ultrasonic energy, followed by aspiration and irrigation through a small corneal incision. This procedure is generally performed under topical or local anesthesia and allows patients to go home on the same day [4].

Various preoperative factors can influence the success of cataract surgery, including ocular comorbidities, age, gender, living conditions, and the

potential for surgical complications. These factors underscore the importance of comprehensive preoperative evaluation to plan the appropriate surgical approach and optimize visual outcomes in patients with diverse risk profiles [4], [5]. Clinical characteristics and ocular comorbidities in cataract patients may change with demographic developments, population health patterns, and increased prevalence of systemic comorbidities. Therefore, updating preoperative data is essential to ensure that phacoemulsification surgery planning, including risk stratification, choice of surgical technique, and intraocular lens selection, is based on the clinical picture most relevant to the current population. Updating this information is important for improving the accuracy of preoperative evaluation, minimizing potential complications, and optimizing postoperative visual outcomes. Based on this, this study aims to describe the preoperative clinical profile and ocular comorbidities in patients undergoing phacoemulsification surgery at the Utama Eye Clinic in Gresik [6], [7].

METHODOLOGY

This study is a descriptive, observational, cross-sectional design. The data used are secondary data obtained from the medical records of patients who underwent preoperative examinations and phacoemulsification procedures at the Utama Eye Clinic in Gresik in October–November 2025. The study population included all cataract patients who underwent preoperative examinations, including blood pressure (BP), random blood sugar (RBS), baseline visual acuity measurements, intraocular pressure (IOP), and biometrics such as Anterior Chamber Depth (ACD) and Lens Thickness (LT) during that period. The sample was selected using purposive sampling based on inclusion and exclusion criteria. Inclusion criteria included all patients with a diagnosis of cataracts who had complete medical records regarding age, gender, address, general physical examination results (blood pressure, random blood sugar), eye examination results (IOP and visual acuity), and biometric results (ACD and LT). Exclusion criteria included patients with incomplete medical records and patients who had canceled surgeries. The variables collected included demographic characteristics (age and gender), clinical parameters (blood pressure, random blood sugar, IOP, visual acuity, biometrics), duration of surgery, and coexisting ocular diseases.

The data analysis was performed univariately to present the frequency distributions and proportions for each variable. This study assessed data normality using the Shapiro-Wilk. Only variables that showed a normal distribution ($p \geq 0.05$) were presented as mean \pm SD and analyzed using parametric tests. Variables with non-normal distributions were summarized as median (IQR) and analyzed using nonparametric statistical tests. This study presents the analysis results in tables and descriptive narratives.

RESULTS

A total of 246 patients underwent phacoemulsification surgery during October–November 2025. The distribution of patient characteristics is listed in Table 1.

TABLE 1: Basic Characteristics of Cataract Patients Undergoing Phacoemulsification Surgery at the Utama Eye Clinic in Gresik (October–November 2025).

Characteristic	Frequency (n)	Percentage (%)
Age		
<40 years	5	2.1
40-49 years	20	8.1
50-59 years	47	19.1
60-69 years	112	45.5
≥ 70 years	62	25.2
Gender		
Female	130	52.8
Male	116	47.2
Operated Eye		
Right Eye (OD)	124	50.4
Left Eye (OS)	122	49.6

Blood Pressure		
Normotension (<140/90 mmHg)	104	42.3
Hypertension ($\geq 140/90$ mmHg)	142	57.7
GDS		
Normoglycemic (<200 mg/dL)	225	91.5
Hyperglycemic (≥ 200 mg/dL)	21	8.5
Visual acuity		
$\geq 6/18$	1	0.4
<6/18 - $\geq 6/60$	75	30.4
<6/60 - LP	170	69.1
IOP		
<21.00 mmHg	238	96.7
≥ 21.00 mmHg	8	3.3

The most common age group was 60–69 years (45.5%), followed by 70 years (25.2%) and 50–59 years (19.1%). Most patients were female (52.8%). Blood pressure was predominantly in the hypertensive category (57.7%). The majority were normoglycemic based on random blood glucose tests (91.5%). Surgery was more often performed on the right eye (50.4%) than the left eye (49.6%). Most patients presented with visual acuity of <6/60–LP (69.1%) at the time of phacoemulsification surgery, indicating that most had poor vision before surgery.

TABLE 2: Biometric and Surgical Characteristics of Phacoemulsification Surgery Patients.

Variable	Value	Unit
Operative Duration	11.0 (5-69)	menit
ACD	3.18 (2.03-6.03)	mm
Lens	4.51 \pm 0.67	mm
IOL	20.00 (-2.00-32.00)	D

Table 2 shows the biometric and operative characteristics of the patients. Lens thickness had a normal distribution (4.51 \pm 0.67 mm), while operative duration, ACD, and IOL power had abnormal distributions and are presented as medians (range).

TABLE 3: Distribution of Coexisting Ocular Diseases in Preoperative Phacoemulsification Patients with Valid Data (n = 34).

Ocular pathologies	N (patients)
Posterior Capsular Fibrosis	11
Glaucoma	3
Pseudo exfoliation Syndrome (PEX)	3
Lens Subluxation	1
High Myopia	5
Myopia	2
Staphyloma	1
Iridodialysis + Lens Subluxation	1
Glaucoma + Lens Subluxation	1
PEX + Lens Subluxation	3

Corneal scar + PEX	1
Posterior Capsular Fibrosis + High Myopia + Retinal Detachment + Lens Subluxation	1
Post-traumatic + M. Spinchter Pupil Paralysis + lens Subluxation	1

The most common associated eye disease was posterior capsule fibrosis, found in 11 patients. High myopia affected five patients, followed by glaucoma and pseudoexfoliation syndrome (PEX), which affected three patients each.

DISCUSSION

The age distribution of patients in this study shows that the 60–69 age group is the largest group undergoing phacoemulsification. This finding reinforces the understanding that cataracts are a degenerative disease that worsens with age. These results are consistent with Asferaw's (2024) findings, which reported that the 60–69 age group had the highest prevalence (38.2%) [8]. This correlation is further reinforced by Hugosson & Ekström (2020), who stated that age is a significant risk factor for cataract formation through the mechanism of oxidative stress on lens proteins [9]. Angelia & Manoe (2025) also reported the highest prevalence in the ≥ 65 age group (35.3%), further emphasizing that advanced age is an important determinant in cataract development [10].

In this study, the proportion of female patients (52.8%) was higher than that of male patients (47.2%). This finding is in line with the study by Choirunnisa et al. (2024), which reported a 62% proportion of female patients, and supports the evidence that women have a higher risk of cataracts [11]. Jiang et al. (2023) suggested that this risk may be related to women's longer life expectancy and hormonal changes during pregnancy, breastfeeding, and menopause, which may contribute to accelerated lens opacification. Similar findings were reported by Hugosson & Ekström (2020), with a cataract prevalence of 59.4% in women. Overall, these data reinforce the global trend that women are the group with a greater burden of cataract [9], [12].

In this study, the right eye, or oculus dexter (OD), was the most frequently operated on eye at 50.4%. Although no specific physiological or clinical factors favor operating on the right eye, clinicians determine the choice of eye based on each patient's clinical condition. These considerations include the degree of visual impairment, the severity of cataracts, the eye with the most severe symptoms, and the presence of concomitant eye diseases that may affect the urgency or complexity of the procedure. These findings are consistent with the clinical principle that surgical priority is determined by the eye with greater functional impairment rather than by anatomical lateralization; the proportion of right eyes (OD) was 50.4% [13].

In this study, hypertension was the most common comorbidity, with a prevalence of 57.7%. The prevalence of hypertension has important clinical

implications, given that it is associated with an increased risk of perioperative medical events, such as cardiovascular and neurological complications. In addition, uncontrolled hypertension can increase the risk of intraocular hemorrhage before, during, and after cataract surgery, and in some cases can contribute to permanent vision loss. These findings emphasize the need to assess and stabilize blood pressure in the preoperative phase to minimize the risk of complications [14]-[15]. However, in this study, the highest preoperative blood pressure was only 180/90 mmHg in one patient, and all patients underwent additional evaluation to ensure systemic and ophthalmological stability, including intraocular pressure, fasting blood sugar levels, and no history of significant heart disease. This allowed the procedure to be performed safely without major complications. Kumar et al. (2017) reported that the available evidence on the direct relationship between blood pressure levels and systemic risk during cataract surgery remains limited. This limitation is mainly due to the low incidence of serious cardiovascular or neurological events (e.g., decompensated heart failure, cardiac death, non-fatal myocardial infarction, or stroke) in modern cataract procedures [14]. Thus, although clinicians must monitor hypertension, proper stabilization and careful patient selection can minimize risks and allow for safe surgery [16].

Based on the 2021 PERKI guidelines, random blood glucose (RBG) measurements in this study were divided into two categories with a threshold of 200 mg/dL. The proportion of patients with RBG < 200 mg/dL was higher (91.5%) than that of patients with RBG ≥ 200 mg/dL (8.5%). Clinically, hyperglycemia has significant implications for ocular tissue healing. Grzybowski et al. (2019) reported that patients with diabetes may experience delayed corneal wound closure, increased risk of epithelial defects, recurrent erosion, superficial punctate keratopathy, decreased corneal sensitivity, and impaired epithelialization and wound healing [17]. Considering this evidence, the preoperative preparations in this study were appropriate to minimize the risk of postoperative complications related to hyperglycemia. The patient's GDS results were generally within safe limits, providing better opportunities for the healing process and reducing the risk of postoperative adverse events.

We classified visual impairment in this study into three groups based on visual acuity: less than 6/18, 6/18 to $\geq 6/60$, and $< 6/60$ to light perception (LP). The group with visual acuity $< 6/60$ -LP had the highest prevalence (69.1%), followed by the group with visual acuity $< 6/18$ - $\geq 6/60$ (30.4%). This condition may reflect delays in patients seeking treatment. Studies report that patients weigh factors such as distance to healthcare facilities, the risk of losing employment during treatment, and limited awareness of their vision loss when deciding to undergo cataract surgery. In addition, the high proportion of patients with severe visual impairment may be attributable to comorbidities such as pseudoexfoliation syndrome, hypertension,

and diabetes mellitus. These comorbidities can accelerate cataract progression and worsen visual acuity. Patients are often unaware of this progressive condition, so they seek treatment when their vision has already deteriorated significantly [5], [8], [10], [18].

Preoperative intraocular pressure (IOP) measurement is an important component of preoperative evaluation to minimize the risk of complications and ensure optimal postoperative outcomes. In addition to IOP, biometric parameters such as anterior chamber depth (ACD) and lens thickness (LT) are essential predictors of cataract surgery success [19]. In this study, most patients had IOP within the normal range (96.7%). Meanwhile, ACD values ranged from 2.03 to 6.03 mm, with a median of 3.18 mm, and LT values ranged from 2.38 to 6.16 mm, with a median of 4.5 mm.

These findings are relevant to the study by Zhang et al., which showed that ACD is closely associated with postoperative refractive error, with ACD variation affecting the effective position of the intraocular lens (IOL) and refractive outcome. Muhammad (2025) also reported that shallow preoperative ACD was significantly associated with postoperative myopia shift.[20], [21] In this study, IOL power ranged from -2 D to 32 D, with a median of 20 D, underscoring the importance of accurate biometric measurements, particularly ACD, LT, and axial length (AL), for determining the appropriate IOL power.

Meng et al. reported that lens thickness (LT) is an essential indicator for predicting intraocular lens (IOL) position, as changes in lens morphology during cataract progression can occur alongside decreased transparency. Clinicians can therefore use LT as a parameter with both clinical and pathophysiological value [20]. However, Henriquez et al. demonstrated that LT does not consistently correlate with cataract density in mild to moderate cases, so clinicians should not rely on LT as the sole indicator of cataract maturity [19]. These findings highlight the need for clinicians to consider clinical variability when interpreting LT and to avoid using it as a single parameter [20].

In this study, the duration of phacoemulsification surgery ranged from 5 to 69 minutes. The longest surgical time (69 minutes) was observed in one patient with several complicating factors, including posterior capsule fibrosis, floppy iris, inadequate pupil dilation, and low patient cooperation. This variation in operating time aligns with the literature, which shows that factors such as anesthesia type, surgeon experience, case complexity, pupil size and reactivity, use of additional pupil dilators, the need for a capsular tension ring (CTR), and intraoperative complications influence phacoemulsification duration. Patient non-cooperation is also a factor that often prolongs the procedure and increases technical risks [21], [22]. In addition, the presence of concomitant eye diseases such as posterior capsule fibrosis, pseudoexfoliation syndrome, glaucoma, or zonular

abnormalities can increase the difficulty of the operation and prolong the procedure. These factors not only affect the duration of the operation but also have the potential to contribute to variations in postoperative outcomes by increasing the risk of intraoperative complications and intraocular lens stability disorders.

The most common eye disease found in this study was posterior capsule opacification (PCO). PCO is a form of posterior capsule opacification caused by the migration and proliferation of residual lens epithelial cells (LECs) after cataract surgery, followed by the differentiation of these cells into fibroblasts and lens-like cells [23],[24]. This condition is the most common postoperative complication of cataract surgery. The literature also reports that LEC proliferation can occur in non-operative conditions, such as ocular trauma, characterized by the formation of fibrotic tissue and disorganization of lens fibers [24]. These findings form the conceptual basis that the occurrence of preoperative PCO in this study is likely related to LEC proliferation that occurred before surgery.

The second most common comorbidity is high myopia. Cataract surgery in patients with high myopia is generally more complex due to degenerative changes in the posterior segment involving the sclera, choroid, and retinal pigment epithelium, thereby increasing the risk of intraoperative complications and worsening postoperative visual prognosis [25], [26]. However, Ramakrishnan et al. reported that patients with high myopia can still achieve good postoperative visual outcomes, although the risk of refractive error persists, particularly residual hyperopia in eyes with very long axial length or in cases requiring negative-power IOLs [27]. Other associated eye diseases found include glaucoma and pseudoexfoliation syndrome (PEX). PEX is a systemic disorder affecting elastic tissue, characterized by the accumulation of abnormal fibrillar matrix material triggered by oxidative stress. PEX material is often seen on the anterior surface of the lens and can cause zonular weakness, thereby increasing the risk of lens subluxation and technical complications during cataract surgery. Progressive development of PEX material can also increase outflow resistance in the trabecular meshwork, ultimately causing or worsening glaucoma [1], [18].

The presence of concomitant eye diseases is a significant risk factor for achieving good postoperative visual outcomes in cataract surgery. These conditions can limit the potential for visual recovery, complicate the surgical procedure, and increase the risk of intraoperative and postoperative complications. However, previous studies show that most patients with ocular comorbidities still achieve meaningful visual improvement and improved quality of life after surgery when clinicians conduct a comprehensive preoperative evaluation and tailor perioperative management to each patient's condition.

CONCLUSION

This study describes the preoperative characteristics of patients undergoing phacoemulsification at the Main Eye Clinic in Gresik. It shows that most patients are elderly, female, and present with severe visual acuity loss. Biometric parameters indicate anatomical variations relevant to IOL power planning and refractive outcomes.

Concomitant eye diseases, particularly posterior capsule fibrosis, high myopia, glaucoma, and pseudoexfoliation syndrome, can increase procedural complexity and affect visual outcomes. These findings emphasize the importance of comprehensive preoperative evaluation, including identification of ocular comorbidities and accurate biometric examination, to optimize the success of cataract surgery.

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