

Visual Outcomes of Phacoemulsification

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Visual Outcomes of Phacoemulsification in Senile Cataract Patients in Purworejo Indonesia



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ABSTRACT

Purpose: There was still limited study about the success rate of phacoemulsification in Indonesia, although it has been widely used. This study aimed to assess the visual acuity based on the characteristics of patients with senile cataract who underwent phacoemulsification.

Study Design: Descriptive observational.

Place and Duration of Study: Panti Waluyo Hospital, Purworejo from January to November 2019.

Methods: This included 58 senile cataract patients (70 eyes) who underwent phacoemulsification. Basic patient characteristics such as: age, gender, cataract stages, comorbidity and pre- and postoperative visual acuity were taken from medical records. The visual acuity was measured pre-and postoperatively using Snellen Chart. The data were analyzed using a descriptive analysis method.

Results: There were 23 men and 35 women who underwent phacoemulsification during the study period. Seventy six percent were 60 – 74 years old. Eighty percent had immature cataract. Half of the patients did not have any comorbidity of diabetes mellitus or hypertension. There were 45 (64.3%) eyes with moderate to severe visual impairment (vision 6/18 – \geq 3/60) and 25 (35.7%) eyes with blindness (vision < 3/60). The postoperative vision of 57 eyes (81.4%) improved to a good outcome. Thirteen eyes (18.6%) were categorized as borderline outcome. No eyes were reported to have poor outcome post-surgery.

Conclusion: The postoperative visual acuity of cataract patients who underwent phacoemulsification was classified as good outcome (81.4%) and borderline outcome (18.6%). In this study, there was no poor visual outcome found.

Key Words: Cataract, Phacoemulsification, Visual acuity.

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INTRODUCTION

According to the World Health Organization, one of the leading causes of vision impairment and blindness is cataract (94 million out of one billion people

globally).¹ In Indonesia, 77.7% of blindness above 50 years is caused by cataract making it the leading cause of reversible blindness.² The prevalence of cataract related blindness in people more than 50 years old in Indonesia is 1.9%. The 2013 RISKESDAS (Basic Health Research) showed that Indonesians had the tendency of developing cataract 15 years earlier than people who live in subtropical areas. There is one out of 1000 people with the newly diagnosed cataract, and around 16 – 22% of the people with cataract aged less than 55 years old underwent surgery.³

As the life expectancy of Indonesians increases, the prevalence of senile cataract will increase due to

the degeneration process. The only definitive treatment of cataract is surgery with intraocular lens (IOL) implantation. Correction of visual impairment can have positive impact on the quality of life.⁴ Surgical Coverage of cataract in Indonesia is 52.7% with vision of < 3/60, 43.3% in patients with vision of < 6/60 and 25.6% in patients with vision of < 6/18.²

Phacoemulsification is one of the most common techniques of cataract surgery with modern technology. It only requires a small incision which makes its recovery fast, no suture is needed and the rehabilitation time is short. Visual acuity improves quickly as there is no or very little astigmatism after surgery. Outcome of cataract surgery can be measured by using a clinical indicator such as visual acuity or contrast sensitivity; or using a patient report of quality of life.⁵

A meta-analysis reported that phacoemulsification provided better uncorrected visual acuity (UCVA) due to lower astigmatism compared to manual small-incision cataract surgery.⁶ Phacoemulsification showed a significantly better visual outcome compared to an extracapsular cataract extraction procedure in Malaysia. Good visual outcome was found in 80.1% of eyes operated by Phacoemulsification. This result was higher compared to 48.5% of eyes operated by Extra Capsular Cataract extraction.⁷

A study in National Eye Center Cicendo Eye Hospital Bandung-Indonesia reported that visual acuity of the patients who underwent phacoemulsification increased gradually with the proportion of 81% of the cases having postoperative visual acuity higher than 6/18.⁸ A study in Yogyakarta and Southern Central Java Region Indonesia comparing the outcome of manual small incision cataract and phacoemulsification found improvement in visual acuity of $\geq 6/18$ in 59.6% eyes after phacoemulsification and 53.5% eyes after manual small incision cataract surgery (mSICS).⁹ There was no statistical difference in visual outcome results between the two groups ($p = 0.10$). A more recent study found 71.1% of samples in Sanjiwani Hospital Gianyar Bali obtained good visual outcome six weeks after phacoemulsification.¹⁰ The number of studies on the success rate of phacoemulsification in Indonesia is still limited. This study aimed to assess the visual acuity based on the characteristics of patients with senile cataract who underwent phacoemulsification in Indonesia.

METHODS

This was a descriptive observational study. The data were collected from the medical records of patients with senile cataract who underwent phacoemulsification at Panti Waluyo Hospital, Purworejo, Indonesia from January to November 2019. The study obtained ethical approval from the Health Research Ethics Committee of Duta Wacana Christian University and Panti Waluyo Hospital.

Senile cataract can be classified into four stages, such as early, immature, mature and hypermature. Visual acuity was measured pre- and postoperative using Snellen Chart and was converted into logMAR. According to WHO and the International Classification of Diseases 11 (2018), distance vision impairment is classified into Mild (< 6/12 to 6/18), Moderate (< 6/18 to 6/60), Severe (< 6/60 to 3/60) and blindness (< 3/60).¹¹

Postoperative visual acuity was measured and interpreted with these categories: good 6/6 – 6/18 (0,00 – 0,48 in logMAR), borderline < 6/18 – 6/60 (0,48 – 1,00 in logMAR) and poor < 6/60 (> 1,00 in logMAR). Age of the senile cataract patients were divided into 3 categories as proposed by the WHO: elderly (60 – 74 years old), old elderly (75 – 90 years old) and very old elderly (above 90 years old).¹¹

Patients with senile cataract ≥ 60 years old who underwent cataract surgery with phacoemulsification, had the pre- and post-operative visual acuity recorded (at least 28 days post-surgery), with or without comorbidities of diabetes mellitus and/or hypertension were included in the study. Incomplete medical records data and patients who had existing eye disease other than cataract (such as glaucoma, age-related macular degeneration) were excluded.

Total population record was used, so all patients who met the inclusion criteria were included in the study. Data were analyzed using a descriptive analysis method (univariate).

RESULTS

A total of 70 eyes underwent phacoemulsification. The data were collected from the medical records in Panti Waluyo Hospital. The demographic and eye data are presented in Table 1. Out of 58 patients, a total of 46 patients underwent phacoemulsification on only one side of the eye, while a total of 12 patients underwent the surgery on both sides.

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Table 1: Characteristics of the study population (n = 58).

Characteristic	n (%)
Age (years)	
Elderly (60 – 74 years old)	45 (77.6)
Old elderly (75-90 years old)	12 (20.7)
Very old elderly (above 90 years old)	1 (1.7)
Gender	
Male	23 (39.7)
Female	35 (60.3)
Number of Operated Eyes	
Right eye	35 (50)
Left eye	35 (50)
Senile cataract stages	
Immature cataract	56 (80)
Mature cataract	14 (20)
Comorbidity	
Diabetes mellitus	10 (17.2)
Hypertension	17 (29.3)
Diabetes mellitus and hypertension	2 (3.4)
None	29 (50)

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Table 2: The pre-operative and post-operative visual acuity.

Pre-operative Visual Acuity	Number of eyes, n (%)
Moderate to Severe Vision Impairment (< 6/18 - ≥ 3/60)	45 (64.3)
< 3/60	25 (35.7)
Post-operative Visual acuity (in logMAR)	n (%)
Good (0.00 - 0.48)	57 (81.4)
Borderline (<0.48 - 1.00)	13 (18.6)
Poor (>1.00)	0 (0)

Table 2 shows data of pre-operative and post-operative visual acuity. Table 3 compares postoperative visual acuity based on the characteristics of the study population. Postoperative visual acuity was assessed according to the age group. The highest percentage of good outcome and borderline outcome

were obtained in elderly (60 – 74 years) with a total of 45 eyes (83.3%) and 9 eyes (16.7%), respectively. There was no poor outcome recorded after phacoemulsification.

The distribution of postoperative visual acuity based on gender showed that the highest percentage of good outcome was found in female patients, which included 40 eyes (88.9%), while the highest percentage of borderline outcome was found in eight eyes of male patients (32%). Side of the operated eye that had a good postoperative outcome was the right eye with a total of 30 eyes (85.7%), while the higher percentage of borderline outcome was found in left eye (eight eyes, 22.8%).

Table 4 compares the visual acuity based on the senile cataract stages and comorbidity. Based on the stage of senile cataract, all the participants of the study had an improved visual acuity. Immature cataract had the highest percentage of good outcome results with a total of 51 eyes (91.1%), while most of the patients with mature cataract had borderline post operative outcome with a total of eight eyes (57.2%). Based on comorbidities, a good outcome was found in patients with no history of diabetes mellitus or hypertension with a total of 33 eyes (94.2%). Six eyes (30%) of patients with hypertension had the highest percentage of borderline outcome.

DISCUSSION

Fifty-eight patients and 70 eyes were included in the study. Forty-five eyes (64.3%) had moderate-severe vision impairment and 25 eyes (35.7%) had legal blindness pre-operatively. A study in Nigeria recorded

Table 3: Postoperative Visual Acuity Based on Characteristics of the Study Population.

Characteristics	Postoperative Visual Acuity. Number of Eyes, (%)			Total Number of Eyes, (%)
	Good Outcome	Borderline Outcome	Poor Outcome	
Age				
Elderly (60 – 74 years old)	45 (83,3)	9 (16,7)	0 (0)	54 (100)
Old (75-90 years old)	12 (80,0)	3 (20,0)	0 (0)	15 (100)
Very old (above 90 years old)	0 (0)	1 (100)	0 (0)	1 (100)
Total	57(81,4)	13 (18,6%)	0 (0)	70 (100)
Gender				
Male	17 (68)	8 (32)	0 (0)	25 (100)
Female	40 (88,9)	5 (11,1)	0 (0)	45 (100)
Total	57 (81,4)	13 (18,6)	0 (0)	70 (100)
Side of the operated eye				
Right eye	30 (85,7)	5 (14,2)	0 (0)	35 (100)
Left eye	27 (77,2)	8 (22,8)	0 (0)	35 (100)
Total	57 (81,4)	13 (18,6)	0 (0)	70 (100)

Table 4: Postoperative Visual Acuity based on the cataract stages and comorbidity.

Characteristics	Postoperative Visual Acuity Number of Eyes, (%)			Total Number of Eyes, (%)
	Good Outcome	Borderline Outcome	Poor Outcome	
Stage of the cataract				
Immature	51 (91,1)	5 (8,9)	0 (0)	56 (100)
Mature	6 (42,8)	8 (57,2)	0 (0)	14 (100)
Total	57 (81,4)	13 (18,6)	0 (0)	70 (100)
Comorbidity				
None	33 (94,2)	2 (5,8)	0 (0)	35 (100)
Diabetes mellitus	9 (69,2)	4 (30,8)	0 (0)	13 (100)
Hypertension	14 (70)	6 (30)	0 (0)	20 (100)
Diabetes Mellitus + Hypertension	1 (50)	1 (50)	0 (0)	2 (100)
Total	57 (81,4)	13 (18,6)	0 (0)	70 (100)

the preoperative visual acuity of 499 cataract patients from January 2007 to December 2016. Over the decades, the mean preoperative visual acuity remained within the range of blindness (visual acuity < 3/60) with only three patients with mild visual impairment. The mean preoperative visual acuity was in the range of 2.05 – 2.64 LogMAR which was worse than 6/120 or classified as severe visual impairment.¹² This suggested that patients in the Sub-Saharan African country sought surgery at a very low visual acuity or a reflection of the visual acuity threshold that the surgeons offered for cataract surgery.

Another study from France investigated the result of phacoemulsification in 100 patients (the other eye of these patients had visual acuity of \leq 20/200) reported that the mean pre-operative visual acuity was 0.74 logMAR (20/100 which was considerate moderate) in 75% patients, > 20/40 in 8%, and < 20/200 in 17% patients.¹³

Factors that may be responsible for the differences in preoperative visual acuity are variation or restrictive indications for surgery, lower surgical capacity and difficulty in healthcare access.¹³ Greater surgical capacity in developed countries may be a contributing factor that people in developed countries have milder pre-operative visual impairment.

Preoperative visual acuity is related to a country's human development index and Cataract Surgical Rates (CSR). According to Wang et al, countries with low human development index (HDI) had poorer preoperative visual acuity.¹⁴ In our study, more than half of the operated eyes had a moderate-severe vision impairment which was consistent with Indonesia's HDI. In Indonesia CSR was estimated to be 1,600 in 2018.² The CSR is targeted to reach 2000-3000 in 2030. CSR is ideally measured based on cataract registry. However, it is not yet available in Indonesia

therefore the number of cataract may be higher.²

A study in Bandung showed that there were 8964 blind eyes (94.8%) and 495 eyes with severe visual impairment (5.2%) preoperatively.¹⁵ The patients received free cataract surgery in the field or the village. In our study, patients came to get their eyes checked in the hospital with their own free will, whereas the cataract surgery performed in Bandung was conducted in the field. Limited cost, poor access to healthcare facilities and surgeons' threshold to operate might be the cause of lower number of surgeries.¹⁵ There are several possible reasons why cataract patients in Indonesia refuse to get operated. Some of the reasons are; lack of knowledge about cataract, indication of cataract surgery and fear of operation.²

On the other hand, a study found a trend of better preoperative visual acuity in Sweden, Malaysia and Netherlands.¹⁶ Visual acuity threshold for cataract surgery increases gradually and postoperative visual activity also improves. The latter one may be linked to fewer surgical complications.

Out of 70 eyes that underwent phacoemulsification, 57 eyes (81.4%) were categorized to have good outcome and 13 eyes (18.6%) had borderline outcome. No one had a decline in their visual acuity or was categorized as poor visual acuity. A recent systematic review showed there was a large variation in postoperative visual acuity in cataract patients all over the world.¹⁷ More than 70% of the patients had an improved visual acuity of \geq 0.32 (20/60) in high-income countries. On the other hand, in low-income and middle-income countries, less than 70% patients achieved the desired postoperative visual acuity. These differences were observed across 26 cross-sectional studies from low-income and middle-income countries, as well as five cross-sectional

studies from high-income countries. Postoperative visual impairment was mainly caused by refractive error, ocular comorbidities and surgical complications such as posterior capsule opacification.¹⁷

In this study, 77.6% patients were 60 – 74 years old. A meta-analysis revealed that percentage of senile cataract was highest over-60 years of age.¹⁸ Prevalence of cataract increases with age, and age is directly correlated with cataract. Some scholars think that age and cataract is not fully a causal-relationship, but rather it is a result of uncontrolled risk factors that cause a cumulative effect. Some of the examples of the risk factors are ultraviolet radiation or oxidative damage.¹⁸

Good postoperative outcome was seen in patients with 60-74 years of age (45 eyes, 83.3%). The oldest participant in the study was 94 years old and the postoperative visual acuity improved to borderline outcome. This finding was consistent with the finding of a recent study in India that reported younger age as one of the predictors of good postoperative outcome.¹⁹

Phacoemulsification was done in 58 eyes (80.0%) with immature cataract and 14 eyes (20.0%) with mature cataract. This indicated that most of the patients in Panti Waluyo Hospital had enough information or knowledge about cataract so they mostly got their eyes checked by the doctor at an earlier stage of cataract. A study in India had similar finding which showed that there were 105 patients (64.4%) with immature cataract and 34 patients (20.8%) with mature cataract.²⁰ However, an epidemiology study about correlation of cataract cases in tertiary health care center in rural area of India showed that 57% cases had mature cataract.²¹ Awareness about the issue, availability and the utilization of the health care facility may be the factors that influence the stage of cataract at the time of presentation.²¹ In this study, patients with immature cataract had better visual acuity outcome than those with mature cataract.

Hypertension and diabetes mellitus are known risk factors for the development of cataract. In this study, there were 17 patients (29.3%) who had hypertension, ten patients (17.2%) had diabetes mellitus, and two patients (3.4%) had both comorbidities. Half of the patients (29 patients) did not have any comorbidity. One study reported that hypertension was the pronounced risk factor in cataract cases.²² In this study, patients without comorbidity had good visual

outcome, with a total of 33 eyes (94.2%). The second highest percentage of patients with good outcome were patients with hypertension, followed by 9 eyes (69.2%) of patients with diabetes mellitus and one eye of patient with both comorbidities. This is supported by a study that compared postoperative visual acuity of patients with and without diabetes.²³ People without diabetes had better postoperative visual acuity, although the difference was not significant.²³

A good preoperative glycaemic control and better surgical techniques play a role in minimizing the incidence of complications and hence resulting in better postoperative vision.²⁴ Diabetic patients are at a higher risk of intra and postoperative complications compared to non-diabetic patients. Poor postoperative visual acuity could possibly be found in diabetic patients with these following risk factors: diabetic macular edema, poor preoperative visual acuity (diabetic maculopathy, ischemia and traction). Systemic disease or non-communicable diseases should be screened properly prior to surgery.²²

In a study in Trinidad and Tobago, 49% of 401 patients with cataract had hypertension. The presence of hypertension increased the risk of poor visual outcome compared to those without hypertension.²⁵ Some studies suggested that hypertension led to conformational changes in the lens capsule, but further studies need to be done.^{21,24}

Based on the result of this study, we propose a larger multicentre study, which includes a bigger number of cataract patients who undergo phacoemulsification and make comparisons with other surgical techniques to provide further information about advantages and disadvantages of each technique based on the demography in Indonesia. Health promotion and prevention should be done widely in order to increase the knowledge and awareness of cataracts so that patients will be treated at an earlier stage. Regular screening and free cataract surgery will help to increase CSR.

Conflict of Interest: Authors declared no conflict of interest.

Ethical Approval: The study was approved by the Institutional review board/Ethical review board (1138/C.16/FK/2020).

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Authors' Designation and Contribution

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